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(54) **DISPOSABLE CAPSULE FOR USE IN A VAPING DEVICE**

(57) Present invention relates to a disposable capsule (20) and a plurality of capsule assembly for use in a vaping device, wherein the capsule (20) having a housing for containing liquid substance, comprising a male connector (12) provided on one side of the housing and a female connector (14) provided on another side of the housing, wherein the male connector (12) and the female connector (14) comprises a surface to mate with a female connector and a male connector of other capsules, respectively, the female connector (14) comprises a substantially cir-

cular base area having an accepting lip element having a primary sealed opening (15), the male connector (12) comprises a substantially circular base area with a dome structure having a primary sealed opening (15), wherein when a male connector (12) of a capsule and a female connector (14) of another capsule, or vice versa, are mated, the primary sealed openings (15) are ruptured, thereby allowing liquid substance of the capsules to communicate.

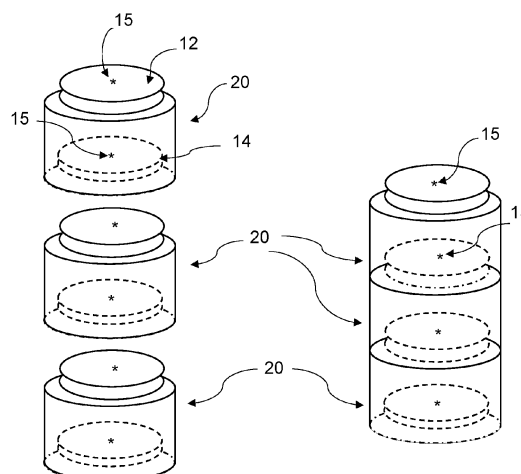


FIGURE 1A

FIGURE 1B

Description

Technical field of the invention

[0001] The present invention relates to the field of tobacco, more specifically to the electronic cigarette which produces vapour.

Background of the invention

[0002] Smoking devices which heat rather than burn vaporisable material, such as tobacco-containing substrate, to create a vapour for inhalation are becoming popular. They generally comprise a heat source powered by gas or electricity and a chamber for receiving a plug of vaporisable material or a disposable capsule containing a vapour-generating product. When in use, the plug or capsule is inserted into the device and heated by the heat source to generate a vapour for inhalation.

[0003] A number of capsules used for vaping in different purposes are known. For instance, patent document US 2006174901 discloses a capsule containing additive materials such as flavour components. The sealed capsule is subjected to external force, such as squeezing, by a smoker prior or during smoking of the cigarette in order to release at least a portion of the additive material from the one or more capsules and expose the additive material to mainstream smoke passing through the filter.

[0004] Another patent document US 20190239558 discloses a smoking article including a capsule configured to release a liquid, preferably water, as an additive material providing modified sensory attributes. In the case of using a liquid-filled capsule for a smoking article, the capsule may be a non-directional capsule or preferably a directional capsule. A directional capsule is configured to break at predetermined rupture region and is adapted to direct liquid release into a desired direction or towards a particularly desired region of the smoking article.

[0005] These capsules often have several drawbacks. For instance, some capsules are structurally integrated with the device and they are not easily replaceable or disposable. Other capsules may be disposable upon consummation; however, the volume of the liquid is either too little or too much to suit according to the needs of different users, as some users may have to carry additional capsules to replace the used capsules.

[0006] It is therefore an object of the present invention to provide an improved capsule for a vaping device.

Summary of the invention

[0007] The present inventors have found solutions to the above-posed problems through the present invention as illustrated in the present specification.

[0008] In a first aspect, present invention relates to a disposable capsule for use in a vaping device, wherein the capsule having a housing for containing liquid sub-

stance, comprising a male connector provided on one side of the housing and a female connector provided on another side of the housing, wherein the male connector and the female connector comprises a surface to mate with a female connector and a male connector of other capsules, respectively; the female connector comprises a substantially circular base area having an accepting lip element having a primary sealed opening; the male connector comprises a substantially circular base area with a dome structure having a primary sealed opening; wherein when a male connector of a capsule and a female connector of another capsule, or vice versa, are mated, the primary sealed openings are ruptured, thereby allowing liquid substance of the capsules to communicate.

