



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.07.2022 Bulletin 2022/28

(51) International Patent Classification (IPC):
A24F 40/40 ^(2020.01)

(21) Application number: **21151202.5**

(52) Cooperative Patent Classification (CPC):
A24F 40/40; A24F 40/42

(22) Date of filing: **12.01.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **ADAIR, Kyle**
Lisburn, County Antrim, BT28 2UW (GB)
• **LOVEDAY, Peter**
Woking, GU24 9PW (GB)
• **POPOOLA, Olayiwola Olamiposi**
Walton-on-Thames, KT12 2SJ (GB)

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

(74) Representative: **Bardehle Pagenberg**
Partnerschaft mbB
Patentanwälte Rechtsanwälte
Prinzregentenplatz 7
81675 München (DE)

(54) **AEROSOL GENERATION ASSEMBLY SYSTEM WITH MODULARIZED ELEMENTS**

(57) An aerosol generation assembly system with modularized elements, an aerosol generation system thereof, an aerosol generating consuming system thereof and an assembling method therefor are disclosed. The aerosol generation assembly system comprises a main body 10 and at least one modularized unit, wherein the modularized unit is configured to be mounted into the main body. The modularized unit comprises socket modules 11 of at least two different models, each configured to be assembled with the main body to form an aerosol

generation system which allows a user to consume a substrate contained in a container 32 received and contained by the socket module, wherein each of the socket modules is configured to receive a container. However, a first one of the socket modules is not configured to receive a second container, which is to be received in a second socket module. Partial modifications and upgrades of the aerosol generation device are thereby simplified.

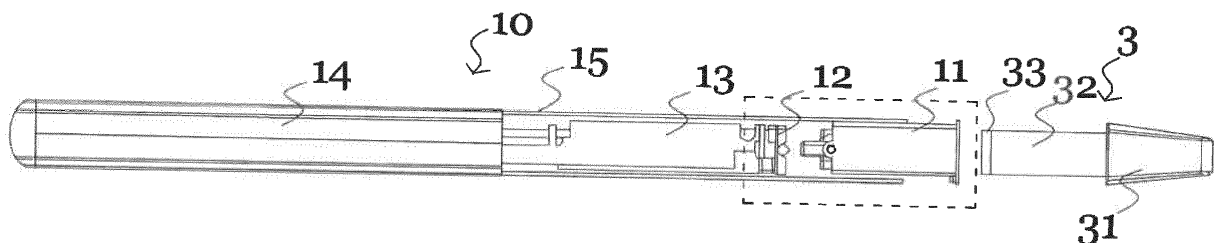


Fig. 2

Description

TECHNICAL FIELD

[0001] The present invention relates to an aerosol generation assembly system with modularized elements, an aerosol generation system thereof, an aerosol generating consuming system thereof and an assembling method therefor.

BACKGROUND

[0002] An aerosol generation system, or E-cigarette, is now a mainstream product to simulate a traditional tobacco cigarette. There are many types of aerosol generation systems, and the one which still has tobacco or substrate inside is one of the most popular types. The advantage of this type of aerosol generation device is that the user is still smoking tobacco, which means the smoking perception resembles the traditional cigarette. Besides, by heating but not burning the article, the aerosol generation device does not release the by-products of combustion such as tar and carbon monoxide. The operation method of the aerosol generation device is to contain an aerosol generation carrier inside and to heat it, but not to its burning point. There is also another type of E-cigarette, the operation method of which is to evaporate liquid to form smoke.

[0003] For both types of aerosol generation systems, some key elements may differ from each other. There are also different types of containers and different designs for these devices. However, in the current practice, a change of one element in the device may cause an entirely different design of the complete aerosol generation system.

[0004] Therefore, there is a need for an aerosol generation assembly system which can reduce the cost of and simplify partial modifications and upgrades of the aerosol generation device.

SUMMARY OF THE INVENTION

[0005] The present invention provides an aerosol generation assembly system with modularized elements, an aerosol generation system thereof, an aerosol generating consuming system thereof and an assembling method therefor.

