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(54) DEVICE FOR INHALING DRY PARTICLES OF NICOTINE-BASED SUBSTANCE

(57) An inhalation device (10) for inhaling dry particles (52) of nicotine-based substance comprises: a reservoir (38) for receiving the dry particles (52) of nicotine-based substance, a pressurized air device (20), an air flow feeding element (26) configured to supply pressurized air from the pressurized air device (20) into the reservoir (38) via multiple air flow inputs (30), and an outlet pipe (56) fluidly communicating with the reservoir (38) for delivering a mixture of dry particles (52) of nicotine based substance and pressurized air outside the reservoir (38).

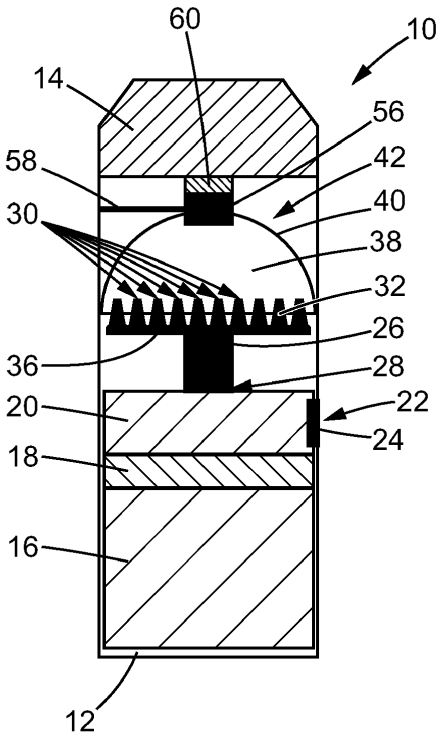

FIG. 1

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Description

Technical Field

[0001] The invention refers to a device for inhaling dry particles of nicotine-based substance.

Background Art

[0002] A current practice for consuming a tobacco product, consists in inhaling or sniffing a dry snuff tobacco product after having prepared a dose of the product on a surface, e.g. the back surface of a hand. The tobacco product is not burned nor heated, so that this practice is smokeless. The inhaled dry snuff tobacco product - or snuff - is a tobacco made from finely ground or pulverized tobacco leaves. It is generally inhaled into the nasal cavity, delivering a swift hit of nicotine and a lasting flavored scent (especially if flavoring has been blended with the tobacco). Traditionally, snuff is inhaled lightly after a pinch of snuff is either placed onto the back surface of the hand, held pinched between thumb and index finger, or held by a specially made "snuffing" device.

[0003] Snuff comes in a range of texture and moistness, from very fine to coarse, and from toast (very dry) to very moist. Often drier snuffs are ground more finely.

[0004] This practice has several issues for the consumer.

[0005] First nicotine may not be delivered efficiently as the powder is not completely delivered to the lungs.

[0006] Then, dosing of the tobacco product is critical, and under/overdosing of the tobacco product often occurs.

[0007] Sniffing tobacco product may also be uncomfortable or even unpleasant. For example, sniffing tobacco may trigger sneezing.

[0008] Also, people around may think the consumer is consuming cocaine or other drugs which can be inhaled rather than snuff.

[0009] Finally, the tobacco product may drop while preparing the dose leading to wasting some product.

[0010] There is thus a need to facilitate dry snuff tobacco powder consumption while increasing product delivery efficiency and sensorial experience.

[0011] Moreover, CN-A-113491824 discloses an inhalation device that delivers aerosol formed of a powdered substance to the nasal passages of a user. The inhalation device comprises a power supply unit, a strength adjuster, an air fan, an inner container, and a discharge port. The container contains powdered substance. The air fan delivers air to the container which entrain the substance and deliver it to the user via the discharge port. The power supply supplies power to the air fan and the strength adjuster. The strength adjuster controls the rotation of the air fan.

[0012] It is also known from WO-A-2011/013003 an inhalation device that delivers powdered therapeutic formulation into the nostril of a user. The inhalation device is constructed to receive nozzle that includes a capsule which contains powdered substance. The inhalation device comprises an electrical air pump, a valve assembly, and a nozzle hole. The air pump delivers air to the capsule which carry the substance and deliver it to the user via the nozzle hole. The valve assembly controls the airflow from the pump to the nozzle. The pump comprises a slidable piston which can be actuated by electric means.