[0009] In a second aspect, present invention relates to a plurality of disposable capsules assembly according to the present invention interconnected to form a capsule assembly.

[0010] According to some embodiments, the male connector and the female connector are provided on an opposite side of the disposable capsule. This allows the capsules to be connected longitudinally. As vaping device generally has an elongated body, the battery of capsules can thus be fitted into the body of the vaping device.

[0011] According to some embodiments, two, three or four pairs of male connectors and female connectors are provided to the capsule, wherein each pair of the male connector and the female connector are arranged on an opposite side of the capsule. This allows the capsules to be connected not only longitudinally but also at the sides, thus the connected capsules may appear as a "t-cross", allowing an even higher volume of liquid substance to be provided.

[0012] According to some preferred embodiments, the accepting lip of the female connector comprises a surface and a periphery complimentary to the male connector such that when the female connector and the male connector are mated, the accepting lip of the female connector surround the male connector in a water-tight manner. This configuration prevents liquid from leaking through the connection points. Moreover, when the capsule especially the male and female connectors are made of elastomeric material, this allows leak-proof connection to be established.

[0013] According to some preferred embodiments, at least a valve is provided to the capsule. The valve not only prevents liquid leakage, but it can also be served as a check valve to prevent backflow of the liquid.

[0014] According to yet some other embodiments, the at least one valve is provided to the male connector and/or the female connector and/or nipples of the capsule. The valve is preferably provided to the male connector and/or the nipple in the protruding part as this allows an easy installation of the valve.

[0015] According to some embodiments, the valve is a flanged duckbill valve.

[0016] According to some embodiments, the accepting

lip is a flanged duckbilled check valve.

[0017] According to yet some other embodiments, the primary sealed opening of the female connector and/or the secondary sealed opening of the nipple is a tearable opening. As the protruding structures e.g., male connector and nipple penetrates the female connector, the sealed opening in the female connector can be easily ruptured or torn.

[0018] According to a preferred embodiment, the primary sealed opening of the male connector and/or the secondary sealed opening of the nipple is a pressure-sensitive opening and/or pressure-sensitive valve.

[0019] According to a preferred embodiment, a nipple with a secondary sealed opening is provided on top of the male connector and the female connector of the capsule, respectively, wherein the secondary sealed openings are only ruptured after the primary sealed openings are ruptured. This two-step configuration allows the capsules to be connected to each other without establishing a communication of the liquid substance, and only when the user desires to establish the liquid communication, the user may then rupture the second sealed openings by pressing the two longitudinal ends of the capsules for instance.

[0020] According to some embodiments, the opening of the female connector is a tearable opening.

[0021] According to some embodiments, the opening of the male connector is a pressure-sensitive opening.

[0022] By "about" or "approximately" in relation to a given numerical value, it is meant to include numerical values within 10% of the specified value. All values given in the present disclosure are to be understood to be complemented by the word "about", unless it is clear to the contrary from the context.

[0023] The indefinite article "a" or "an" does not exclude a plurality, thus should be treated broadly.

[0024] Unless defined otherwise, technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs.

[0025] A tobacco-containing substrate can be any compound, mixture, particle matter, material and/or solution that contains and/or carries a constituent of tobacco, either artificially included or naturally contained in tobacco, e.g. tobacco, tobacco particles, tobacco flavor and/or nicotine. The liquid substance according to the present invention may comprises the tobacco-containing substrate.

[0026] As used herein, the term "vaping device" refers to a device for producing a vapour and/or aerosol that is intended to be heated rather than combusted in order to release volatile compounds that can form a vapour and/or an aerosol.