[0006] A 1st embodiment of the invention is directed to an aerosol generation assembly system comprising a main body and at least one modularized unit, wherein the modularized unit is configured to be mounted into the main body, the modularized unit comprises a plurality of socket modules, each of the socket modules is configured to be assembled with the main body to form an aerosol generation system which allows a user to consume a substrate contained in a container received and contained by the socket module of the aerosol generation assembly system, wherein each of the socket modules

is configured to receive and contain a container, wherein

- a first one of the pluralities of socket modules is configured to receive a first container and contain it such that the substrate in the first container can be consumed,
- a second one of the pluralities of socket modules is configured to receive a second container and contain it such that the substrate in the second container can be consumed, and
- the first one of the pluralities of socket modules is not configured to receive the second container and/or contain it such that the substrate in the second container can be consumed.

[0007] The arrangement according to the 1st embodiment makes the aerosol generation device easier to be upgraded or changed in design. Furthermore, if there is a problem, such as design flaws, with only one part of the device, it can be fixed without altering the remainder of the design of the aerosol generation device. This reduces the manufacturing cost considerably.

[0008] According to a 2nd embodiment, in the 1st embodiment, the socket modules are configured to be permanently assembled to the main body.

[0009] The arrangement according to the 2nd embodiment ensures that the change of the design would not be vulnerable or easy to be detached by the user.

[0010] According to a 3rd embodiment, in any one of the previous embodiments, the socket module is hermetically connected to the main body.

[0011] The arrangement according to the 3rd embodiment improves the insulation performance between the socket module and the container.

[0012] According to a 4th embodiment, in any one of the previous embodiments, the main body comprises a silicone gasket configured to be connected with the socket module for sealing the connection between the main body and the socket module.

[0013] According to a 5th embodiment, in any one of the previous embodiments, the main body comprises a device outer housing comprising a battery unit and a device chassis therein, the socket module comprises an opening and is configured to be connected to the device chassis, the containers are configured to be electrically connected to the device chassis directly via electric connectors, and the electric connectors are configured to pass through the opening of the socket module to connect with the containers.

[0014] The arrangement according to the 5th embodiment makes the structure of the device simpler since the electrical connection between the aerosol generation device, and the container would not be involved in the change or the re-design of the socket module.

[0015] According to a 6th embodiment, in the previous embodiment, the chassis comprises a PCB configured with electric connectors, preferably pogo pins, configured to electrically connect with the containers.

[0016] According to a 7th embodiment, in any one of the 5th or 6th embodiments, the modularized units of the aerosol generation assembly system comprises a plurality of device outer housings, and/or a plurality of battery units and/or a plurality of device chassis, wherein

one of the plurality of the device outer housings is configured to connect with at least one of the plurality of battery units but not with the other battery units, and/or with at least one of the plurality of device chassis but not with the other device chassis, and/or one of the plurality of the battery units is configured to connect with at least one of the plurality of the device outer housings but not with the other device outer housings, and/or with at least one of the plurality of device chassis but not with the other device chassis, and/or

one of the plurality of the device chassis is configured to connect with at least one of the plurality of the device outer housings but not with the other device outer housings, and/or with at least one of the plurality of battery units but not with the other battery units.

[0017] According to an 8th embodiment, in any one of the 5th to 7th embodiments,

- a first one of the pluralities of device chassis is configured to be connected to the first one of the pluralities of socket modules,
- a second one of the pluralities of device chassis is configured to be connected to the second one of the pluralities of socket modules, and
- the first one of the pluralities of device chassis is not configured to be connected to the second one of the pluralities of socket modules, due to an aspect of the second one of the pluralities of socket modules.

[0018] According to a 9th embodiment, in any one of the previous embodiments, the first one of the plurality of socket modules is not configured to receive the second container and/or contain it such that the substrate in the second container can be consumed, due to an aspect of the second container, preferably a shape of the second container.

[0019] A 10th embodiment of the invention is directed to an aerosol generation system allowing a user to consume a substrate contained in a container and configured to be assembled with a socket module comprised by an aerosol generation assembly system according to any one of the preceding embodiments, the aerosol generation system is configured to be assembled with the step of:

- determining a socket module from the plurality of the socket modules according to an aspect of a container; and

- assembling the determined socket module with the main body comprised by the aerosol generation assembly system to form the aerosol generation system.

