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(54) **ELECTRONIC SMOKING DEVICE WITH INTEGRATED MOUTHPIECE AND CAPSULE ASSEMBLY**

(57) An electronic smoking device (10) comprising a mouthpiece/liquid reservoir portion (14) comprising a mouthpiece (48) comprising a rigid outer housing, and a liquid reservoir (42), an atomizer/battery portion (12) comprising a battery (18) and an atomizer (26) operable

when connected to the battery (18) to atomize liquid stored in the liquid reservoir (42), the rigid outer housing including the liquid reservoir (42), and the mouthpiece (48) being detachable from the atomizer/battery portion (12).

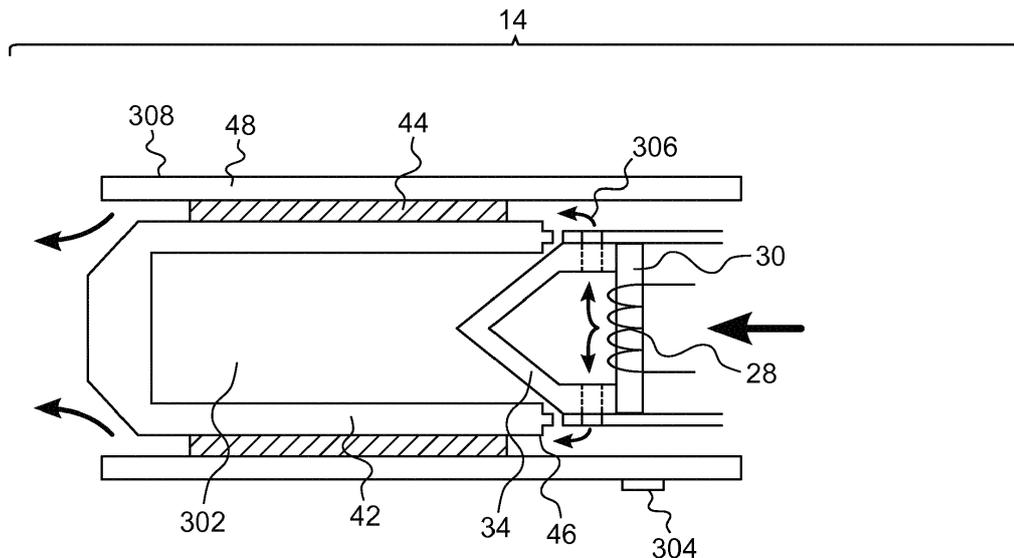


Fig. 3

DescriptionFIELD OF INVENTION

[0001] The present invention relates generally to electronic smoking devices and in particular to electronic cigarettes that comprise an integrated mouthpiece and capsule assembly.

BACKGROUND OF THE INVENTION

[0002] An electronic smoking device, such as an electronic cigarette (e-cigarette), typically has a housing accommodating an electric power source (e.g. a single use or rechargeable battery, electrical plug, or other power source), and an electrically operable atomizer. The atomizer vaporizes or atomizes liquid supplied from a reservoir and provides vaporized or atomized liquid, as an aerosol. Control electronics control the activation of the atomizer. In some electronic cigarettes, an airflow sensor is provided within the electronic smoking device, which detects a user puffing on the device (e.g., by sensing an under-pressure or an air flow pattern through the device). The airflow sensor indicates or signals the puff to the control electronics to power up the device and generate vapor. In other e-cigarettes, a switch is used to power up the e-cigarette to generate a puff of vapor.

[0003] An electronic smoking device comprises a liquid reservoir, in the form of a capsule, that includes a heating element which allows among others the easy replacement of the liquid reservoir of smoked liquid. In capsules where the liquid reservoir and the heating element are not coupled, since the size of the capsule is quite small, its exchange and handling are difficult, especially for users with physical disabilities. Further, the exchange of the capsule could require that the consumers remove first the mouthpiece of the electronic cigarette in order to exchange the capsule. This operation is cumbersome.

[0004] Therefore a need exists in the art for an electronic smoking device that allows for easy handling of the device while exchanging the liquid reservoir.

SUMMARY OF THE INVENTION

[0005] In accordance with one aspect of the present invention there is provided an electronic smoking device comprising, comprising a mouthpiece/liquid reservoir portion and an atomizer/battery portion. The mouthpiece/liquid reservoir portion comprises a mouthpiece, the mouthpiece comprising a rigid outer housing, and a liquid reservoir. The atomizer/battery portion comprises a battery, and an atomizer operable when connected to the battery to atomize liquid stored in the liquid reservoir. The rigid outer housing includes the liquid reservoir, and the mouthpiece is detachable from the atomizer/battery portion.

[0006] The characteristics, features and advantages of this invention and the manner in which they are ob-

tained as described above, will become more apparent and be more clearly understood in connection with the following description of exemplary embodiments, which are explained with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the drawings, same element numbers indicate same elements in each of the views:

Figure 1 is a schematic cross-sectional illustration of an e-cigarette in accordance with the present invention;

Figure 2 shows a schematic cross-sectional illustration of a mouthpiece/liquid reservoir portion of the e-cigarette in accordance with the present invention;

Figure 3 is a sectional view of the atomizer/liquid reservoir of an electronic smoking device in accordance with one embodiment of the present invention;

Figures 4 to 7 illustrate various views of a capsule in accordance with the present invention;

Figures 8 to 11 illustrate various view of a mouthpiece in accordance with the present invention;

Figure 12 illustrates a mouthpiece in accordance with the present invention and a capsule with counter element(s) that protrude from an outer lateral side of the liquid reservoir or capsule;

Figures 13 and 14 illustrate cross section and full body perspective views of the atomizer/liquid reservoir of an electronic smoking device in accordance with one embodiment of the present invention; and

Figures 15 and 16 illustrate a front view into the mouthpiece-capsule assembly in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0008] Throughout the following, an electronic smoking device will be exemplarily described with reference to an e-cigarette. As is shown in Figure 1, an e-cigarette 10 has a housing comprising a cylindrical hollow tube having an end cap 16. The cylindrical hollow tube may be a single-piece or a multiple-piece tube. In Figure 1, the cylindrical hollow tube is shown as a two-piece structure having a battery/atomizer portion 12 and a mouthpiece/liquid reservoir portion 14. Together the battery/atomizer portion 12 and the mouthpiece/liquid reservoir portion 14 form a cylindrical tube which can be approximately the same size and shape as a conventional cigarette, typically about 100 mm with a 7.5 mm diameter,

although lengths may range from 70 to 150 or 180 mm, and diameters from 5 to 30 mm.

[0009] The battery/atomizer portion 12 and mouthpiece/liquid reservoir portion 14 are made of metal, e.g. steel or aluminum, or of hardwearing plastic and act together with the end cap 16 to provide a housing to contain the components of the e-cigarette 10. The battery/atomizer portion 12 and the mouthpiece/liquid reservoir portion 14 may be configured to fit together by a friction push fit, a snap fit, or a bayonet attachment, magnetic fit, or screw threads. The end cap 16 is provided at the front end of the battery/atomizer portion 12. The end cap 16 may be made from translucent plastic or other translucent material to allow an LED 20 positioned near the end cap to emit light through the end cap. The end cap can be made of metal or other materials that do not allow light to pass. In alternative presentations the e-cigarette does not have a discrete end-cap, but the end-cap may be part of the main body. Further, in alternative presentations the main body is not a continuous part but comprises a top and bottom which are fixed together.

[0010] An air inlet may be provided in the end cap, at the edge of the inlet next to the cylindrical hollow tube, anywhere along the length of the cylindrical hollow tube, or at the connection of the battery/atomizer portion 12 and the atomizer/liquid reservoir portion 14. Figure 1 shows an inlet 38 provided between the battery/atomizer portion 12 and the mouthpiece/liquid reservoir portion 14. The number of air inlets may be larger than one.

[0011] A battery 18, a light-emitting diode (LED) 20, control electronics 22 and optionally an airflow sensor 24 are provided within the cylindrical hollow tube battery/atomizer portion 12. The battery 18 is electrically connected to the control electronics 22, which are electrically connected to the LED 20 and the airflow sensor 24. In this e-cigarette the LED 20 is at the front end of the battery portion 12, adjacent to the end cap 16 and the control electronics 22 and airflow sensor 24 are provided in the central cavity at the other end of the battery 18 adjacent the atomizer 26.