[0027] As used herein, the term "vapour" refers to a material, upon heating, capable of releasing volatile compounds, which can form a vapour and/or an aerosol. The vapour generated from liquid substance described herein may be visible or invisible and may include aerosol (for

example, fine particles of substances, which are in a gaseous state, that are ordinarily liquid or solid at room temperature) as well as gases and liquid droplets of condensed vapours.

[0028] An electronic cigarette (e-cigarette) or similar devices like electronic pipes or heat-not-burn devices, as referred to in the present invention, are not particularly limited, and may be used to provide a user with an aerosol to inhale. It can, according to certain embodiments, comprise a mouthpiece, a heater, a receiving portion, e.g. a pod, stick, capsule and a casing.

Brief description of the figures

[0029]

Figure 1A shows a schematic perspective view of the capsule according to an embodiment of the present invention.

Figure 1B shows a schematic perspective view of a plurality of capsules according to the Figure 1A stacked upon each other.

Figure 2 demonstrates a schematic view of the capsules according to the present invention loaded in a vaping device.

Figure 3A and 3B show a closed-up view of the internal of the male connector according to one embodiment of the present invention.

Figure 4A shows a schematic perspective view of the capsule according to an embodiment of the present invention.

Figure 4B shows a schematic perspective view of a plurality of capsules according to the Figure 4A stacked upon each other.

Detailed description of the invention

[0030] The following description of the preferred embodiments is merely exemplary in nature and is in no way intended to limit the scope of the invention, its application or uses.

[0031] Figure 1A shows an exemplary of a capsule 20 according a first embodiment. The capsule 20 can be provided in a cylindrical shape, having a male connector 12 and a female connector 14 provided on an opposite location of the capsule 20. Preferably, the male connector 12 is a protruding structure whereas the female connector 14 is an acceptor or a concave structure for accepting the male connector 12. It is preferably that the female connector 14 is situated within the capsule 20. However, it can be provided to be located outside of the main body of the capsule 20. The capsule 20 comprises a housing, wherein liquid substance is contained within. The hous-

ing of the capsule 20 can be made of a plastic material such as polyethylene or silicone material in order to ensure for lightweight. Alternatively, biodegradable material can be used to make the housing such as said capsule can be degraded easily than plastic material. The capsule can contain between 1 ml and 50 ml of liquid substance for instance, or preferably between 2 ml and 20 ml.

[0032] A sealed opening 15 is provided on the surface of each of the male connector 12 and the female connector 14. The sealed opening 15 may be a weakened point which is easily ruptured upon distortion. As the male connector 12 and the female connector 14 comprises a complimentary surface and shape to mate with a female connector and a male connector of other capsules, respectively, hence no liquid is leaked from the two connected capsules 20. Once the two capsules 20 are connected to each other, their sealed openings 15 are ruptured or broken due to the distortion force, thus allowing the liquid substance contained in the two capsules to communicate and flow freely through the sealed openings 15.

[0033] As can be seen in the Figure 1A, the female connector 14 comprises a substantially circular base area having an accepting lip element having a primary sealed opening 15. Similarly, the male connector 12 comprises a substantially circular base area with a dome structure having a primary sealed opening 15. When a male connector 12 of a capsule 20 and a female connector 14 of another capsule, or vice versa, are mated, the primary sealed openings 15 are ruptured, thereby allowing liquid substance of the capsules to communicate. It is disclosed herein that the sealed openings 15 may preferably has a thickness of less than 0.5 mm, preferably less than 0.2 mm to allow easy rupture. The sealed opening 15 once being ruptured, a permanent opening will be created and thus the capsule 20 is no longer watertight. As illustrated in the Figure 1B, multiple capsules can be stacked and connected with each other, like *Lego* pieces. When the male connector 12 and the female connector are mated, due to their complimentary shapes and surfaces, an airtight connection between the male connector 12 and the female connector 14 can be created, thus ensuring the liquid substance within the capsules 20 remained inside the capsules 20.