[0013] Finally, WO-A-2013128447 seems to disclose an inhalation device that delivers nicotine-based substance to the nasal passages of a user. The inhalation device comprises a capsule, an air flow pump, a valve, and a nosepiece. The nosepiece and the capsule form a single unit which is attached to the inhalation device. The capsule contains nicotine-based substance. The airflow pump delivers air to the capsule which carry the substance and deliver it to the user via the nosepiece. The valve is used to control the airflow to the capsule for the pump.

[0014] However, only a small amount of product can be inhaled per use.

Summary

[0015] In the present application, an inhalation device for inhaling dry particles of nicotine-based substance is described, the inhalation device comprising:

a reservoir for receiving the dry particles of nicotine-based substance,
a pressurized air device,
an air flow feeding element configured to supply pressurized air from the pressurized air device into the reservoir via multiple air flow inputs,
an outlet pipe fluidly communicating with the reservoir for delivering a mixture of dry particles of nicotine-based substance and pressurized air outside the reservoir.

[0016] Thus, thanks to the multiple air flow inputs into the reservoir, it is possible to deliver a mixture comprising more dry particles of nicotine-based substance outside the reservoir, without to increase the pressure of the pressurized air, which could lead to an uncomfortable experience for a user of the inhalation device.

[0017] The following features can be optionally implemented, separately or in combination one with the others:

- the inhalation device further comprises a filter downstream of the reservoir and upstream from an outlet of the outlet pipe, the filter preferably being in the outlet pipe or upstream of the outlet pipe (e.g. in the reservoir);
- the inhalation device further comprises an air diluting channel fluidly communicating with the outlet pipe, the air diluting channel comprising one opening outside the inhalation device and one opening into the outlet pipe, especially between an input opening of

the outlet pipe inside the reservoir and an output opening of the outlet pipe outside the reservoir;

- the air diluting channel has a cross-section surface comprised between 0.5 mm^2 and 1.5 mm^2;
- the air diluting channel has a length comprised between 4 mm and 20 mm;
- the cross-section surface of the air diluting channel is adjustable;
- the cross-section surface of the air diluting channel is manually adjustable;
- the cross-section surface of the air diluting channel is automatically adjustable, preferably to mimic the ratio of nicotine by puff delivered in a cigarette;
- the reservoir is comprised of, preferably consists in, an exchangeable cartridge received in a housing in a casing of the inhalation device;
- the air flow feeding element comprises multiple needles adapted to form multiple air inlets in the reservoir, said needles preferably being adapted to pierce the cartridge;
- the outlet pipe is adapted to perforate the cartridge, preferably on an outlet face of the cartridge opposite to the inlet face of cartridge pierced by the needles;
- the inlet face of the cartridge is formed by a foil sealed on a flange of cup-shaped body or bowl of the cartridge;
- the body or bowl and the foil of the cartridge form a moisture and preferably air-impermeable container for the nicotine-based substance; e.g., made of aluminium;
- the air pressure device is an air pump;
- the inhalation device further comprises a control unit for controlling the pressurized air device, preferably so that the pressurized air supplied into the reservoir is adapted to form a fluidized bed of dry particles of nicotine-based substance in the reservoir;
- the reservoir, preferably an exchangeable cartridge, comprises dry particles of nicotine-based substance, the dry particles of nicotine-based substance preferably comprising ground tobacco powder;
- the dry particles of nicotine-based substance have a particle size below 100 micrometer.

Brief Description of Drawings

[0018] Other features, details and advantages will be shown in the following detailed description and on the figures, on which:

Fig. 1 schematically illustrates an example of an inhalation device;

Fig. 2 illustrates an example of an air flow feeding element used in the inhalation device of Fig. 1;

Fig. 3 shows an example of a cartridge of nicotine-based substance which can be used in the inhalation device of Fig. 1; and

Fig. 4 illustrates a cross section of the cartridge of nicotine-based substance as shown in Fig. 3.

Description of Embodiments

[0019] Fig. 1 shows an example of an inhalation device 10 for inhaling dry particles of nicotine-based substance by a user. In the present case, the inhalation device 10 is a handheld device. Indeed, the dimensions and weight of the inhalation device **10** are such that the inhalation device **10** can easily be carried by a user, e.g. with only one hand.