[0020] An 11th embodiment of the invention is directed to an assembling method for assembling an aerosol generation system allowing a user to consume a substrate contained in a container, and configured to be assembled with a socket modules comprised by an aerosol generation assembly system according to any one of the 1st to 9th embodiments, wherein the assembling method comprised the steps of:

- determining a socket module from the plurality of the socket modules according to an aspect of a container; and
- assembling the determined socket module with the main body comprised by the aerosol generation assembly system to form the aerosol generation system.

[0021] A 12th embodiment of the invention is directed to an aerosol generation consuming system, comprising a plurality of containers comprising a substrate, and the aerosol generation assembly system according to any one of the 1st to 9th embodiments, wherein the plurality of containers are configured to be received and contained in the aerosol generation system according to the 10th embodiment.

[0022] According to a 13th embodiment, in the previous embodiment, the containers are cartridges and/or tanks, and the substrates are e-liquids.

[0023] According to a 14th embodiment, in any one of the 12th or 13th embodiments, each of the containers is configured to be electrically connected to the aerosol generation assembly system.

[0024] Preferred embodiments are now described, by way of example only, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Figure 1 is a schematic illustration of an aerosol generation system according to an exemplary embodiment of the present invention;

Figure 2 is an exploded schematic illustration view of the aerosol generation system according to the exemplary embodiment of the present invention;

Figure 3(a) is a partial exploded schematic diagram of the aerosol generation system comprising modularized elements according to an exemplary embodiment of the present invention;

Figure 3(b) is a partial exploded schematic diagram of the aerosol generation system of Figure 3(a), viewed from another direction;

Figure 3(c) is a partial exploded schematic diagram of the aerosol generation system comprising another set of modularized elements according to the exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0026] In the description of the present invention, it should be understood that the terms "aerosol generation system", "aerosol generation consuming system" and "aerosol generation assembly system", may represent different entities or combinations of different elements. Specifically, the aerosol generation system is an assembled device for consuming the substrate contained in the container; the aerosol generation assembly system is a system with a complete set of modules, elements, components and/or units which can be assembled into the aerosol generation system, the aerosol generation assembly system comprises at least a modularized module, element, components and/or unit, together with at least one different model or type of the modularized module, element, components and/or unit, which has at least one different aspect and can be used to replace the modularized module, element, components and/or unit so as to be assembled into a complete aerosol generation system having the different model or type of the modularized module, element, components and/or unit; the aerosol generation consuming system is the aerosol generation assembly system together with multiple models or types of containers which contains the substrate to be consumed, and the multiple models or types of containers can be inserted into the aerosol generation assembly system individually. The terms "modular" "modularized" or "modularization" mean that a device or system can be decomposed into a number of components or modules that may be mixed and matched in a variety of configurations. The components or modules are able to connect, interact, or exchange resources in some way, by adhering to a standardized interface. A "modularized" component or module means one of the component or module from the modularized device or system. Hereinafter, the systems are illustrated in detail.

[0027] Figures 1 to 3(c) illustrates an aerosol generation system 1, an aerosol generation consuming system or an aerosol generation assembly system.

[0028] The aerosol generation system 1 is a modularized aerosol generation device. The modularized aerosol generation device 1, as shown in figure 1, comprises a main body 10. The main body 10 comprises an outer casing 14, a device internal chassis 13, an electrical power supply unit (preferably a LiPo battery). The illustrated embodiments of the aerosol generation system in this invention are schematic, and it is possible to combine

some of the units, such as the aerosol inlet and outlet, operator or computer modules, which is apparent to a person skilled in the art.