[0034] Figure 2 shows an exemplary mode of operation of the capsules 20 with the vaping device 200, wherein a plurality of capsules 20 are loaded into the vaping device 200. The vaping device may comprise a mouth piece 120, a power supply 220, a controller 240, an electric heater 160 and channels 180 for directing liquid substance from the capsule 20 towards the electric heater 160 such that the liquid substance can be heated to be vaporized. A wick-like element may be incorporated with the electric heater 160 such that liquid substance from the capsules 20 are drawn constantly out of the capsules and fed towards the electric heater 160. As can be seen in the Figure 2, the vaporized liquid substance will be channelled towards the mouth end (see arrow head),

passing through a mouth piece 120 and be inhaled by the user.

[0035] The capsules 20 are loaded into a capsule storing portion where typically between two and five capsules 20 of the present invention can be loaded therein. The capsule 20 according to the present invention may be provided in different length such that the right total length of the capsules can be loaded into the capsule storing portion of the vaping device. Of course, for those vaping device which has an integrated tank, present invention will not be suitable. Ideally, the vaping device comprises a capsule storing portion of at least 3 cm where at least one removable capsule or cartridge can be loaded therein. Once the right length or amount of capsules are loaded to the capsule storing portion, the male connector 12 can be perfectly connected to the liquid channel 180.

[0036] Figure 3A and 3B demonstrate a closed-up view of the internal of the male connector 12 according to an exemplary of the present invention, wherein a valve 33 is provided within the male connector 12. In addition to the sealed opening 15 which is provided to the surface of the male connector 12, the valve 33 is provided as an additional protection from leaking when the male connector 12 and the female connector 14 are mated. Upon connected, the valve 33 can be situated within and accepted by the female connector 14. To this end, it is disclosed that the valve 33 can be provided also within the female connector 14, or within the nipple 22, 24 of the capsule 20.

[0037] To this end, it is reiterated that the accepting lip of the female connector 14 comprises a surface and a periphery complimentary to the male connector 12 such that when the female connector 14 and the male connector 12 are mated, the accepting lip of the female connector 14 surrounds the male connector 12 in a water-tight manner. This can be achieved as the material of said parts are elastomeric material so that the accepting lips for instance can wrap tightly around the other parts. It is disclosed that several valves 33 can be provided to the capsule 20. For example, the valve 33 can be provided to the male connector 12 and/or female connector 14 and/or nipple 22, 24 of the capsule 20.

[0038] According to a further embodiment, the valve 33 can be for instance flanged duckbill valves. Flanged duckbill valves are unique, one-piece, elastomeric components that act as backflow prevention devices or one-way valves or check valves. They have elastomeric lips 35 in the shape of a duckbill which prevent backflow and allow forward flow. The main advantage of duckbill valves over other types of one-way valves is that duckbill valves are self-contained i.e., the critical sealing function is an integral part of the one-piece elastomeric component as opposed to valves where a sealing element has to engage with a smooth seat surface to form a seal. Therefore, duckbill valves are easily incorporated and assembled into the capsule 20 without the hassle or problems associated with the surface finish quality of mating seats and/or complex assembly processes.

[0039] Moreover, when the valve 33 is provided to the capsule 20 especially to the male connector 12, it has other advantages such as position independent, low opening pressure-immediate free flow, virtually no internal volume and dead space, corrosion resistant, wear resistant and cost effective.

[0040] The capsule 20 and/or the valve 33 according to the present invention can be provided in various elastomeric material such as medical and food-grade silicone or hydrocarbon-resistant fluoro-silicone rubber in order to handle a broad range of media and temperatures.

[0041] Figures 4A and 4B show another embodiment of the invention, wherein a secondary protruding element is provided to the male connector 12 and/or the female connector 14. In this example, a nipple 22, 24 is provided to the top of the male connector 12 and the female connector 14, respectively, wherein a secondary sealed opening 25 can be seen provided on the surface of the nipple. To this end, it is disclosed that the characteristics and the features of the secondary sealed opening 25 can be identical to the primary sealed opening 15.