[0020] As shown, the handheld inhalation device **10** comprises a casing **12** and an endpiece **14** mounted on the casing **12**. The casing **12** can be made of a single part. However, the casing **12** is preferably made of several parts, for example at least two parts which can be separated from each other, to facilitate access to one or several pieces of the inhalation device **10** received in the casing **12**.

[0021] The endpiece **14** may be a nosepiece. However, in the present case, the endpiece **14** is a mouthpiece. In both cases indeed, particles inhaled through the nose or through the mouth can be carried to the lungs of a consumer. Moreover, inhaling particles through the mouth is deemed less likely to cause sneezing to the consumer.

[0022] The casing **12** here receives a battery **16**. The battery **16** can for example be received at a first end of the casing **12** opposite to a second end of the casing **12** on which the endpiece **14** is mounted.

[0023] The casing **12** further receives an electronic command unit **18** (or ECU). The ECU **18** can comprise or even consist in a printed circuit board (or PCB). As illustrated, the ECU **18** can be close to the battery **16** to avoid long and bulky wirings inside the casing **12**.

[0024] The casing **12** also receives an air pump **20** of the inhalation device **10** as illustrated on Fig. 1. The air pump **20** is in fluid communication with outside the casing **12** through an air input **22** provided on the casing **12**. Preferably, an air filter **24** is provided in the air input **22** or between the air input **22** on the casing **12** and the air input of the air pump **20**, so that only filtered air goes through the air pump **20**.

[0025] The air pump **20** is here adapted to suck air from outside the casing **12**, to pressurized said air, and to feed said air into an air flow inlet of an air flow feeding element **26.**

[0026] The air flow feeding elements **26** here comprises a manifold **26**. The manifold **26** can comprise at least one air flow inlet **28** in fluid communication with an outlet of the air pump **20**. The manifold **26** preferably comprises only one air flow inlet **28** in fluid communication with the single outlet of the air pump **20**. The manifold **26** can further comprise a plurality of air flow outlets **30**, each air flow outlet **30** being in airtight fluid communication with the at least one air flow inlet **28** or with the single air flow inlet **28**. The manifold **26** thus allows to divide the air flow

provided by the air pump **20** into several air flows at the air flow outlets **30** of the manifold **26**.

[0027] As illustrated on Fig. 2, each of the air flow outlets **30** can be formed at a free end of a needle **32**. The needles **32** can form an array **34** or matrix of needles **32**. In the illustrated example, the array **34** of needles **32** has a base portion **36**, e.g. formed as a circular disc.

[0028] Thus, according to the illustrated example, the manifold **26** comprises:

- a input pipe, one end of which forming the air flow inlet **28** of the manifold **26**;
- the base portion **36** comprising one air inlet corresponding to the air outlet of the input pipe and a plurality of air outlets, each air outlet being in airtight fluid communication with the air inlet;
- a plurality of needles **32** each extending from the base portion **36** and forming an air flow outlet **30** of the manifold **26**, each air flow outlet **30** being in airtight fluid communication with a respective air outlet of the base portion **36**. The manifold **26** can for example comprise between **10** and **100** needles **32**. A density of needles is advantageously of 9 to 100 needles per square centimeter.

[0029] The outlets **30** at the free end of the needles **32** are received within a reservoir **38** of dry particles of nicotine-based substance. As illustrated, the reservoir **38** can consist in a cartridge **40** received in a corresponding housing **42** formed in the casing **12** of the inhalation device **10**. Preferably, the housing **42** is open when the two parts of the casing **12** are separated from each other. Alternatively, the casing **12** or at least one part of the casing comprises a flap which can selectively be opened and closed to allow a user to reach the housing **42** inside the casing **12**.

[0030] An example of a cartridge **40** is illustrated on Figs. 3 and 4. The cartridge **40** as illustrated is comprised of a bowl **44**, which is substantially hemispheric in the illustrated example, and a lid **46** closing the space **48** inside the bowl **44**. For example, the bowl **44** and the lid **46** are sealed together along a rim **50**.

[0031] The bowl **44** can be made in any suitable material, e.g. in aluminum. Preferably the bowl **44** is made in an airtight material.

[0032] The lid **46** can also be made in any suitable material, e.g. of aluminum. Preferably the lid **46** is made of an airtight material.