[0029] The cartridge 3 comprises a mouthpiece part 31, a consumable containing part 32 containing the consumable, preferably an e-liquid, and a contacting part 33. The contacting part 33 is configured to be connected with the main body 10 and receive a power source, preferably providing electrical power. When the cartridge 3 is fully inserted into the main body 10 for consuming the consumable, the mouthpiece part 31 protrudes from the main body 10, and the consumable containing part 32 and the contacting part 33 are inserted inside a cavity of a cartridge socket 11 comprised by the aerosol generation device 1. The consumable containing part 32 and the contacting part 33 are at least partially in contact with the cavity. In another embodiment, the container 3 can be a tank with similar characters as the cartridge 3. The e-liquid therein can be inhaled by a user from the mouthpiece part 31 with the power support from the main body 10. The e-liquid typically comprises an aerosol-forming substance, such as glycerin or propylene glycol that creates the vapor. Other common substances in the liquid are nicotine and various flavorings. In other embodiments, other common consumables, such as substrates having nicotine, can be used and inserted into the aerosol generation device 1 for consumption. In yet another embodiment, the container 3 of the consumable is a cigarette stick or any container for an e-cigarette.

[0030] The cartridge socket 11 is configured to be connected to the internal chassis 13. The cavity of the cartridge socket 11 is exposed at the top end of the outer casing 14. The cartridge 3 can be inserted into the cavity in an insertion direction. The cartridge 3 is at least electrically connected with the electrical contacts in the cavity, which provide the electric power to the one or more heater elements comprised in the cartridge 3. The electrical contacts 131 are comprised by the inner chassis 13. In other words, the electrical contacts 131, preferably pogo pins, protrude through an opening of the cartridge socket 11, to directly contact with the electrical contacts 33 of the cartridge 3, as shown in figure 3(a). In another embodiment, the cartridge socket 11 comprises at least a pair of electrical contacts which function as an intermediary for and connect with the electrical contacts of the inner chassis 13 and the cartridge 3. In other embodiments, one or more heater elements are arranged in the cavity for heating the consumable. The electric power flows from the LiPo battery through the PCBA 132 to the cartridge socket 11, which are all electrically connected with each other. The LiPo battery can be charged through a USB port in the device 1. The PCBA 132 and the LiPo battery are mounted together on and comprised by the inner chassis 13.

[0031] The outer casing 14 of the aerosol generation device 1 comprises a frame and two substantially parallel panels 15. The frame has a substantially U-shape or cuboid shape, with two right-angle corners close to the

cavity end, and two or four rounded or curved corners arranged at another end, which is the end opposite to the cavity end. The frame forms three circumferential side surfaces between and substantially perpendicular to the two main surfaces. One of the circumferential surfaces is another base end. Except for the curved corners, the frame has curved sections at the connection parts between the seams of the main surfaces 15 and the frame, wrapping around or covering the edges of the main surfaces 15, which form overhang members on the edges of the frame. The main surfaces 15 are attached to the frame through guiding means, such as slots, and ribs may be formed inside the frame.

[0032] For aerosol generation devices, it is common to make upgrades or modifications for only one part or several parts of the aerosol generation devices. The current practice is to change the complete design even if only a part of the device needs to be modified. Therefore, the aerosol generation system 1 provided in this invention comprises at least one modularized unit which can be adapted with the other parts of the main body without any change of the other parts of the main body, as the connection interfaces between those modularized units are standardized. In the present embodiment, the modularized units comprise at least the socket module 11 and the inner chassis 13.

[0033] As shown in **figure 3(a) and 3(c)** which comprise an enlarged partial exploded view of the dashed rectangle part of the aerosol generation device 1 in **figure 2**, the modularized socket modules 11, 21 and the inner chassis 13, 23 have at least two different models. In general, the cavity shape 111, 211 of the socket modules 11 are different. In order to contain different containers, herein a cartridge 3 with a cuboid-shaped consumable containing part 32 and a cartridge 3 with a cylinder-shaped consumable containing part 32 (not shown), the first cartridge socket 11 correspondingly has a slightly larger sized cuboid shape cavity, and the second cartridge socket 21 correspondingly has a slightly larger sized cylinder shape cavity. The opening 111 of the first cartridge socket 11 has a squircle shape; the opening 211 of the second cartridge socket 21 has a round shape. Because of the different shapes of the cavities or any other aspect, such as the electrical contacts, the first cartridge 3 cannot be received and contained inside the second cartridge socket 21. Likewise, the second cartridge 3 cannot be received and contained inside the first cartridge socket 11.