[0042] In this example, a two-step rupturing of the sealed openings 15, 25 are provided to the capsule. When a user connects the male connector 12 of a capsule 20 with a female connector 14 or another capsule 20, the two capsules 20 are connected while the primary sealed openings 15 are being ruptured while the secondary sealed openings 25 remained intact. A typical "click" sound may be heard when the two capsules 20 are connected to each other in order to notify the user that the connection has been established. This can be realised by providing a pin or little protruding-like element on the male connector 12 and grooves on the female connector 14. A plurality of capsules 20 can be connected in the similar manner, as seen in the Figure 4B.

[0043] The secondary sealed openings 25 can then be ruptured to established fluid communication when the user decides to operate the battery of capsules 20 by pressing the capsules for example through the two longitudinal ends. As the secondary sealed openings 25 are ruptured only after the primary sealed openings 15, a fluid communication of the liquid substance between the capsules 20 is therefore established. This allows the user to enjoy the content of the capsule with an increased volume without needing to replace the empty capsule frequently. Alternatively, the user has always some additional capsules 20 available and may decide whenever to furnish the vaping device with the additional liquid substance. This provides the user with a higher degree of freedom and flexibility.

Claims

1. A disposable capsule (20) for use in a vaping device, wherein the capsule (20) having a housing for containing liquid substance, comprising

a male connector (12) provided on one side of the housing and a female connector (14) provided on another side of the housing, wherein the male connector (12) and the female connector (14) comprises a surface to mate with a female connector and a male connector of other capsules, respectively,

the female connector (14) comprises a substantially circular base area having an accepting lip element having a primary sealed opening (15), the male connector (12) comprises a substantially circular base area with a dome structure having a primary sealed opening (15), wherein when a male connector (12) of a capsule and a female connector (14) of another capsule, or vice versa, are mated, the primary sealed openings (15) are ruptured, thereby allowing liquid substance of the capsules to communicate.

2. The capsule (20) according to claim 1, wherein the male connector (12) and the female connector (14) are provided on an opposite side of the disposable capsule (20).
3. The capsule (20) according to claim 1 or claim 2, wherein two, three or four pairs of male connectors (12) and female connectors (14) are provided to the capsule (20), wherein each pair of the male connector (12) and the female connector (14) are arranged on an opposite side of the capsule (20).
4. The capsule (20) according to any one of the preceding claims, wherein the accepting lip of the female connector (14) comprises a surface and a periphery complimentary to the male connector (12) such that when the female connector (14) and the male connector (12) are mated, the accepting lip of the female connector (14) surround the male connector (12) in a water-tight manner.
5. The capsule (20) according to any one of the preceding claims, wherein at least a valve (33) is provided to the capsule (20).
6. The capsule (20) according to claim 5, wherein the at least one valve (33) is provided to the male connector (12) and/or the female connector (14) and/or nipple (22, 24) of the capsule (20).
7. The capsule (20) according to any one of the claim 5 or claim 6, wherein the valve (33) is a flanged duck-bill valve.
8. The capsule (20) according to any one of the preceding claims, wherein the primary sealed opening (15) of the female connector (14) and/or the secondary sealed opening (25) of the nipple (24) is a tear-

able opening.

