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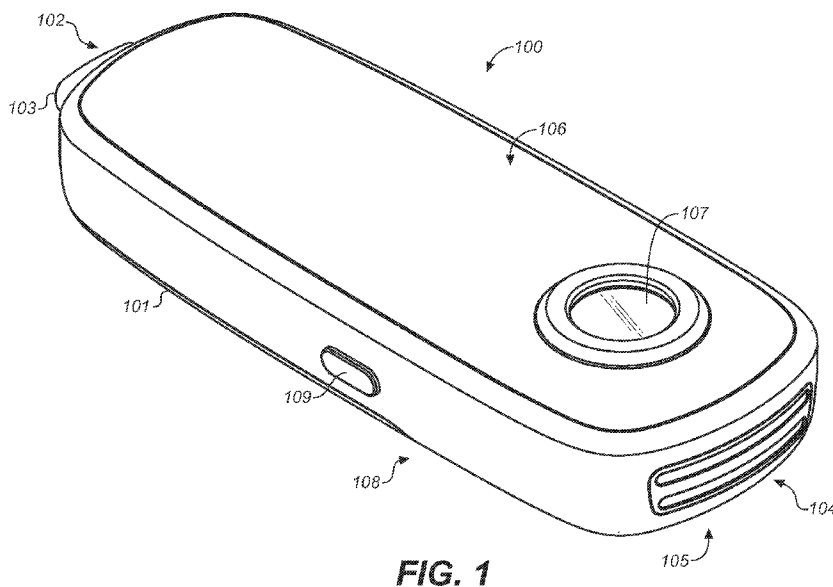


FIG. 1

(57) Abstract: A vaporizer and method of vaporizing a botanical material, such as tobacco, is described. Embodiments of the apparatus include a self-contained, fully enclosed, battery operated vaporizer having an air inlet and a mouthpiece. The vaporizer includes a window for viewing a botanical material contained therein and a heating element that is also visible through the window and through an air inlet. The vaporizer also includes a push-button switch that rapidly provides power to heat air, which is then drawn through the botanical material by inhaling. Embodiments of the method include utilizing a push-button switch for heating vaporizer air and viewing the glow of the heating element as a signal that the vaporizer is ready for use.



PORTABLE TOBACCO VAPORIZER

TECHNICAL FIELD

[0001] The present invention generally relates to the field of vaporizers for consuming botanical materials, such as tobacco, and more particularly to an apparatus and method for using a portable, self-contained vaporizer for sufficient to release volatile components without combustion.

BACKGROUND ART

[0002] Tobacco is commonly consumed by igniting the tobacco, thus requiring that the consumer inhale products of combustion along with any volatile compounds, such as nicotine, that are present. Since combustion products may be harmful, the inhalation of combusted tobacco may produce unwanted health effects.

[0003] One way of avoiding inhaling combustion products is to heat the tobacco, without combustion, to a temperature sufficient to drive off its volatile compounds. Prior art devices, often referred to as “vaporizers,” commonly employ a continuous heating source such as a butane-powered flame, a butane powered catalytic burner, or an electrical resistive heater. The heat source in many such devices is in conductive contact with the tobacco or the receptacle containing the tobacco. This may result in high temperatures, leading to singing and charring of the tobacco near the heat source.

[0004] Further, many prior art vaporizers require several minutes of heat-up time as they need to heat both the mass of the tobacco and a holder of the material to a desired temperature before they can extract volatile vapors.

[0005] Further, since the heating is typically continuous, rather than on-demand, many existing vaporizers use their power inefficiently as they are often providing heat to maintain a steady state of elevated temperature that does not correspond to the user’s intended duty-cycle of intermittent inhalation of the vapors produced.

DISCLOSURE OF INVENTION

[0006] One embodiment of the present invention overcomes the disadvantages of prior art by providing a vaporizer that entirely contains a material to be consumed.

[0007] Another embodiment of the present invention overcomes the disadvantages of prior art by providing a vaporizer having an upper portion that may be removably placed on a lower portion to contain tobacco. In one embodiment, the upper and lower portions are held in place with magnets.

[0008] Yet another embodiment of the present invention overcomes the disadvantages of prior art by providing an enclosed vaporizer having a window for viewing tobacco contained therein. In one embodiment, the window also allows the extracted vapor and glow from a heating element to be viewed.

[0009] One embodiment of the present invention overcomes the disadvantages of prior art by providing an enclosed vaporizer that allows the glow from a heating element to also be viewed through an air inlet.

[0010] Another embodiment of the present invention overcomes the disadvantages of prior art by providing a vaporizer having a heating element suspended in a transparent heating chamber that allows for the transmission of light generated by the heating element of the device.

[0011] Yet another embodiment of the present invention overcomes the disadvantages of prior art by providing an enclosed vaporizer having a heating element suspended in a transparent heating chamber that is integrated with and concentric to the material chamber.

[0012] One embodiment of the present invention includes a computer controlled temperature regulation system that allows for the proper vaporization temperature.

[0013] Another embodiment of the present invention includes a vaporizer having rechargeable battery that is removable by the user.