[0034] In the first cartridge socket 11 and the second cartridge socket 21, the connection pieces 112, 113, 212 are arranged at the opposite ends to the opening ends 111, 211 of the cartridge sockets 11, 21. The connection pieces 112, 113, 212 are configured to connect with the corresponding connection parts of the inner chassis 13, 23. In order to have a better sealing performance between the inner chassis 13, 23 and the cartridge socket 11, 21, the inner chassis 13, 23 comprises a silicon gasket 12, 22 configured to connect with the cartridge socket

11, 21. The silicon gasket 12, 22 forms at least a part of the interface between the inner chassis 13, 23 and the electrical contacts 131, 231, which are configured to be connected with the electrical contacts of the cartridges 3. The rest of the inner chassis parts 13, 23 are identical to each other. With this arrangement, if the designer intends to only change the design of the aerosol generation device 1 in order to fit with different cartridges 3, only the models of the cartridge sockets 11, 21 and the silicon gaskets 12, 22 need to be changed, while the other portions of the aerosol generation device can be left unchanged.

[0035] In the first cartridge socket 11, a pair of first connection pieces 113 protrude from the cartridge socket 11 and are arranged parallel to each other. The pair of first connection pieces 113 are firmly connected with a pair of second connection pieces, which are small sheets. Correspondingly, the silicon gaskets 12 comprise a pair of recesses 122 configured to receive the connection pieces 113, and a wavy shaped opening arranged to receive the connection pieces 112. The electrical contacts of the inner chassis 23 are exposed within and protrudes through the wavy shaped opening. The connections pieces 112 comprise protrusions at one end, so that the connections pieces 112 can be locked in the edge of the opening 121 of the silicon gaskets 12.

[0036] In the second cartridge socket 11, a hollow 212 is arranged at the end opposite to the opening end 211 and is configured to function as the connection piece 212. Correspondingly, a column-shaped protrusion 211 of the silicon gasket 22, within which the electrical contacts 231 of the inner chassis 23 are exposed through the openings of the silicon gasket 22, are configured to be fastened with the connection piece 212 of the second cartridge socket 21 in a bayonet mount. Therefore, the first cartridge socket 11 is not compatible with the second cartridge 3, and the second cartridge socket 21 is not compatible with the first cartridge 3, because the connection method between the cartridge sockets and the cartridges are different.

[0037] In another embodiment, a different model of the cartridge socket is provided with a cavity design which is identical to that of the second cartridge socket 21, and a design of connection pieces 112, 113 which is identical to the design of the first cartridge socket 21. With such an arrangement, only the cartridge socket needs to be changed for the second cartridge, and the rest of the aerosol generation device 1 can remain unchanged, since the connection between the socket and the inner chassis is standardized.

[0038] This invention makes the aerosol generation assembly system easier to upgrade or change in design. Furthermore, if there is a problem with only one part of the design, it can be fixed without altering the remainder of the design, the rest of the aerosol generation device. This reduces the manufacturing cost considerably. Therefore, the intention of the invention is not that the user would change the modularized part. Rather, it is so

that if a component needs to be changed slightly, parts such as the socket and inner chassis, since they are modular, can be adapted without having to change every aspect of the device. During manufacturing, for example, the modularized parts, such as the cartridge socket, of the aerosol generation assembly system are determined from a plurality of models of the modularized parts according to the model or an aspect of the adjacent connecting parts, such as the shape of the cartridge socket. Subsequently, the selected modularized parts are assembled into the main body so as to form the aerosol generation device.

[0039] Although the modularized parts are not intended to be changed by the user, in other embodiments of this invention, some of the modularized parts, such as the cartridge sockets 11 21, can be changed by the user.