[0033] The bowl **44** and the lid **46** can be made of a one same material or of different materials.

[0034] The space **48** inside the bowl **44** closed by the lid **46** comprises dry particles **52** of nicotine-based substance, e.g. as a powder. Said dry particles may comprise, *inter allia*:

- finely ground or pulverized tobacco leaves, e.g. a ground tobacco powder;
- at least one flavoring or scent.

[0035] The dry particles **52** can have a particle size (D90) below 100 μm.

[0036] Preferably, the dry particles **52** of nicotine-based substance do not totally fill the space **48** inside the bowl **44**. On the contrary, a part **54** of the space **48** is preferably kept empty, *id est* void or filled with air or another gas, for example nitrogen, at a pressure substantially equal to or above 1 bar, at a temperature of 25 °C. A density of air bath being lower than the compressed particles, such that preferably 10% to 100% empty volumes should be added to the volume of the compressed particles 52.

[0037] The inhalation device **10** further comprises an outlet pipe **56** in airtight fluid communication with the space **48** inside the bowl **44** of the cartridge **40**. For example, the outlet pipe **56** can be adapted to pierce the bowl **44** when the cartridge **40** is installed in the housing **42** formed in the casing **12** and/or when the casing **12** is closed after the cartridge has been installed in the housing **42** formed in the casing **12**. According to another embodiment, a consumer may have to remove a lid or foil on the cartridge **40** (for instance, the top of the bowl could have an opening sealed by a foil (like a sticker). The foil could be peeled or perforated), especially on the bowl **44** to allow the outlet pipe **56** to be in fluid communication with the space **48** inside the bowl **44** of the cartridge **40** once the cartridge **40** has been installed in the housing **42** formed in the casing **12**.

[0038] The inhalation device **10** further comprises a diluting air channel **58**. The diluting air channel **58** extends between a diluting air inlet on the casing **12** of the inhalation device **10** and a diluting air outlet in fluid communication of with the outlet pipe **56**. Thus, the diluting air channel **58** allows air to be sucked from outside the casing **12** into the outlet pipe **56**. Air sucked through the diluting channel **58** is then mixed up with the mixture of particles of nicotine-based substance and pressurized air from the cartridge **40**, before this mixture exits the casing **12**.

[0039] According to an embodiment, the cross section of the diluting air channel **58** may be modified. For example, the cross section of the diluting air channel can be adjustable manually. Thus, a user may modify the quantity of dry particles of nicotine-based substance in the inhaled mixture. For example, a flapper or diaphragm may be provided so as to modify the cross section of the diluting air channel **58**, e.g. of an orifice of the diluting air channel **58**.

[0040] According to another example, the cross section of the diluting air channel **58** is automatically adjustable. The ECU **18** can for example control any means adapted to modify the cross section of the diluting air channel **58**, e.g. a flapper or diaphragm. The cross section of the diluting air channel **58** can be modified to mimic the ratio of nicotine by puff delivered by a cigarette.

[0041] The cross section of the diluting air channel **58** can be comprised between 0.5 and 1.5 mm^2. The diluting air channel **58** can have a length between 4 and 20 mm.

[0042] The outlet pipe **56** extends into the endpiece **14**. A filter **60** can be provided in the outlet pipe **56** or between the outlet pipe **56** and the endpiece **14**, preferably downstream from the diluting air channel **58**. The filter **60** can be static or moving, e.g. spinning, to remain clean and/or to increase the velocity of the particles going through the filter **60** and/or to mix the particles and the air going through the filter **60**. In a possible embodiment, the filter 60 is provided in the cartridge such as by a piece of gauze or fibrous sheet attached to the inner surface of the bowl in the air inlet region.

[0043] An example of use of the inhalation device **10** is described below in more detail.

[0044] The inhalation device **10** is adapted to deliver dry snuff tobacco powder when used like a vaping device. For example, the inhalation device **10** is used to be sucked by mouth (*id est* the endpiece is a mouthpiece). However, according to another embodiment the inhalation device **10** comprise an endpiece which is a nosepiece, adapted to be received in a nose of a user.