[0012] The airflow sensor 24 acts as a puff detector, detecting a user puffing or sucking on the mouthpiece/liquid reservoir portion 14 of the e-cigarette 10. The airflow sensor 24 can be any suitable sensor for detecting changes in airflow or air pressure, such as a microphone switch including a deformable membrane which is caused to move by variations in air pressure. Alternatively the sensor may be a Hall element or an electromechanical sensor.

[0013] The control electronics 22 are also connected to an atomizer 26. In the example shown, the atomizer 26 includes a heating coil 28 which is wrapped around a wick 30 extending along a central passage 32 of the mouthpiece/liquid reservoir portion 14. The heating coil 28 is positioned anywhere in the atomizer 26 and in the embodiment presented in figure 1 is transverse to the liquid reservoir 42. The wick 30 and heating coil 28 do not completely block passage 46, that is provided on ei-

ther side of the heating coil 28 enabling air to flow past the heating coil 28 and the wick 30. Rather, the passage or air gap 46 is provided on either side of the heating coil 28 enabling air to flow past the heating coil 28 and the wick 30. The atomizer 26 may alternatively use other forms of heating elements, such as ceramic heaters, or fiber or mesh material heaters that may not necessarily be disposed transverse to the liquid reservoir. Nonresistance heating elements such as sonic, piezo and jet spray may also be used in the atomizer in place of the heating coil.

[0014] The central passage 32 is surrounded by a liquid reservoir 42 with the ends of the wick 30 abutting or extending into the liquid reservoir 42 in the central passage 32. The wick 30 may be a porous material such as a bundle of fiberglass fibers, with liquid in the liquid reservoir 42 drawn by capillary action from the ends of the wick 30 towards the central portion of the wick 30 in contact with the heating coil 28.

[0015] The liquid reservoir 42 may alternatively include wadding soaked in liquid which encircles the central passage 32 with the ends of the wick 30 abutting the wadding. In other embodiments, the liquid reservoir 42 may comprise a toroidal cavity arranged to be filled with liquid and with the ends of the wick 30 extending into the toroidal cavity. In yet other embodiments, the liquid reservoir is sealed with a porous cap, the cap coming into contact with a heating element or wick from a heating element. In this case, the liquid reservoir and the mouthpiece have a cross sectional geometry that allows air to pass over the liquid reservoir.

[0016] An air inhalation port 36 is provided at the back end of the mouthpiece/liquid reservoir portion 14 remote from the end cap 16. The inhalation port 36 may be formed directly into and from the mouthpiece/liquid reservoir portion 14 or may be formed in an end cap.

[0017] In use, a user sucks on the e-cigarette 10. This causes air to be drawn into the e-cigarette 10 via one or more air inlets, such as air inlet 38, and to be drawn through the passage 46. The air flow splits by 90 degrees when it arrives at the heating element from where it travels to the outsides of the device to go around the liquid reservoir towards the air inhalation port 36. The change in air pressure which arises is detected by the airflow sensor 24, which generates an electrical signal that is passed to the control electronics 22. In response to the signal, the control electronics 22 activate the heating coil 28, which causes liquid present in the wick 30 to be vaporized creating an aerosol (which may comprise gaseous and liquid components) within the passage 46. As the user continues to suck on the e-cigarette 10, this aerosol is drawn through the passage 46 and inhaled by the user. At the same time the control electronics 22 also activate the LED 20 causing the LED 20 to light up which is visible via the translucent end cap 16 mimicking the appearance of a glowing ember at the end of a conventional cigarette. Alternatively, the LED may be located below the snapping mechanism of the mouthpiece/liquid

reservoir 14 and battery/atomizer portion 12, rather than at the end of the device, as shown in figure 1. When activated, the LED conveys to the user that their device is working properly. As liquid present in the wick 30 is converted into an aerosol more liquid is drawn into the wick 30 from the liquid reservoir 42 by capillary action and thus is available to be converted into an aerosol through subsequent activation of the heating coil 28.

[0018] In the art, e-cigarettes are known that are intended to be disposable and the electric power in the battery 18 is intended to be sufficient to vaporize the liquid contained within the liquid reservoir 42, even after which the e-cigarette 10 is thrown away. This is not the case with the e-cigarette of the present invention. In the e-cigarette of the present invention, the battery 18 is rechargeable and the liquid reservoir 42 is refillable or exchangeable. The mouthpiece/liquid reservoir portion 14 of the e-cigarette 10 is detachable from the battery/atomizer portion 12 and a new mouthpiece/liquid reservoir portion 14 can be fitted with a new liquid reservoir 42 thereby replenishing the supply of liquid. In some cases, replacing the liquid reservoir 42 involves the replacement of the entire mouthpiece/liquid reservoir portion 14, as it will be described in more detail in this document. Further, the heating coil 28 and the wick 30 are as well replaceable along with the replacement of the liquid reservoir 42.

[0019] The mouthpiece/liquid reservoir 14 contains the liquid reservoir 42 in the form of a cartridge and has air passages 46 through which a user inhales aerosol. In other embodiments, aerosol may flow around the exterior of the cartridge 42 to an air inhalation port 36. The air passages 46 may alternatively be formed as a central passage around which the liquid reservoir 42 is arranged.

[0020] Of course, in addition to the above description of the structure and function of a typical e-cigarette 10, variations also exist. For example, the LED 20 may be omitted. The airflow sensor 24 may be placed adjacent the end cap 16 rather than in the middle of the e-cigarette. The airflow sensor 24 may be replaced with a switch which enables a user to activate the e-cigarette manually rather than in response to the detection of a change in air flow or air pressure.

[0021] Different types of atomizers may be used. Thus for example, the atomizer may have a heating coil in a cavity in the interior of a porous body soaked in liquid. In this design aerosol is generated by evaporating the liquid within the porous body either by activation of the coil heating the porous body or alternatively by the heated air passing over or through the porous body. Alternatively the atomizer may use a piezoelectric atomizer to create an aerosol either in combination or in the absence of a heater.

[0022] In this document the terms "capsule", "capsule with liquid", "reservoir" and "liquid reservoir" are used interchangeably and refer to a container including the liquid that is subject to atomization or vaporization in the e-cigarette and is designated in the appended drawings with numeral 42.

[0023] The control electronics 22 are connected to the atomizer 26. The atomizer 26 is disposed parallel to the longitudinal axis of the e-cigarette 10, and includes a heating coil 28 which is wrapped around a wick 30 extending across a central passage 32 or cannula section. The cannula section 32 is provided such that it comprises the wick 30 inside. The cannula section 32 has a needle shaped tip 34 extending into the liquid reservoir 42. The mouthpiece/liquid reservoir section 14 is shaped to ergonomically fit the mouth of a user and comprises a mouthpiece 48 that comprises a capsule constituting the liquid reservoir 42. An attachment mechanism 44 secures the capsule 42 with liquid in the mouthpiece/liquid reservoir section 14. One possible embodiment for the attachment mechanism 44 is a latch element, the latch element provided with a through hole. A through hole is easy to provide if the capsule 42 is made via injection molding, since the injection molding tool would only need to have one movable element. An air inhalation port 36 is provided in the mouthpiece 48. The mouthpiece 48 comprises a rigid outer housing that includes the liquid reservoir 42.

[0024] Figure 2 shows a schematic cross-sectional illustration of a mouthpiece/liquid reservoir portion 14 of the e-cigarette 10 in accordance with the present invention.

[0025] The mouthpiece/liquid reservoir portion 14 of the e-cigarette 10 illustrated in figure 2 comprises a mouthpiece 48, the mouthpiece 48 comprising a rigid outer housing. A liquid reservoir 42 is included in the rigid outer housing of the mouthpiece 48. The mouthpiece 48 is detachable from the atomizer/battery portion 12 of e-cigarette 10 and is shaped to ergonomically fit the mouth of a user. The mouthpiece/liquid reservoir portion 14 of the e-cigarette 10 also has a central passage 32 or cannula section. The cannula section 32 is provided such that it may accommodate inside the wick 30. The cannula section 32 has a porous tip 34 extending into the liquid reservoir 42. The mouthpiece/liquid reservoir section 14 is shaped to ergonomically fit the mouth of a user and comprises a mouthpiece 48 that comprises a capsule constituting the liquid reservoir 42. An attachment mechanism 44 secures the capsule 42 with liquid in the mouthpiece/liquid reservoir section 14. One possible embodiment for the attachment mechanism 44 is a latch element, the latch element provided with a through hole. An air inhalation port 36 is provided in the mouthpiece 48.