9. The capsule (20) according to any one of the preceding claims, wherein the primary sealed opening (15) of the male connector (12) and/or the secondary sealed opening (25) of the nipple (22) is a pressure-sensitive opening. 5
10. The capsule (20) according to any one of the preceding claims, wherein a nipple (22, 24) with a secondary sealed opening (22) is provided on top of the male connector (12) and the female connector (14) of the capsule (20), respectively, wherein the secondary sealed openings (25) are only ruptured after the primary sealed openings (15) are ruptured. 10 15
11. A plurality of disposable capsules (20) assembly according to any one of the preceding claims interconnected to form a capsule assembly. 20

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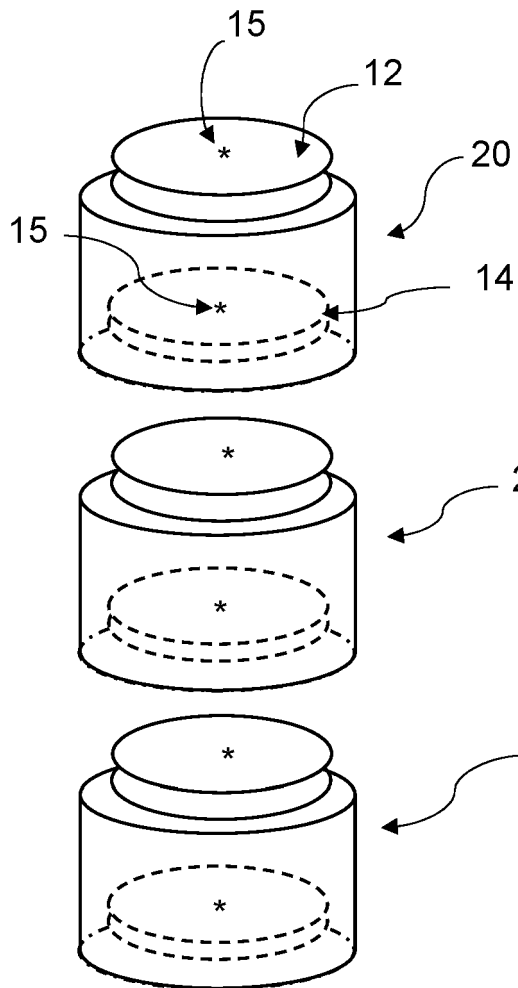