[0045] As explained above, cartridges **40** can be used as reservoir **38** of dry particles of nicotine-based substance in the inhalation device **10**. Using cartridges **40** is particularly advantageous. First, this limits the risks that the tobacco product to be inhaled, drops and is wasted. Moreover, using cartridge **40** can allow a particularly precise dosing of the particles of nicotine-based substance to be inhaled. For example, the cartridge **40** can comprise a quantity of dry particles of nicotine-based substance for eight puffs rather than only one single sniff.

[0046] Preferably, by placing a cartridge **40** inside the housing **42** and then closing the casing **12**, if necessary, the cartridge **40** is pierced by both the needles **32** of the manifold **36** as well as by the outlet pipe **56**.

[0047] Then, the user switches on the inhaling device **10**. Doing so, the pump **20** is started, the pump **20** being controlled by the ECU **18**. Here, the ECU **18** can control the pump **20** so that the pressure and the rate of flow of the air flow provided by the pump **20** inside the cartridge **40** forms a fluidized bed with the dry particles **52** of nicotine-based substance.

[0048] A fluidized bed is a well-known physical phenomenon that occurs when a solid particulate substance is under the right conditions so that it behaves like a fluid. The usual way to achieve a fluidize bed is to pump pressurized fluid into the particles. The resulting medium then has many properties and characteristics of normal fluids, such as the ability to free flow under gravity. In other words, a fluidized bed consists of fluid-solid mixture that exhibits fluid-like properties. A fluidized bed can be considered as a heterogeneous mixture of fluid and solid that can be represented by a single bulk density.

[0049] Here, a fluidized bed of particles of nicotine-based substance in air lead to a particularly comfortable inhalation of the mixture by a user, through his/her mouth. This also maximize the quantity of particles of nicotine-based substance by puff.

[0050] Here, the pressure and the rate of flow of the air flow provided by the pump **20** inside the cartridge 40 can be such that the dry particles **52** of nicotine-based substance are boiling inside the cartridge **40** without flying away nor depositing on a surface of the cartridge **40**, especially on the lowest surface of the cartridge **40**. The dry particles **52** of nicotine-based substance also boil in the cartridge **40** because of the number of air flow outlets **30** of the manifold **26** opening inside the cartridge **40**. More specifically since several air flow outlets **30** of the manifold **26** are inside the cartridge **40** then the air flow inside the cartridge **40** is more homogeneously divided. This helps to form a fluidized bed compared to the case where only one air flow outlet **30** would be inside the cartridge **40**. In this latter case, the distribution of the air flow inside the cartridge **40** would be heterogenous to form a fluidized bed inside the whole space **48** in the cartridge **40**. In other words, with only one air flow outlet **30**, a fluidized bed could be formed including some of the dry particles **52** of nicotine-based substance present in the cartridge **40**. But not all the dry particles **52** would be in such a fluidized bed, so that some product would be wasted.

[0051] With the inhaling device **10** of Fig. 1, the powder of the dry particles **52** of nicotine-based substance is "boiling" without flying away or depositing. This can be achieved by injecting diffused air into the powder at a rate that is just not enough to make the powder fly away but just "boils". In this way, the powder of dry particles **52** is like weightless because the injected air is balancing out the gravity. If the injected air is too much, the force created by the airflow would be greater than the gravity, and the powder of dry particles 52 would fly away if not constrained by a cover. Contrary, if the injected air is not enough, the powder would sediment and behave like a solid. When lift force and weight are equal, the powder bath appears "boiling" and acts like a liquid, e.g., not being compressed when inserting/moving an object in the bath.

[0052] A fluidized bed of particles of nicotine-based substance can easily and comfortably be inhaled by a user, through the outlet pipe **56**.

[0053] It is to be understood that the invention is not limited to the details of construction set forth above. On the contrary, it is 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 carried out in various way.

[0054] For example, according to the example of Fig. 1, the reservoir **38** consists in an exchangeablecartridge **40**. Alternatively, the reservoir **38** can be open tank, where the dry particles **52** of nicotine-based substance is charged by the user.

[0055] Moreover, in the exampled described here above, a fluidized bed of particles of nicotine-based substance is formed in the cartridge. However, it is also possible for a user to inhale a mixture of air and particles of nicotine-based substance even if no fluidized bed is created in the cartridge. However, it is believed that the cre-

ation of fluidized bed inside the cartridge proves an increased comfort to a user and ensures more cleanliness to the system.