Claims

1. An aerosol generation assembly system comprising a main body and at least one modularized unit, wherein the modularized unit is configured to be mounted into the main body, the modularized unit comprises a plurality of socket modules, each of the socket modules is configured to be assembled with the main body to form an aerosol generation system which allows a user to consume a substrate contained in a container received and contained by the socket module of the aerosol generation assembly system, wherein each of the socket modules is configured to receive and contain a container, wherein

- a first one of the pluralities of socket modules is configured to receive a first container and contain it such that the substrate in the first container can be consumed,
- a second one of the pluralities of socket modules is configured to receive a second container and contain it such that the substrate in the second container can be consumed, and
- the first one of the pluralities of socket modules is not configured to receive the second container and/or contain it such that the substrate in the second container can be consumed.

2. The aerosol generation assembly system according to the preceding claim, wherein the socket modules are configured to be permanently assembled to the main body.

3. The aerosol generation assembly system according to any one of the preceding claims, wherein the socket module is hermetically connected to the main body.

4. The aerosol generation assembly system according to any one of the preceding claims, wherein the main

body comprises a silicone gasket configured to be connected with the socket module for sealing the connection between the main body and the socket module.

5. The aerosol generation assembly system according to any one of the preceding claims, wherein the main body comprises a device outer housing comprising a battery unit and a device chassis therein, the socket module comprises an opening and is configured to be connected to the device chassis, the containers are configured to be electronically connected to the device chassis directly via electronic connectors, and the electronic connectors are configured to pass through the opening of the socket module to connect with the containers.

6. The aerosol generation assembly system according to the preceding claim, wherein the chassis comprises a PCB configured with electronic connectors, preferably pogo pins, configured to electronically connect with the containers.

7. The aerosol generation assembly system according to any one of claims 5 or 6, wherein the modularized units of the aerosol generation assembly system comprise a plurality of device outer housings, and/or a plurality of battery units and/or a plurality of device chassis, wherein

one of the plurality of the device outer housings is configured to connect with at least one of the plurality of battery units but not with the other battery units, and/or with at least one of the plurality of device chassis but not with the other device chassis, and/or one of the plurality of the battery units is configured to connect with at least one of the plurality of the device outer housings but not with the other device outer housings, and/or with at least one of the plurality of device chassis but not with the other device chassis, and/or one of the plurality of the device chassis is configured to connect with at least one of the plurality of the device outer housings but not with the other device outer housings, and/or with at least one of the plurality of battery units but not with the other battery units.

8. The aerosol generation assembly system according to any one of the preceding claims 5 to 7, wherein

- a first one of the pluralities of device chassis is configured to be connected to the first one of the pluralities of socket modules,
- a second one of the pluralities of device chassis is configured to be connected to the second one of the pluralities of socket modules, and

- the first one of the pluralities of device chassis is not configured to be connected to the second one of the pluralities of socket modules due to an aspect of the second one of the pluralities of socket modules. 5
- 9. The aerosol generation assembly system according to any one of the preceding claims, wherein the first one of the plurality of socket modules is not configured to receive the second container and/or contain it such that the substrate in the second container can be consumed due to an aspect of the second container, preferably a shape of the second container. 10
- 10. An aerosol generation system allowing a user to consume a substrate contained in a container, and configured to be assembled with a socket module comprised by an aerosol generation assembly system according to any one of the preceding claims, wherein the aerosol generation system is configured to be assembled with the step of: 15
 - determining a socket module from the plurality of the socket modules according to an aspect of a container; and 25
 - assembling the determined socket module with the main body comprised by the aerosol generation assembly system to form the aerosol generation system. 30
- 11. An assembling method for assembling an aerosol generation system allowing a user to consume a substrate contained in a container, and configured to be assembled with a socket modules comprised by an aerosol generation assembly system according to any one of the claims 1 to 9, wherein the assembling method comprised the steps of: 35
 - determining a socket module from the plurality of the socket modules according to an aspect of a container; and 40
 - assembling the determined socket module with the main body comprised by the aerosol generation assembly system to form the aerosol generation system. 45
- 12. A aerosol generation consuming system, comprising a plurality of containers comprising a substrate, and the aerosol generation assembly system according to any one of the preceding claims 1 to 9, wherein the plurality of containers are configured to be received and contained in aerosol generation system according to claim 10. 50
- 13. The aerosol generation consuming system according to claim 12, wherein the containers are cartridges and/or tanks, and the substrates are e-liquids. 55
- 14. The aerosol generation consuming system according to any one of claims 12 or 13, wherein each of the containers is configured to be electronically connected to the aerosol generation assembly system.