FIGURE 1A

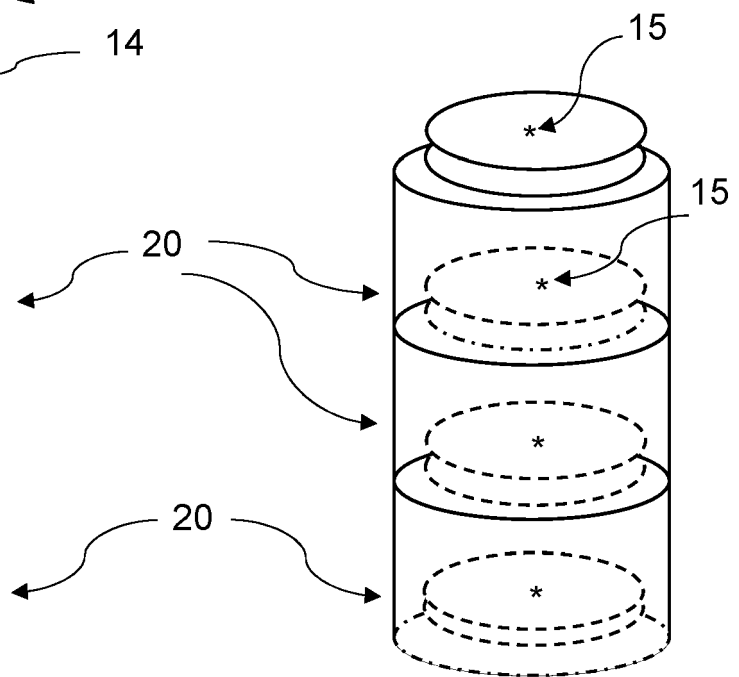


FIGURE 1B

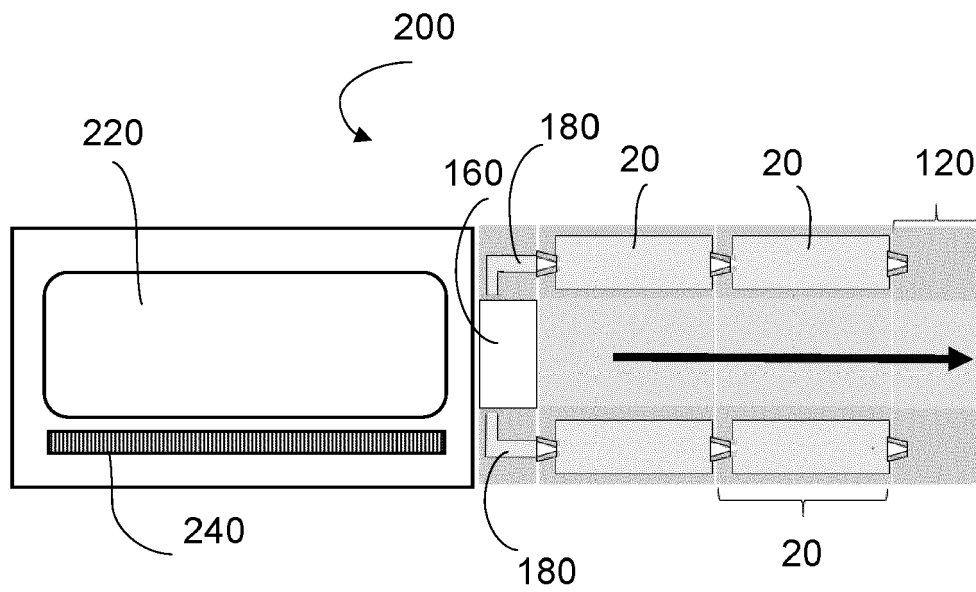


FIGURE 2

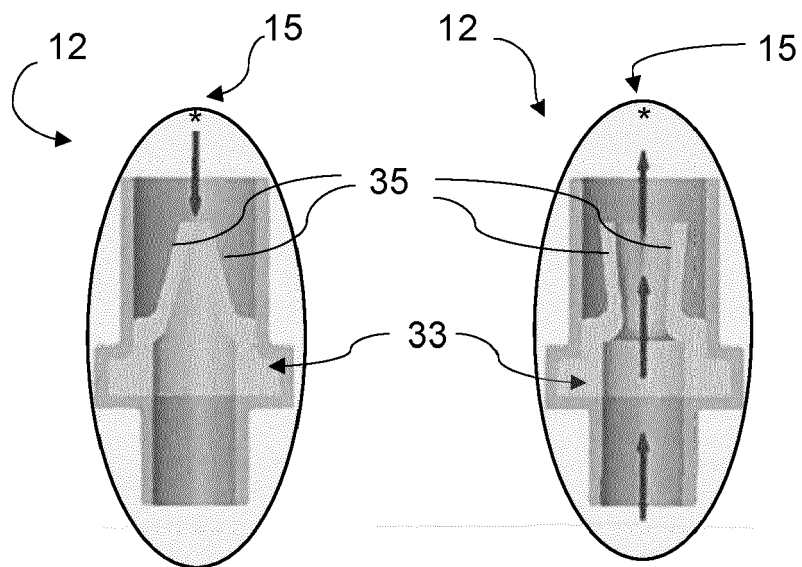


FIGURE 3A

FIGURE 3B

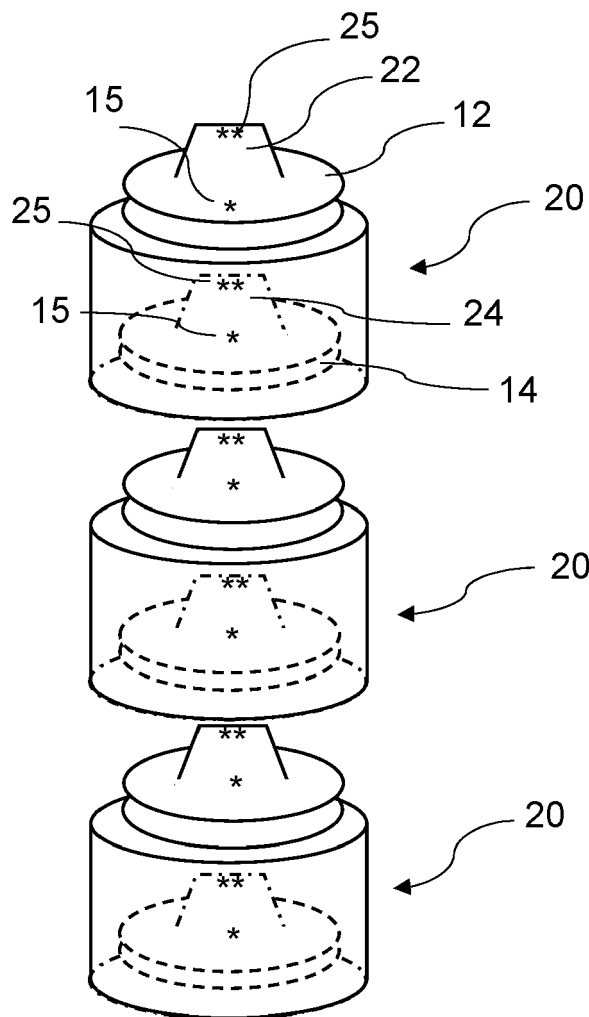


FIGURE 4A

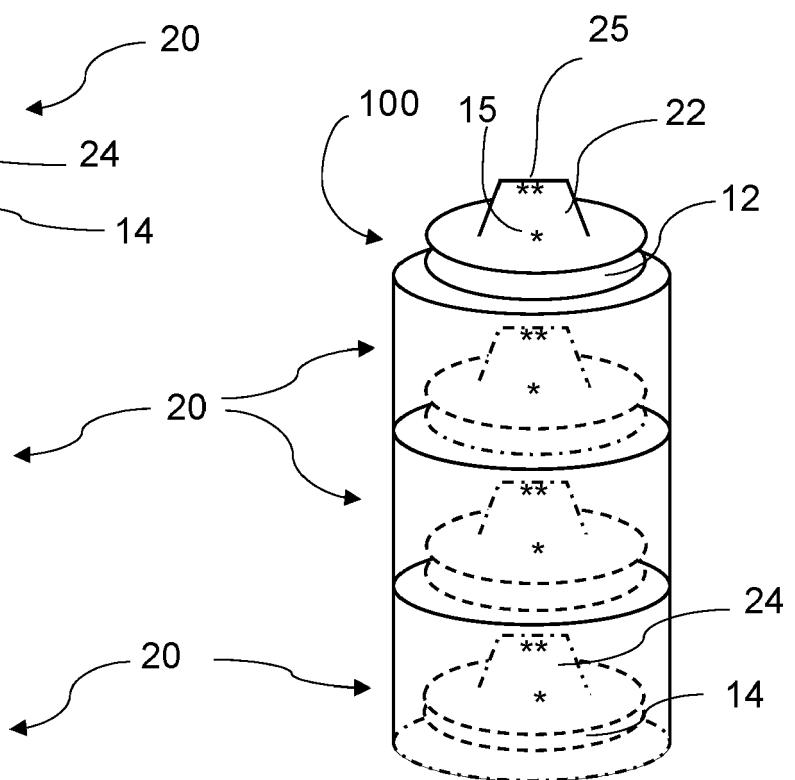


FIGURE 4B



EUROPEAN SEARCH REPORT

Application Number

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	WO 2021/151826 A1 (PHILIP MORRIS PRODUCTS SA [CH]) 5 August 2021 (2021-08-05) * page 21, lines 14-19, page 22, line 19-32 * -----	1-11	INV. A24F40/42
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			TECHNICAL FIELDS SEARCHED (IPC)
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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 24 January 2022	Examiner Cardan, Cosmin
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REFERENCES CITED IN THE DESCRIPTION

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