[0026] Figure 3 is a sectional view of the mouthpiece/liquid reservoir portion 14 of an electronic smoking device 10 in accordance with one embodiment of the present invention.

[0027] As mentioned earlier in this document, the mouthpiece/liquid reservoir portion 14 of e-cigarette 10 is detachable from the battery/atomizer portion 12 of e-cigarette 10. Visible in figure 3 is a mouthpiece/liquid reservoir portion 14 of the e-cigarette 10 that is detached from the battery/liquid reservoir portion 12 and is presented in a cross-sectional view. The mouthpiece/liquid

reservoir portion 14 is an assembly that comprises among others a capsule with a liquid reservoir 42 comprising a liquid 302, and a mouthpiece 48. Visible in figure 3 is as well the attachment mechanism 44 between the capsule with a liquid reservoir 42 and the mouthpiece 48 that in the illustrated embodiment is a latch attachment mechanism comprising latch element provided on the inner surface of the mouthpiece 48, that exemplarily may be shaped as a protrusion, and a counter latch element, provided on the outer surface of the capsule, and that may be exemplarily shaped as a recess channel, in particular as a through hole. Elements of capsule 42 (not illustrated in the drawing) secure the capsule 42 in the mouthpiece 48.

[0028] A plurality of stabilizing leg(s) 304 disposed on the outer portion of the mouthpiece are as well visible in figure 3.

[0029] An atomizer 26 with a sharp porous foil piercing protrusion 34, a porous cannula section comprising a wick, a connection 306 at which the atomizer 26 is affixed to mouthpiece 48, and a wick section heating coil 28 are as well visible in figure 3 as pertaining to the battery/atomizer portion 12 of the e-cigarette 10. The atomizer 26 comprised by the battery/atomizer portion 12 may also comprises a pair of grooves, a pair of protrusions, contact elements, and counter contact elements (not illustrated in the figure) for contacting the atomizer with the rest of the e-cigarette.

[0030] In one possible embodiment, the mouthpiece 48 may have a tilted surface 308 that is tilted away from the air inhalation port 36 of the mouthpiece 48. The mouthpiece 48 is made of rigid material so the capsule with liquid 42 may be inserted and affixed in the mouthpiece 48 by force fit, press fit, form fit or interference fit.

[0031] To facilitate the integration and the fit of the capsule with the liquid 42 in the mouthpiece 48, each one of the capsule and the mouthpiece is provided with various fit elements, situated on the surface of the capsule with liquid and on the inner surface of the mouthpiece 48. As it will be described later in further detail in this document, in accordance with the present invention the capsule may be provided with a counter latch element affixed at one end of the capsule for fitting in a latch element provided on the mouthpiece, and/or the capsule may be provided with a plurality of wings disposed on its surface, and/or the capsule may be provided with grooves on its surface in which elongated elements provided on the inner surface of the mouthpiece are expected to be inserted, and/or the capsule may be provided with elongated protrusions expected to fit in grooves on the inner surface of the mouthpiece. Also, in accordance with the present invention the mouthpiece may be provided with a plurality of latches expected to join in the plurality of counter latches provided on the capsule, and/or grooves in which the wings provided on the surface of the capsule may fit, and/or with elongated elements protruding from the inner surface of the mouthpiece that may fit in the guide grooves provided in the capsule, and/or with elongated

guide grooves on the inner surface of the mouthpiece in which the wings or the elongated protrusions of the capsule are expected to fit in. The latch elements are provided on the inner surface of the mouthpiece 48, that exemplarily may be shaped as a protrusion, and engage with a counter latch element, provided on the outer surface of the capsule 42, and that may be exemplarily shaped as a recess channel, in particular as a through hole, and other elements of capsule 42 for securing the capsule 42 in the mouthpiece 48.

[0032] The capsule 42 with liquid has sealing foil at least at one of its extremities, so it can be easily sealed during the production. The sealing foil needs to be penetrated when a user wants to use the electronic cigarette, so the atomizer 26 comprises a porous foil-piercing atomizer head 34 that, in one possible embodiment, is needle shaped, and that extends into the capsule 42. Once the capsule foil is penetrated by the tip 34 a channel draws out the liquid from capsule 42 by capillary action via the channel, that is part of the atomizer, and may be located inside the needle shaped tip 34. The channel that acts as a wick may in one possible embodiment have a hammer like shape. On the hammer head portion of the wick there is a heating coil 28 that is drawn around the wick.

[0033] The atomizer 26 comprised by the battery/atomizer portion 12 comprises a portion comprising among others a pair of grooves, a pair of protrusions, contact elements, and counter-contact elements that form a bayonet connection between the atomizer and the rest of the electronic cigarette 10. The grooves open away from each other; the contact elements may be provided for connecting the heating coil to a battery and the grooves are provided to be able to rotate the atomizer when installing it into the electronic smoking device via the bayonet connection.

[0034] The capsule 42 with liquid is provided either with wings, latches, grooves or elongated protrusions for enabling the capsule to be fitted in the mouthpiece 48. The wings (not shown in the drawing) are provided on the capsule 42 for guiding the capsule 42 when inserted in the mouthpiece 48 and can be used for providing an interference fit between the capsule 42 and the mouthpiece 48. The wings serve for guiding and/or securing the capsule 42 in the mouthpiece 48. Alternatively, the capsule 42 is secured in a form fit in the mouthpiece 48 via a latch connection provided via counter latches that anchor in guide latches or latch elements provided on the inner surface of mouthpiece 48.

[0035] The liquid in capsule 42 is atomized or vaporized and the resulting aerosol flows from the atomizer along the capsule 42 towards the inhalation port 36 of the mouthpiece 48. The wings, latches or protrusions on the surface of the capsule 42 provide not only for guiding and/or securing the capsule in the mouthpiece but define as well the space necessary around the capsule 42 for the aerosol to flow towards the air inhalation port 36 of the mouthpiece 48.

[0036] The capsule 42 is a container with an extraction

end having an opening closed by a foil, and a latch end opposite to the extraction end, the latch end comprising the counter latch element. Counter latch element engages a latch element of the mouthpiece 48, to form a form fit between the liquid reservoir 42 and the rigid outer housing of the mouthpiece 48. The counter latch element is formed as a through hole that extends perpendicular to a longitudinal direction of the mouthpiece, the longitudinal direction extending from an extraction end of the mouthpiece to the latch end. In figure 3 the arrows indicate the airflow direction.

[0037] As illustrated at least in figures 1 to 3 discussed above, the electronic smoking device 10 of the present invention comprises a mouthpiece/liquid reservoir portion 14 comprising a mouthpiece 48, the mouthpiece 48 comprising a rigid outer housing, and a liquid reservoir 42, an atomizer/battery portion 12 comprising a battery 18, and an atomizer 26 operable when connected to the battery 18 to atomize liquid stored in the liquid reservoir 42, the rigid outer housing including the liquid reservoir 42, and the mouthpiece 48 is detachable from the atomizer/battery portion 12. The rigid outer housing and the liquid reservoir 42 are formed separate from each other, and the liquid reservoir 42 is affixed to the rigid outer housing.

[0038] Figures 4 to 7 illustrate various views of a capsule with liquid 42 in accordance with the present invention. Specifically, figure 4 illustrates the capsule in accordance with the present invention in a top view, figure 5 illustrates the capsule in accordance with the present invention in a cross-sectional side view, figure 6 illustrates the capsule of the present invention in a side view, and figure 7 illustrates the capsule of the present invention in front view.