[0056] Also, according to the described embodiment, an air pump **20** is used to create a flow of air inside the reservoir **38**. However, one with ordinary skills in the art could imagine using other air pressure device to create this flow of air inside the cartridge **40**, such as a compressed air cartridge for example.

Claims

1. An inhalation device (10) for inhaling dry particles (52) of nicotine-based substance comprising:

a reservoir (38) for receiving the dry particles (52) of nicotine-based substance,
a pressurized air device (20),
an air flow feeding element (26) configured to supply pressurized air from the pressurized air device (20) into the reservoir (38) via multiple air flow inputs (30),
an outlet pipe (56) fluidly communicating with the reservoir (38) for delivering a mixture of dry particles (52) of nicotine based substance and pressurized air outside the reservoir (38).

2. The inhalation device of claim 1, further comprising a filter (60) downstream of the reservoir (38) and upstream from an outlet of the outlet pipe (56), the filter (60) preferably being in or upstream of the outlet pipe (56).

3. The inhalation device of claim 1 or 2, further comprising an air diluting channel (58) fluidly communicating with the outlet pipe (56), the air diluting channel (58) comprising one opening outside the inhalation device and one opening into the outlet pipe (56), especially between an input opening of the outlet pipe (56) inside the reservoir (38) and an output opening of the outlet pipe (56) outside the reservoir (38).

4. The inhalation device of claim 3, wherein the air diluting channel (58) has a cross-section surface comprised between 0.5 mm^2 and 1.5 mm^2.

5. The inhalation device of claim 3 or 4, wherein the air diluting channel (58) has a length comprised between 4 mm and 20 mm.

6. The inhalation device of one of claims 3 to 5, wherein the cross-section surface of the air diluting channel (58) is adjustable.

7. The inhalation device of claim 6, wherein the cross-section surface of the air diluting channel (58) is manually adjustable.

8. The inhalation device of claim 6, wherein the cross-section surface of the air diluting channel (58) is automatically adjustable, for example to mimic the ratio of nicotine by puff delivered by a cigarette.

9. The inhalation device of any one of the preceding claims, wherein the reservoir (38) is comprised of, preferably consists in, an exchangeable cartridge (40) received in a housing (42) in a casing (12) of the inhalation device (10).

10. The inhalation device of claim 9, wherein the air flow feeding element (26) comprises multiple needles (32) adapted to form multiple air inlets in the cartridge (40), said needles (32) preferably being adapted to pierce the cartridge (40).

11. The inhalation device of claim 9 or 10, wherein the outlet pipe (56) is adapted to perforate the cartridge (40), preferably on a face of the cartridge (40) opposite to the face of cartridge (40) pierced by the needles (32).

12. The inhalation device of any one of the preceding claims, wherein the air pressure device is an air pump (20).

13. The inhalation device of any one of the preceding claims, further comprising a control unit (18) for controlling the pressurized air device (20), preferably so that the pressurized air supplied into the reservoir (38) is adapted to form a fluidized bed of dry particles (52) of nicotine-based substance in the reservoir (38).

14. The inhalation device of any one of the preceding claims, wherein the reservoir (38) comprises dry particles (52) of nicotine-based substance, the dry particles (52) of nicotine-based substance preferably comprising ground tobacco powder.

15. The inhalation device of claim 14, wherein the dry particles (52) of nicotine-based substance have a particle size below 100 micrometers.