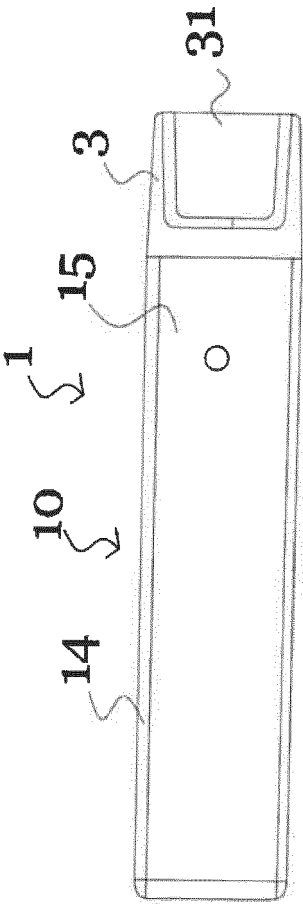


Fig. 1

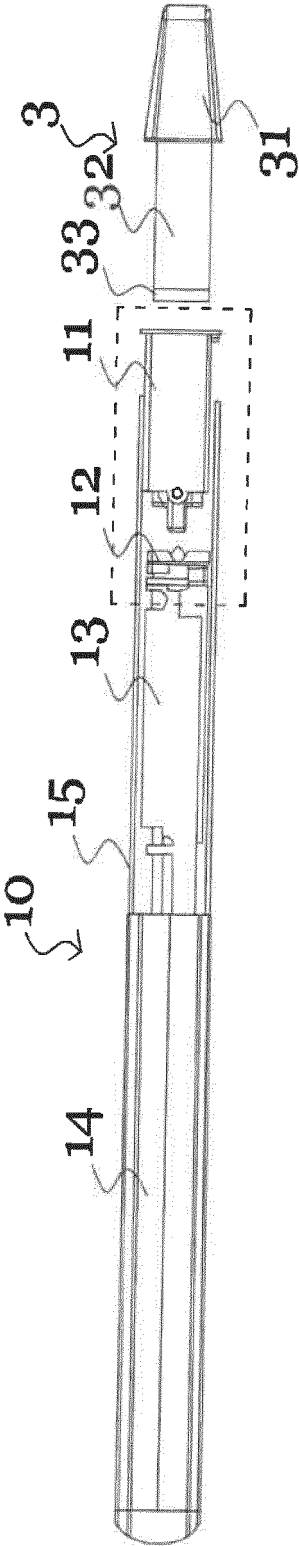


Fig. 2

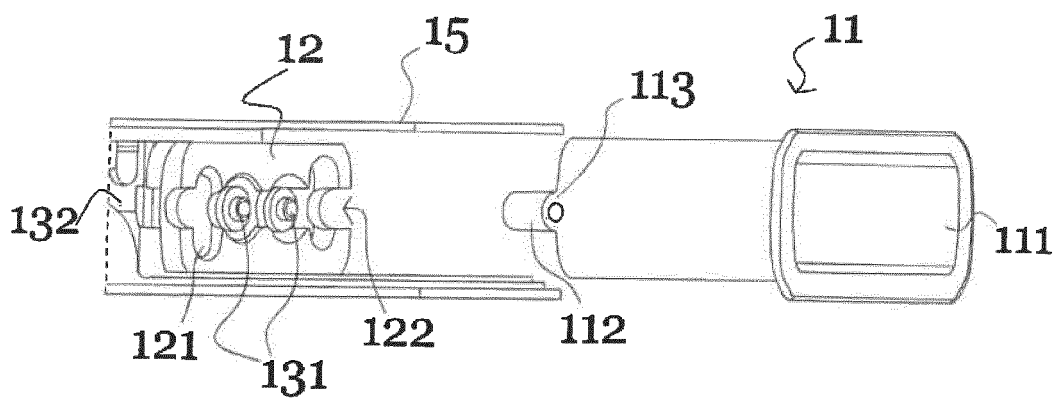


Fig. 3(a)