[0039] As it may be seen in figure 4, the capsule 42 comprises guide grooves 402 that facilitate the attachment of capsule 42 while the capsule is inserted into the rigid outer housing of the mouthpiece 48. The guide grooves 402 are capable of receiving elongated elements protruding from the inner surface of the mouthpiece 48 and guide the elements while the capsule 42 is inserted in the mouthpiece 48. Although in figure 4 only two of guide grooves 402 are visible, the number of the guide grooves may be more than two, as it will be shown in figure 7. The guide grooves 402 interact with the elongated guide protrusions or guide elements present on the inner surface of the rigid housing for guiding the movement of the capsule 42 while the capsule 42 is inserted into the rigid outer housing of the mouthpiece 48, and for securing the capsule 42 in the mouthpiece 48 to form a capsule/mouthpiece assembly 14.

[0040] As it may be seen in figure 5, the capsule 42 may not only comprise guide grooves 402 but may comprise as well counter element(s) 404 that protrude from an outer lateral side of the liquid reservoir or capsule 42, and the height of the counter guide element(s) 404 decreases in the course of the counter guide element 404 in a direction parallel with a longitudinal axis of the cap-

sule, towards the air inhalation port. This particular geometry of the counter element(s) 404 may be as well observed in figure 6 that illustrates the capsule of the present invention in a side view. The elongated counter elements 404 fit in grooves provided on the inner surface of the mouthpiece 48 to provide for a fit between the capsule 42 and the mouthpiece 48 in the mouthpiece/liquid reservoir assembly 14.

[0041] Figure 7 illustrates the capsule of the present invention in front view. As it may be seen in the figure, capsule 42 is provided with multiple guide grooves 402. In the embodiment illustrated in the figure the capsule is provided with four guide grooves 402 and is not provided with any other elements such as wings or elongated counter elements. The guide grooves 402 interact with guide protrusions present on the interior surface of the mouthpiece 48 to permit the capsule 42 to be interaction fitted in the mouthpiece 48.

[0042] Although not illustrated in the above described figures, in another embodiment of the present invention the capsule 42 exhibits instead of grooves 402 or counter elements 404 a plurality of wings for enabling the capsule to be fitted in the mouthpiece 48. The wings (not shown in the drawings) are provided on the capsule 42 for guiding the capsule 42 when inserted in the mouthpiece 48 and can be used for providing an interference fit between the capsule 42 and the mouthpiece 48. The wings serve for guiding and/or securing the capsule 42 in the mouthpiece 48. Alternatively, the capsule 42 is secured in a form fit in the mouthpiece 42 via a latch connection provided via latches that anchor in guide grooves provided on the inner surface of the mouthpiece 48.

[0043] Features of the capsule that are not shown in the figures 4 to 7 are a container section with an extraction end having an opening closed by a foil, and a latch end opposite to the extraction end, the latch end comprising a counter latch element.

[0044] Figures 8 to 11 illustrate various view of a mouthpiece 48 in accordance with the present invention. Specifically, figure 8 shows a top view of a mouthpiece in accordance with the present invention, figure 9 shows a side view of a mouthpiece in accordance with the present invention, figure 10 shows a cross-sectional view of the mouthpiece, and figure 11 shows a front view of a mouthpiece in accordance with the present invention.

[0045] The mouthpiece illustrated in figures 8 to 11, and described in detail in the following, is configured in a manner that allows the liquid reservoir 42 to be affixed to the rigid outer housing comprised by the mouthpiece by either one of force fit, press fit or form fit. As it will be described in the following, in one embodiment of the present invention, the form fit between liquid reservoir 42 and the rigid outer housing of the mouthpiece 48 is provided by a latch connection 502, 504 between the liquid reservoir 42 and the housing 48. The counter latch element(s) 504 of the capsule 42, is formed as a through hole that extends perpendicular to a longitudinal direction of the mouthpiece 48, the longitudinal direction extending

from the extraction end to the latch end of the capsule. The rigid outer housing of capsule 48 comprises a latch element 502 counter to the counter latch element 504, the latch element 502 being arranged at a longitudinal end of an inner lateral side of the housing, the inner lateral side facing a receiving volume of the liquid reservoir. The number of latch elements 502 comprised by the capsule is not limited to one and in one embodiment of the present invention, the rigid outer housing comprises two latch elements 502 protruding towards each other from opposite sections of the inner lateral side. The rigid outer housing comprises a guide element 1202 for guiding the movement of the liquid reservoir 42 while the liquid reservoir is inserted into the rigid outer housing, and the liquid reservoir 42 comprises a counter guide element 404 for interacting with the guide element 1202 of the mouthpiece. The number of guide elements 1202 is not limited to one and in accordance with one embodiment of the present invention, the rigid outer housing comprises two guide elements 1202 or more guide elements. Further, in accordance with one embodiment of the present invention the mouthpiece 48 comprises a guide groove (not illustrated in the figures) extending between the guide elements for receiving the counter guide elements of the capsule at least section-wise, the guide groove opening into and along the receiving volume. The counter element protrudes from an outer lateral side of the liquid reservoir, and its height decreases in the course of the counter guide element. The guide grooves of the mouthpiece are also capable of receiving the wings situated on the surface of the capsule.

[0046] Referring specifically to the embodiments of the invention that are shown in figures 8 to 11, figure 8 is a top view of a mouthpiece 48 that is formed of a rigid outer housing. Figure 9 that illustrates the mouthpiece 48 in side view illustrates again the rigid outer housing 1102 of the mouthpiece that has an inclined front face 308. The inclined front face is tilted from the mouthpiece 48 and ensures that a user may place the mouthpiece only in one direction on the electronic smoking device 10. As such a secure way is provided for attaching the mouthpiece in only one direction. In figure 9 it may be observed that on the outer surface of the mouthpiece a plurality of stabilizing leg(s) 304 are provided that are shaped as protrusions and that ensure that the electronic cigarette does not roll away when placed on a surface. Figure 10 illustrates a cross-sectional view of the mouthpiece 48. A pair of latch elements 502 may be observed in the figure, the latch elements 502 being shaped as protrusions. They engage the latch channel or the counter latch elements 504 of the capsule 42 shaped exemplarily as through holes. A pair of guide elements 1202 may as well be observed in the figure.

[0047] Figure 11 illustrates a front view of the mouthpiece 48. Visible in the figure are the guiding elements 1202, a pair of which is situated on each side of the mouthpiece and pairs of latch protrusions 504 situated further away from each other than the guiding elements

1202. Stabilizing legs 304 may as well be observed in figure 11.

[0048] Figure 12 illustrates a mouthpiece 48 in accordance with the present invention and a capsule 42 with counter element(s) 404 that protrude from an outer lateral side of the liquid reservoir or capsule 42. The height of the counter guide element(s) 404 decreases in the course of the counter guide element 404 in a direction parallel with a longitudinal axis of the capsule, towards the air inhalation port. This particular geometry of the counter element(s) 404 may be as well observed in figure 6 that illustrates the capsule of the present invention in a side view. The capsule 42 is inserted in the mouthpiece 48 in the direction A along a longitudinal axis of the mouthpiece 48 to form a mouthpiece-capsule assembly, the capsule being integrated in the mouthpiece.

[0049] Figures 13 and 14 illustrate cross-section and full-body perspective views of the mouthpiece/liquid reservoir 14 of an electronic smoking device 10 in accordance with one embodiment of the present invention. A bayonet connection 1301 between the atomizer 26 and the rest of the electronic smoking device 10 is visible as well in these figures.

[0050] Figures 15 and 16 illustrate a front view into the mouthpiece 48 with inserted capsule 42 forming a mouthpiece-capsule assembly. As it may be observed in these figures the assembly comprising the capsule 42 integrated in the mouthpiece 48 comprises an air gap 46 or a passage between the capsule 42 and the mouthpiece 48 for atomized liquid extending through the mouthpiece 48, gap 46 that is situated between the rigid outer housing of the mouthpiece and the capsule 42. As it is evidenced in figure 16 the capsule 42 is inserted in the mouthpiece 48 forming an integration fit employing the guide grooves 404 of the capsule 42 countering the guide elements 1202 of the mouthpiece 48.

[0051] In accordance with an embodiment of the present invention, the liquid reservoir of the present invention comprises a front face, situated at an end denominated the extraction end, and a diameter of the liquid reservoir decreases away from the front face. The outer lateral side of the liquid reservoir is tapered with respect to the longitudinal axis of the liquid reservoir. These features may be shared by the liquid reservoirs mentioned in this document, irrespective of the embodiment of the invention that is discussed. The front face of the liquid reservoir comprises an annular protrusion encircling a longitudinal axis of the liquid reservoir, the annular protrusion protruding from the front face along the liquid reservoir.