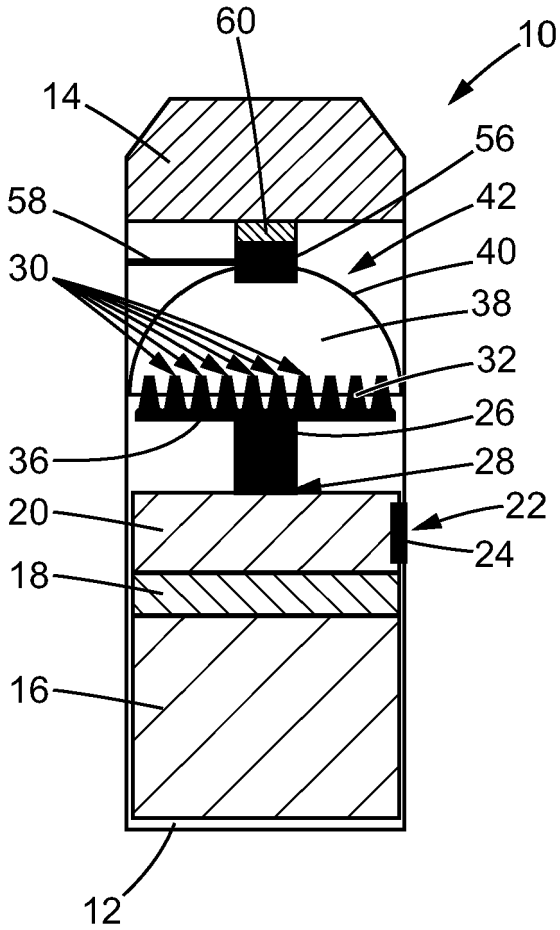

FIG. 1

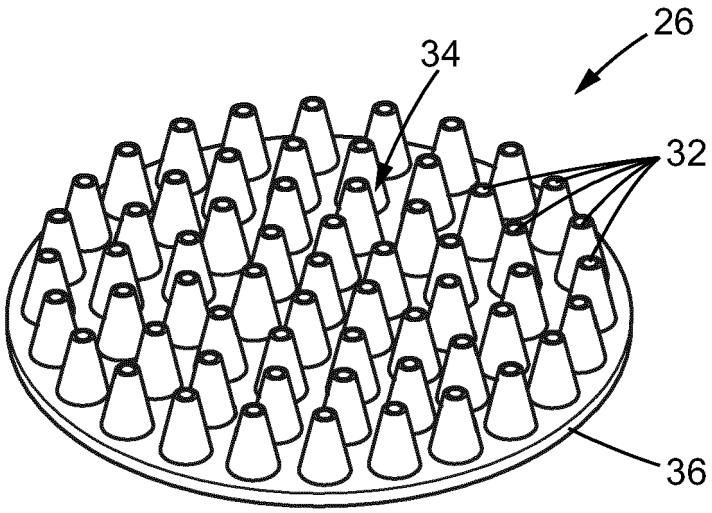

FIG. 2

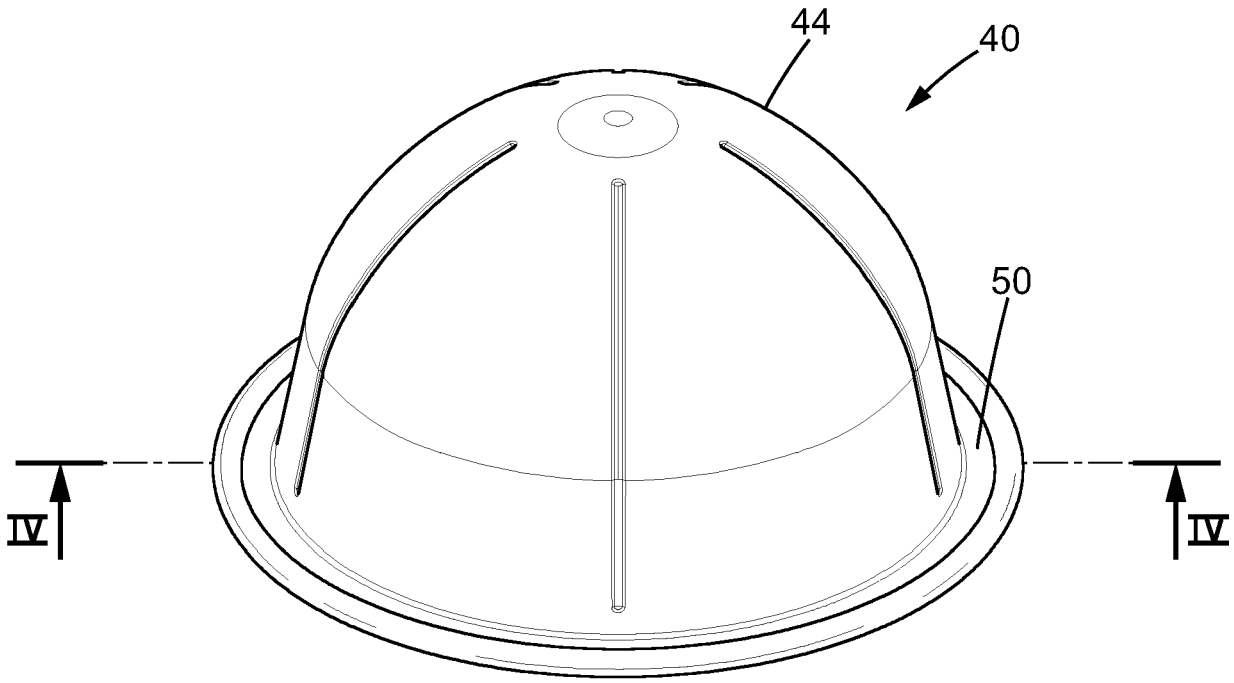

FIG. 3

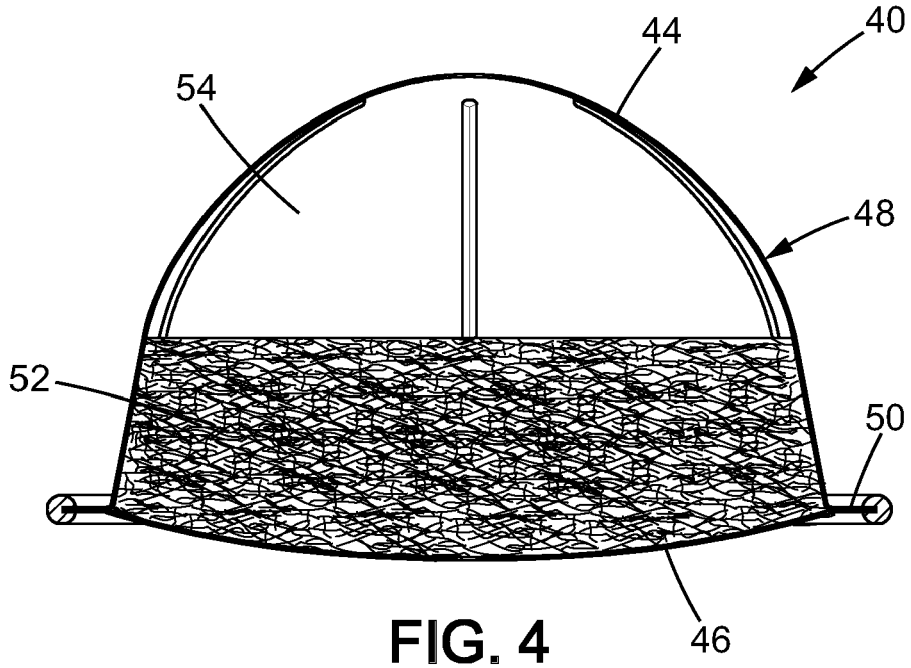

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 22 20 3663

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 2022/126036 A1 (RUBIN DARREN [US]) 28 April 2022 (2022-04-28) * paragraph [0062] - paragraph [0071] * * paragraph [0125] - paragraph [0197]; figures 1-33 *	1-9, 12-15 10,11	INV. A24F40/05 A24F40/48 ADD. A24F40/20 A24F40/42 A24F42/20
X A	US 2003/183229 A1 (SMITH ADRIAN E [US] ET AL) 2 October 2003 (2003-10-02) * paragraph [0087] - paragraph [0139]; figures 1-29 *	1-7,9-13 8,14,15	
X A	WO 2022/010182 A1 (KT & G CORP [KR]) 13 January 2022 (2022-01-13) * paragraph [0039] - paragraph [0105]; figures 1-6 *	1-7,9, 12,13 8,10,11, 14,15	
X A	US 10 071 211 B2 (TSUTSUI TATSUO [JP]; SHIN NIPPON BIOMEDICAL LABORATORIES LTD [JP]) 11 September 2018 (2018-09-11) * column 6, line 19 - column 8, line 63; figures 1-11 * * column 16, line 37 - column 17, line 39 * * column 26, line 46 - column 29, line 11 *	1-7,9, 12,13 8,10,11, 14,15	TECHNICAL FIELDS SEARCHED (IPC) A24F A61M
A	US 11 452 825 B2 (PHILIP MORRIS PRODUCTS SA [CH]) 27 September 2022 (2022-09-27) * column 1, line 10 - column 13, line 12; figures 1-6 *	1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 April 2023	Espla, Alexandre

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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