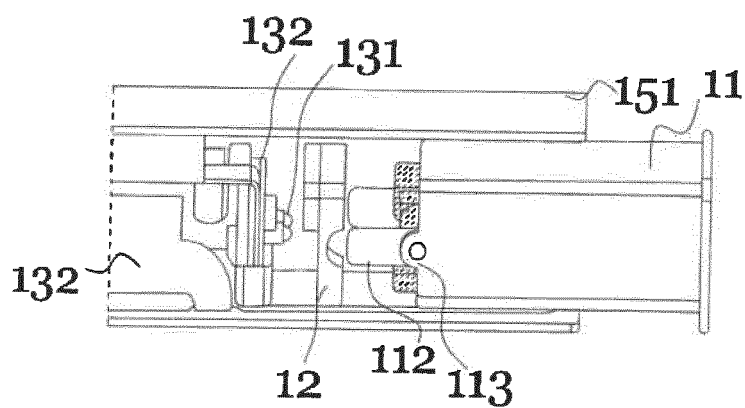


Fig. 3(b)

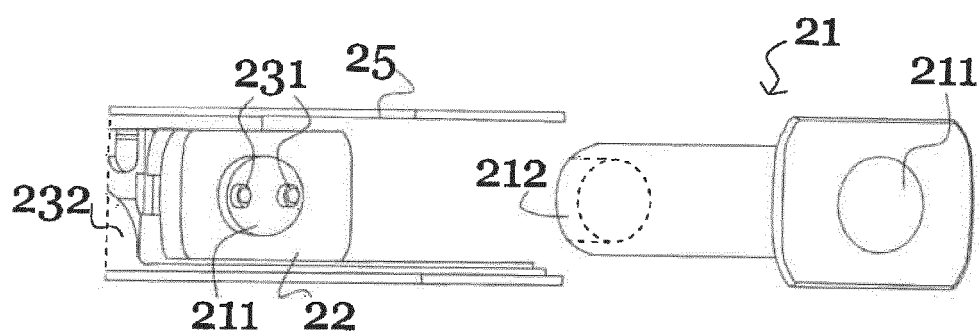


Fig. 3(c)



EUROPEAN SEARCH REPORT

Application Number
EP 21 15 1202

5

10

15

20

25

30

35

40

45

50

55

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	US 10 856 579 B2 (ALTRIA CLIENT SERVICES LLC [US]) 8 December 2020 (2020-12-08) * column 12, line 15 - column 14, line 29; figures 1-3, 5-7 * * column 9, line 13 - line 25 *	1-14	INV. A24F40/40
X	US 2018/132534 A1 (REEVELL TONY [GB]) 17 May 2018 (2018-05-17) * paragraph [0096] - paragraph [0111]; figures 1,2,6-9 *	1-14	
A	US 2018/214645 A1 (REEVELL TONY [GB]) 2 August 2018 (2018-08-02) * paragraph [0130] - paragraph [0131]; figures 1,2 * * paragraph [0140] - paragraph [0146]; figures 5-9 * * paragraph [0156] - paragraph [0162]; figures 16-20 *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			A24F A61M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 June 2021	Examiner Dobbs, Harvey
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 15 1202

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-06-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 10856579 B2	08-12-2020	US 2018168231 A1	21-06-2018
		US 2021045438 A1	18-02-2021
-----		-----	
US 2018132534 A1	17-05-2018	CA 3032485 A1	17-05-2018
		CN 109890232 A	14-06-2019
		EP 3537903 A1	18-09-2019
		JP 2019534026 A	28-11-2019
		KR 20190077328 A	03-07-2019
		RU 2019115678 A	14-12-2020
		US 2018132534 A1	17-05-2018
		US 2020367554 A1	26-11-2020
		WO 2018086999 A1	17-05-2018
-----		-----	
US 2018214645 A1	02-08-2018	US 2018214645 A1	02-08-2018
		US 2020390987 A1	17-12-2020
-----		-----	