[0052] To summarize, in accordance with the present invention an electronic smoking device comprises a mouthpiece/liquid reservoir portion and an atomizer/battery portion. The mouthpiece/liquid reservoir portion comprises a mouthpiece, mouthpiece comprising a rigid outer housing, and a liquid reservoir. The atomizer/battery portion comprises a battery, and an atomizer operable when connected to the battery to atomize liquid

stored in the liquid reservoir. The rigid outer housing includes the liquid reservoir, and the mouthpiece is detachable from the atomizer/battery portion.

[0053] The rigid outer housing and the liquid reservoir are formed separate from each other, and the liquid reservoir is affixed to the rigid outer housing. The liquid reservoir is affixed to the rigid outer housing by one of a force fit, a press fit, a form fit or interference fit. The form fit between the liquid reservoir and the rigid outer housing is provided by a latch connection between the reservoir and the rigid housing. The liquid reservoir comprises a container section with an extraction end having an opening closed by a foil, and a latch end opposite to the extraction end, the latch end comprising a counter latch element. The counter latch element is formed as a through hole that extends perpendicular to a longitudinal direction of the mouthpiece, the longitudinal direction extending from the extraction end to the latch end.

The rigid outer housing of the mouthpiece comprises a latch element counter to the counter latch element of the liquid reservoir, the latch element is arranged at a longitudinal end of an inner lateral side of the housing, and the inner lateral side faces a receiving volume of the liquid reservoir. The rigid outer housing comprises two latch elements protruding towards each other from opposite sections of the inner lateral side. The rigid outer housing comprises a guide element for guiding the movement of the liquid reservoir while the liquid reservoir is inserted into the rigid outer housing. The liquid reservoir comprises a counter guide element for interacting with the guide element. The rigid outer housing comprises two guide elements, and a guide groove extending between the two guide elements for receiving the counter guide element of the liquid reservoir at least section-wise. The guide groove opens into and along a receiving volume of the mouthpiece. The counter element protrudes from an outer lateral side of the liquid reservoir, and a height of the counter guide element decreases in the course of the counter guide element. A front face of the liquid reservoir comprises an annular protrusion encircling a longitudinal axis of the liquid reservoir, the annular protrusion protruding from the front face along the liquid reservoir

[0054] A mouthpiece for an electronic smoking device in accordance with the present invention comprises a rigid outer housing, and a liquid reservoir inside the rigid outer housing. A liquid reservoir for an electronic smoking device in accordance with the present invention is integrated inside a rigid outer housing of a mouthpiece comprised by the electronic smoking device.

[0055] In case the user wishes to exchange the capsule, since the liquid capsule and the mouthpiece are integrated in an assembly, and the dimensions of the assembly are larger than the dimensions of the capsule alone, the exchange of the capsule mouthpiece assembly is much easier for the user. Further, the mouthpiece no longer needs to be removed first to exchange the capsule, and the user may dispose of both of them together, in the event that the user wishes to exchange the capsule.

[0056] While this invention has been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the scope of the appended claims.

LIST OF REFERENCE SIGNS

[0057]

- 10 electronic smoking device or e-cigarette
- 12 battery/atomizer portion
- 14 mouthpiece/liquid reservoir portion
- 16 end cap
- 18 battery
- 20 light-emitting diode (LED)
- 22 control electronics
- 24 airflow sensor
- 26 atomizer
- 28 heating coil
- 30 wick
- 32 central passage or cannula section
- 34 needle shaped tip
- 36 air inhalation port
- 38 air inlet(s)
- 42 liquid reservoir or capsule or capsule with liquid plurality of stabilizing leg(s)
- 304 connection
- 306 tilted surface of mouthpiece
- 308 guide grooves
- 402 counter guide element
- 404 latch element(s)
- 35 504 counter latch element(s)
- 1102 rigid outer housing of the mouthpiece
- 1202 guide element
- 1301 bayonet connection

Claims

1. Electronic smoking device (10), comprising:
 - a mouthpiece/liquid reservoir portion (14) comprising
 - a mouthpiece (48), said mouthpiece (48) comprising a rigid outer housing, and a liquid reservoir (42),
 - an atomizer/battery portion (12) comprising
 - a battery (18), and
 - an atomizer (26) operable when connected to the battery (18) to atomize liquid stored in the liquid reservoir (42),

- wherein said rigid outer housing including the liquid reservoir (42), and wherein said mouthpiece (48) being detachable from said atomizer/battery portion (12).
2. The electronic smoking device (10) of claim 1, wherein the rigid outer housing and the liquid reservoir (42) are formed separate from each other, and wherein the liquid reservoir (42) is affixed to the rigid outer housing.
 3. The electronic smoking device (10) of claim 2, wherein the liquid reservoir (42) is affixed to the rigid outer housing by one of a force fit, a press fit, a form fit or an interference fit.
 4. The electronic smoking device (10) of claim 3, wherein said form fit between said liquid reservoir (42) and said rigid outer housing is provided by a latch connection (502, 504) between said reservoir (42) and said housing.
 5. The electronic smoking device (10) of any of claims 1 to 4, the liquid reservoir (42) comprising a container section with an extraction end having an opening closed by a foil, and a latch end opposite to the extraction end, the latch end comprising a counter latch element (504).
 6. The electronic smoking device (10) of claim 5, wherein the counter latch element (504) is formed as a through hole that extends perpendicular to a longitudinal direction of the mouthpiece (48), the longitudinal direction extending from the extraction end to the latch end.
 7. The electronic smoking device (10) of any one of claims 4 to 6, wherein the rigid outer housing comprises a latch element (502) counter to the counter latch element (504) of the liquid reservoir (42), wherein the latch element (502) is arranged at a longitudinal end of an inner lateral side of the housing, the inner lateral side facing a receiving volume of said liquid reservoir (42).
 8. The electronic smoking device (10) of claim 7, wherein the rigid outer housing comprising two latch elements (502) protruding towards each other from opposite sections of the inner lateral side.
 9. The electronic smoking device (10) of any of claims 1 to 8, wherein the rigid outer housing comprising a guide element (1202) for guiding the movement of the liquid reservoir (42) while the liquid reservoir (42) is inserted into the rigid outer housing.
 10. The electronic smoking device (10) of claim 9, wherein the liquid reservoir (42) comprising a counter guide element (404) for interacting with the guide element (1202).
 11. The electronic smoking device (10) of claim 10, wherein the rigid outer housing comprises two guide elements, and a guide groove extends between the two guide elements for receiving the counter guide element of the liquid reservoir at least section-wise, wherein the guide groove opens into and along a receiving volume of the mouthpiece (48).
 12. The electronic smoking device (10) of claim 10, wherein the counter element (404) protrudes from an outer lateral side of the liquid reservoir (42), and wherein a height of the counter guide element (404) decreases in the course of the counter guide element (404).
 13. The electronic smoking device (10) of any of claims 1 to 12, wherein a front face of the liquid reservoir (42) comprising an annular protrusion encircling a longitudinal axis of the liquid reservoir (42), said annular protrusion protruding from the front face along the liquid reservoir (42).

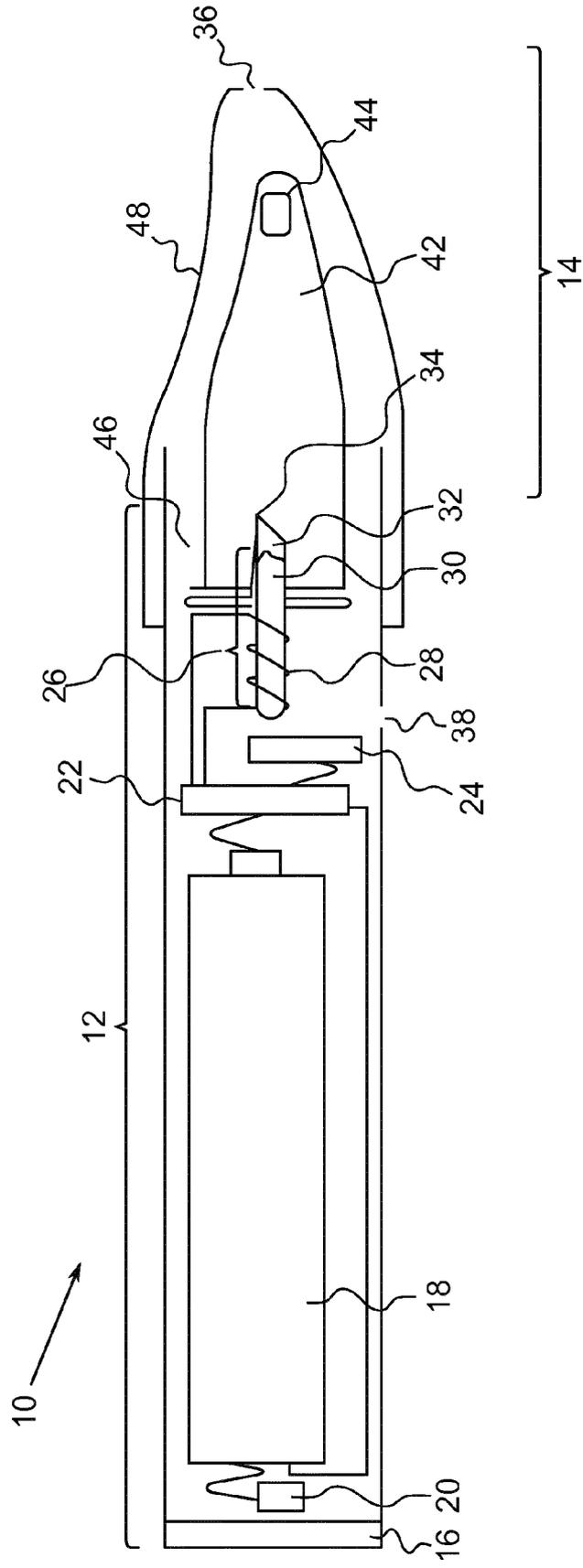


Fig. 1

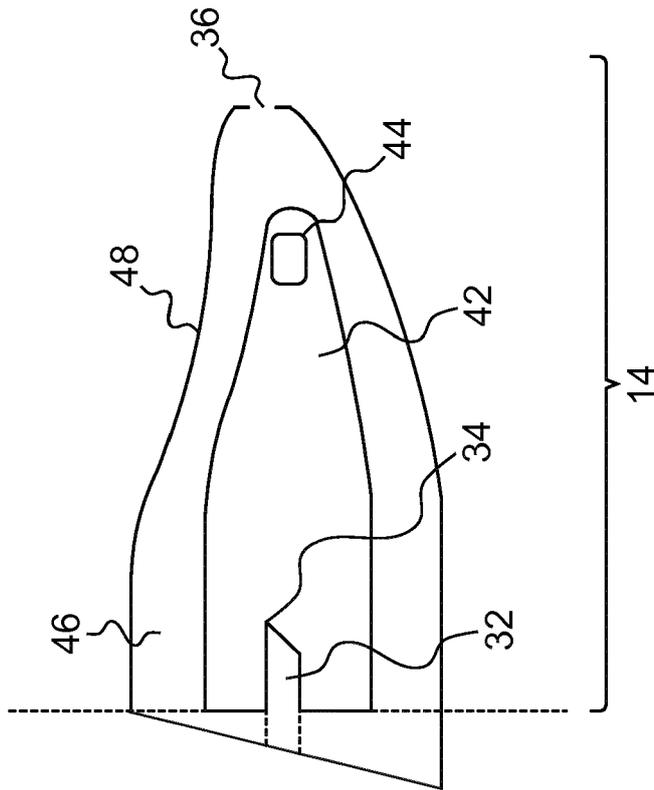


Fig. 2

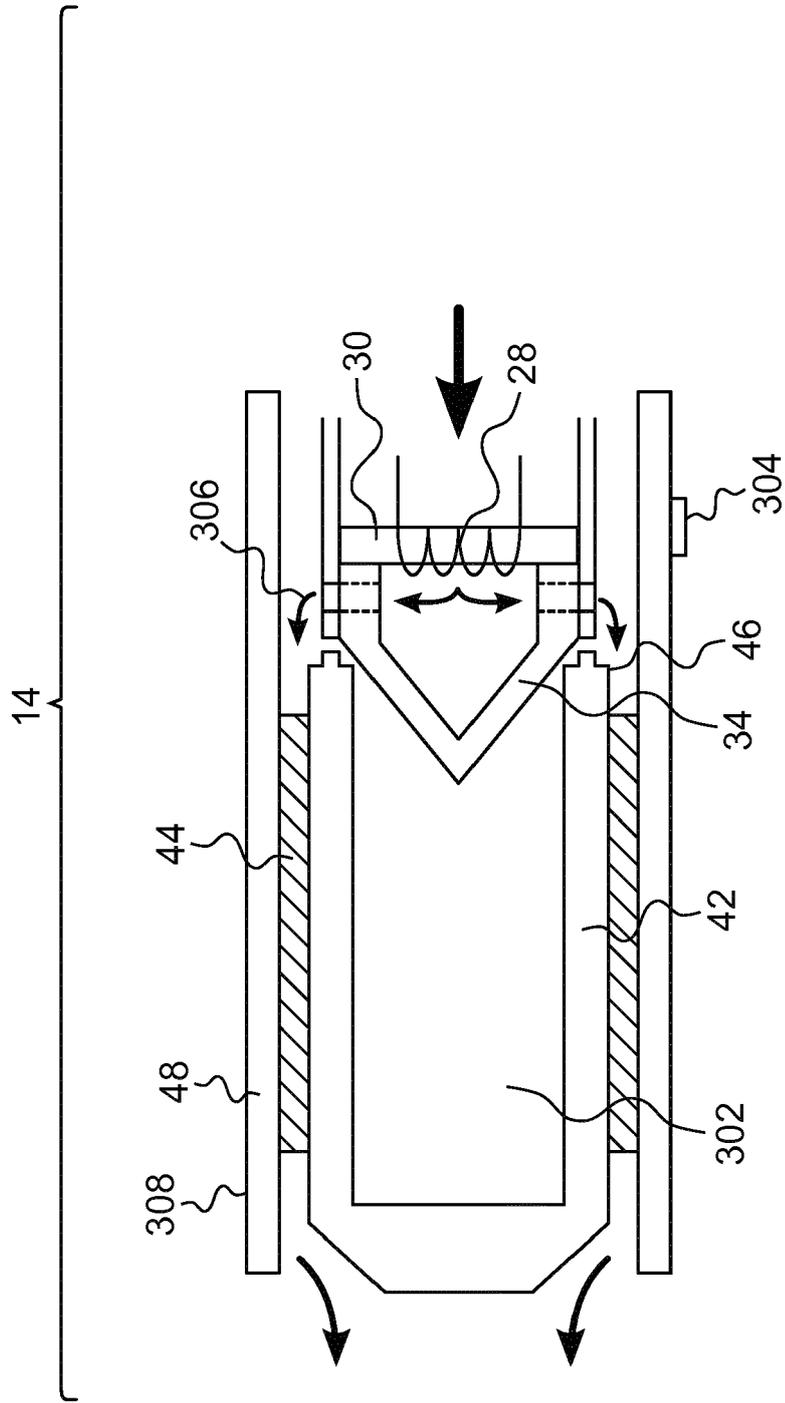


Fig. 3

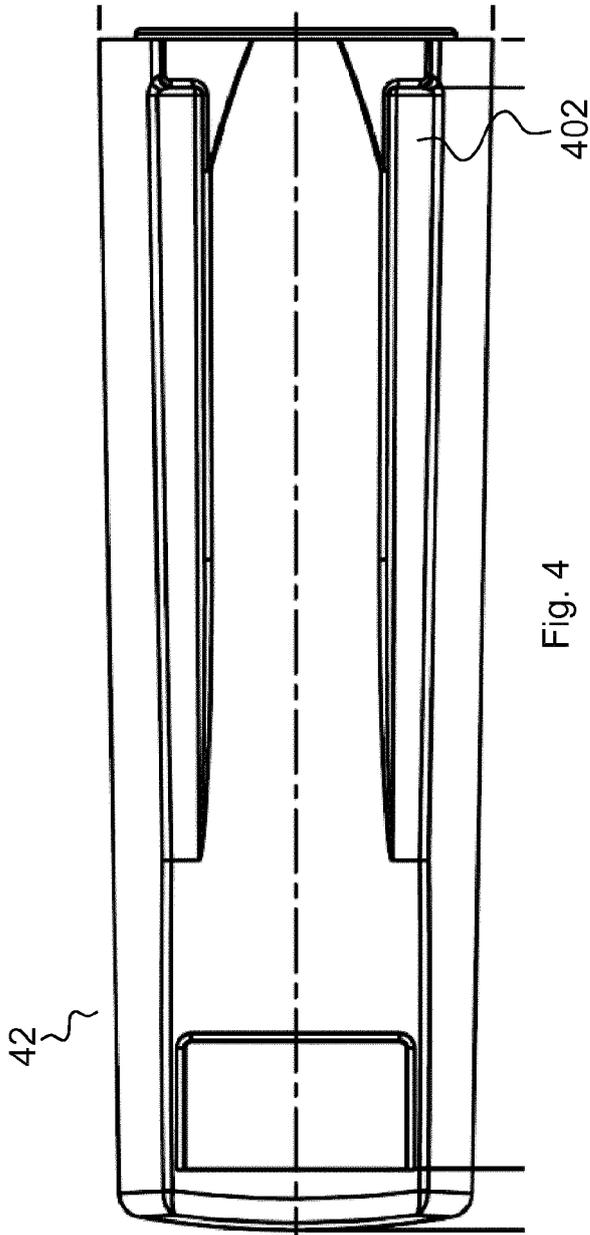


Fig. 4

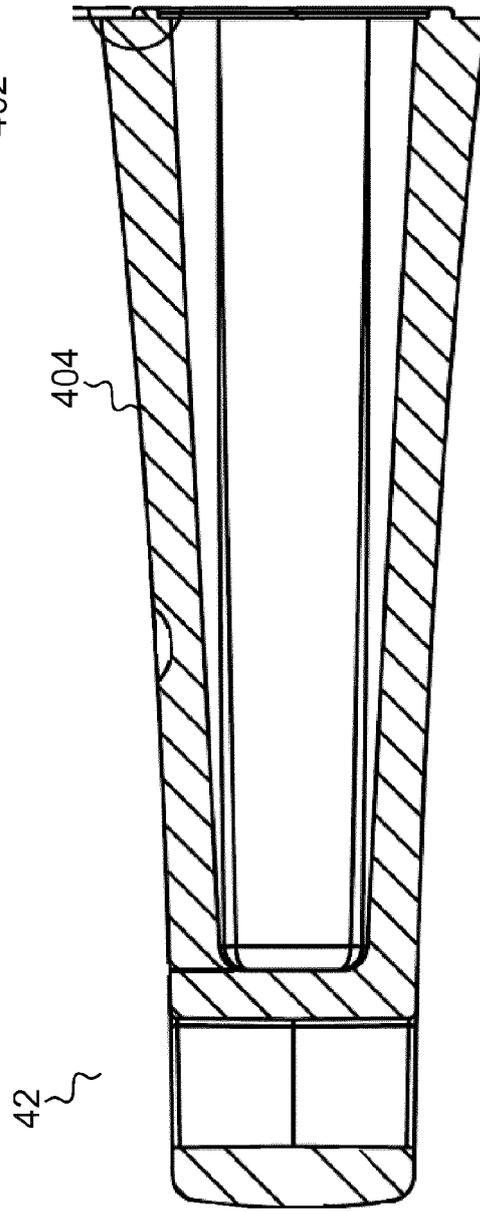


Fig. 5

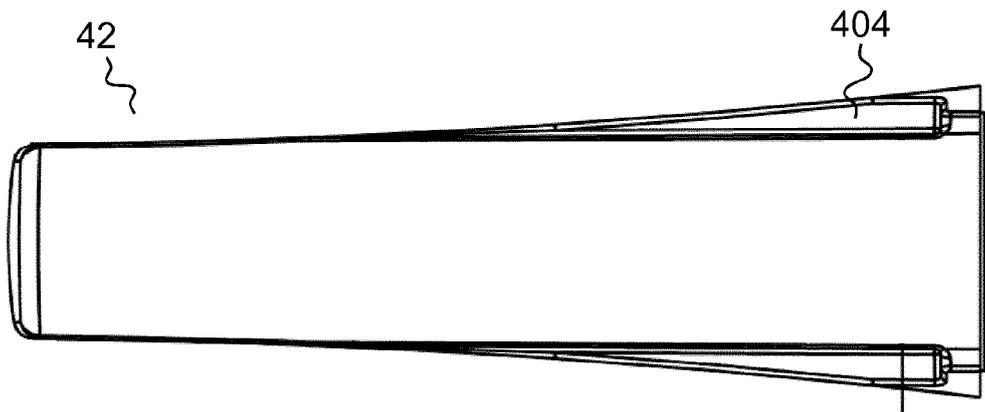


Fig. 6

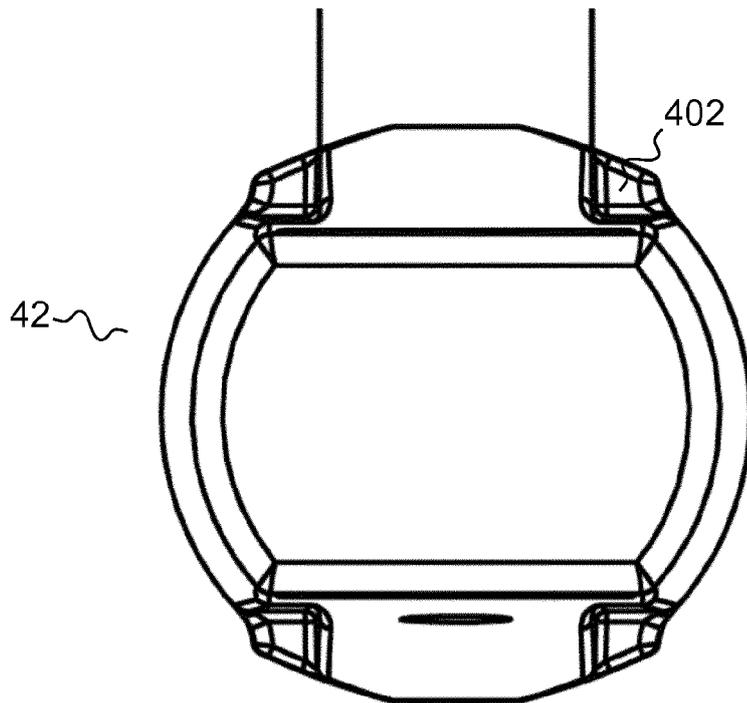


Fig. 7

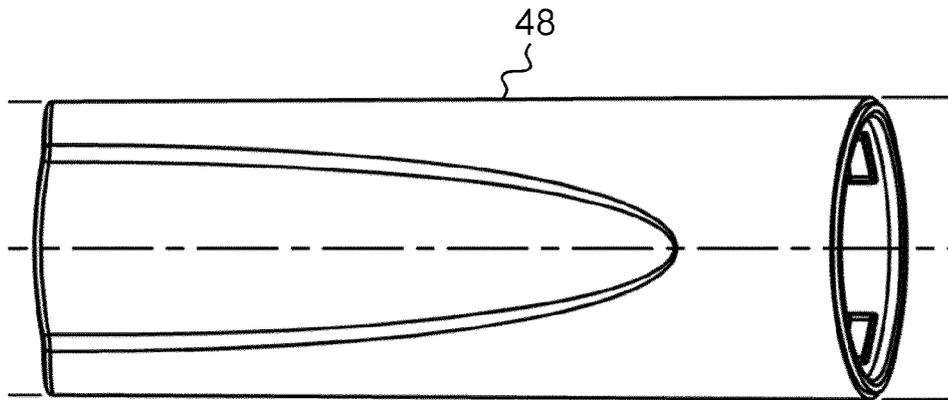


Fig. 8



Fig. 9

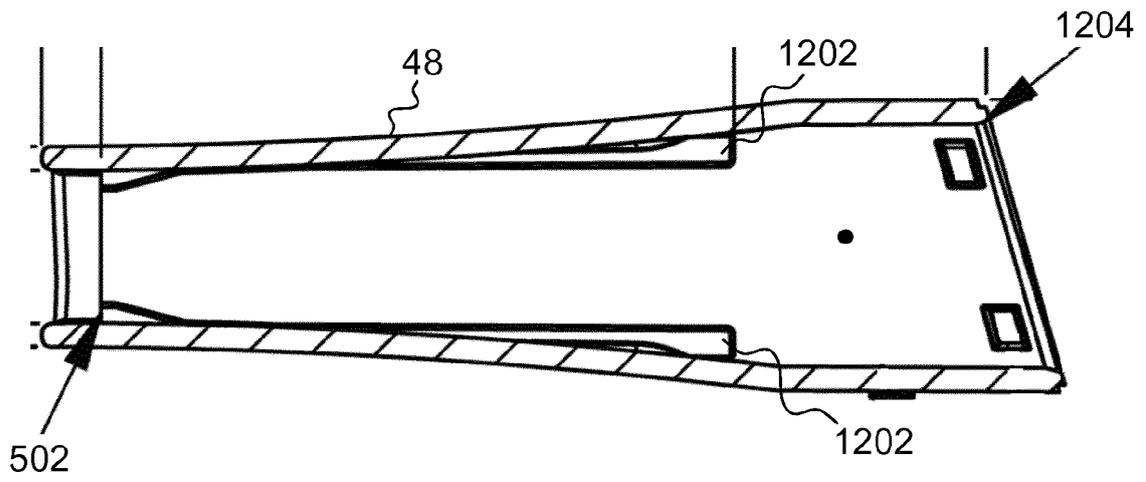


Fig. 10

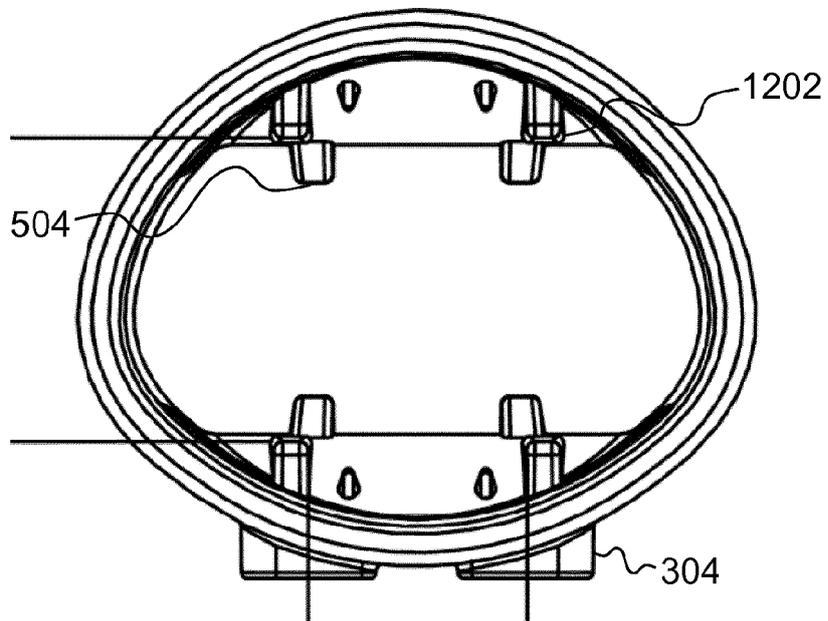


Fig. 11

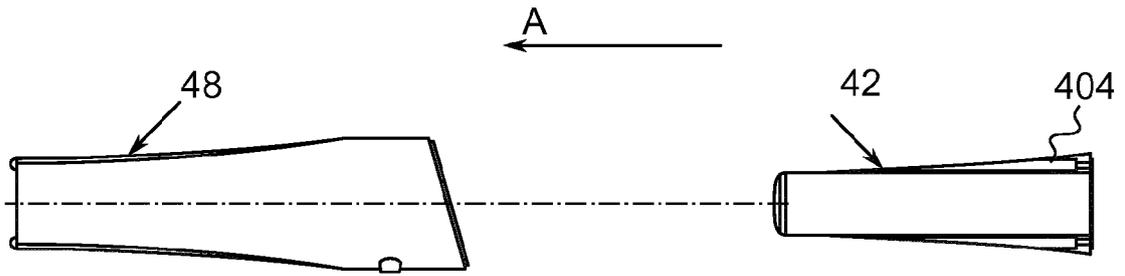


Fig. 12

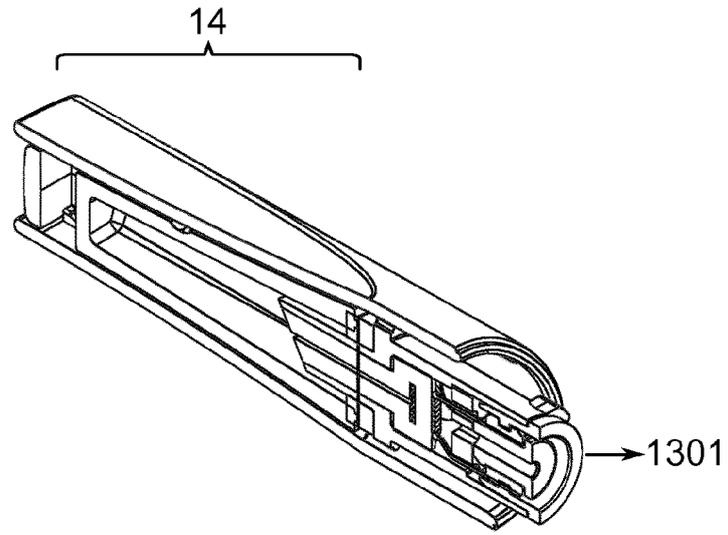


Fig. 13

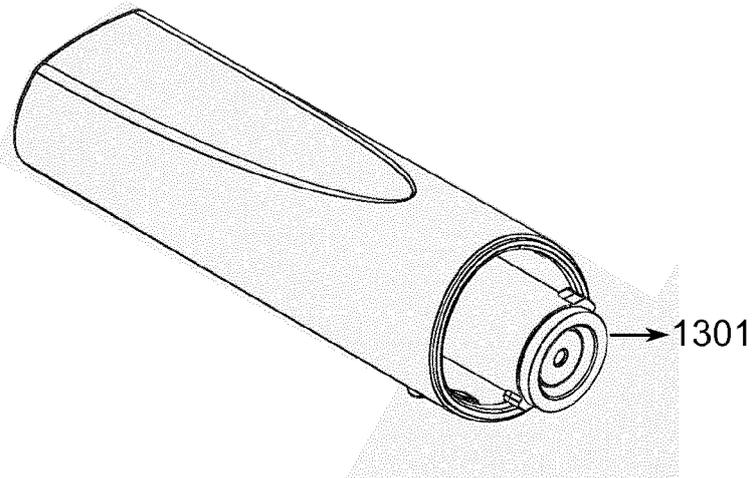


Fig. 14

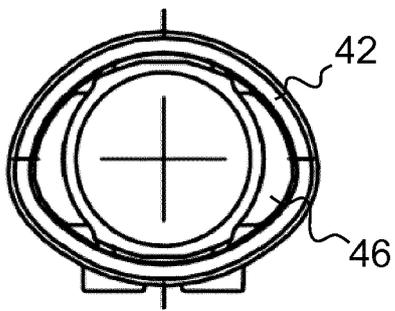


Fig. 15

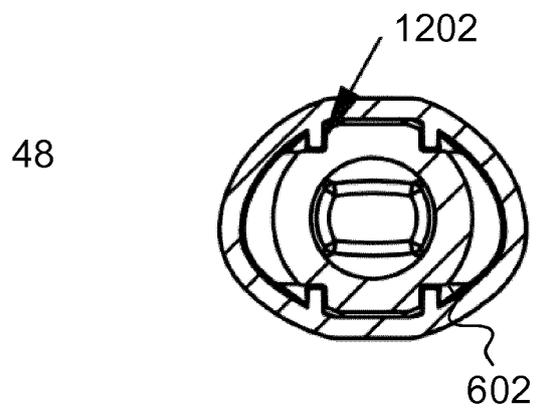


Fig. 16



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