[0014] It is one aspect of the present invention to provide vaporizer to provide a user with a vapor from a botanical material, which may be tobacco. The vaporizer includes a housing; a heater substantially within the housing including an electrical energy storage device, a user-operable switch, a heating element, and an electrical circuit including the electrical energy storage device, the user-operable switch, and the heating element, where the electrical circuit is adapted to provide energy from the electrical energy storage device to the heating element when the user-operable switch is actuated. The vaporizer further includes a passageway with the housing, the passageway including an air inlet, a heater section to provide thermal contact with air within the heater and the heating element, a receptacle for containing tobacco, and an air

outlet. The user may thus actuate the user-operable switch and inhale through the outlet to draw air external to the vaporizer to sequentially, heat air in contact with the heating element to a heated air temperature, at least partially vaporize the botanical material with the heated air, then provide at least a portion of the vaporized tobacco through the outlet to the user.

[0015] It is another aspect of the present invention to provide a method of providing a vapor of a botanical material using a vaporizer. The method includes manually actuating the vaporizer, where the vaporizer includes stored electric energy, a receptacle for containing the botanical material, and a flow passageway extending from an inlet, through a manually actuatable heater to accept the stored electric energy and heat air, through the receptacle, to an outlet; and inhaling through the outlet. Air is thus drawn external to the vaporizer into the passageway and sequentially, has the air temperature increased in the heater, heats and extracts a vapor from the botanical material, and provides the vapor to the user.

[0016] It is yet another aspect of the present invention to provide a vaporizer to provide a user with a vapor from a botanical material. The vaporizer includes a heating element, and a passageway including an air inlet; a heater section to provide thermal contact with air within the heater and the heating element; a receptacle for containing a botanical material; a window to transmit thermal radiation from the heater section to the user, and an air outlet. The user has a visual cue that inhaled air may be heated to a temperature sufficient to vaporize the botanical material.

[0017] It is one aspect of the present invention to provide a method of providing a vapor of a botanical material using a vaporizer, where the method includes manually actuating the vaporizer, where the vaporizer includes a receptacle for containing the botanical material, and a flow passageway extending from an inlet, through a heater to heat air, through the receptacle, to an outlet, and a window to allow a user to view thermal radiation from the heater; and when a user perceives a glow from the heater through the window, inhaling through the outlet. The user thus has a visual cue that inhaled air may be heated to a temperature sufficient to vaporize the botanical material.

[0018] These features together with the various ancillary provisions and features which will become apparent to those skilled in the art from the following detailed description, are attained by the vaporizer of the present invention, preferred embodiments thereof being shown with reference to the accompanying drawings, by way of example only, wherein:

BRIEF DESCRIPTION OF DRAWINGS

- [0019] FIG. 1 is a top perspective view of one embodiment of a vaporizer;
- [0020] FIG. 2 is a top view of the vaporizer of FIG. 1;
- [0021] FIG. 3 is a left side view of the vaporizer of FIG. 1;
- [0022] FIG. 4 is a distal end view of the vaporizer of FIG. 1;
- [0023] FIG. 5 is a proximal end view of the vaporizer of FIG. 1
- [0024] FIG. 6 is a top perspective view of the vaporizer of FIG. 1 with the upper portion removed from the lower portion;
- [0025] FIG. 7 is a sectional view 7-7 of FIG. 2;
- [0026] FIG. 8 is a sectional view 8-8 of FIG. 3;
- [0027] FIG. 9 is an exploded view of one embodiment of a heater block;
- [0028] FIG. 10 is a perspective view of a partially assembled heater block;
- [0029] FIG. 11 is the view of FIG. 6 illustrating air flow through the vaporizer;
- [0030] FIG. 12 is a cut-away perspective sectional view of the embodiment of FIG. 11; and
- [0031] FIG. 13 is a schematic view of one embodiment of the electronics within the vaporizer.
- [0032] Reference symbols are used in the Figures to indicate certain components, aspects or features shown therein, with reference symbols common to more than one Figure indicating like components, aspects or features shown therein.

MODES FOR CARRYING OUT THE INVENTION

- [0033] Figure 1 is a top perspective view of one embodiment of a hand-held vaporizer **100**, and Figures 2, 3, 4, and 5 are, respectively, views of a top side **106**, a left side **202**, a distal end **104**, and a proximal end **102** of the vaporizer.
- [0034] Vaporizer **100** includes a housing **101** having a mouthpiece **103** with an opening **311** into the vaporizer at proximal end **102**, an air inlet **105** at distal end **104**, and a window **107** on

top side **106** through which one can view material placed within the vaporizer, and a push-button switch **109** on a right side **108**. Left side **202** includes a power switch **201**, a power connector **305**, indicator lights **307**, and a recess **309**. The material to be vaporized forms may be, but is not limited to, a botanical material, such as tobacco, and is referred to herein and without limitation as tobacco.

[0035] Housing **101** is formed from a rigid material, and may include one or more pieces or layers of metal or plastic. Thus, for example, sides **108**, **202**, and ends **102**, **104** include a case **207** and a removable bottom panel **303**, and top side **106** includes an elongated portion **205** and a bezel **203** protruding above and surrounding window **107**.

[0036] Window **107** is preferably a scratch resistant material that is transparent to visible light, and may be, for example and without limitation, a glass, such as a borosilicate glass or a crystal quartz or fused quartz material.

[0037] Vaporizer **100** is preferably sized to be hand-held, and may have dimensions of a height, **H**, of from 20 to 30 mm, such as height **H** of 25 mm, a length, **L**, of from 110 to 170 mm, such as a length **L** of 140 mm, and a width, **W**, of from 40 mm to 60 mm, such as a width of 50 mm.

[0038] Indicator lights **307** may include one light, or several different color lights (such as red, green, and/or blue) to indicate if vaporizer **100** is being powered, temperature settings, and/or battery power remaining in the vaporizer.

[0039] In general, a user may open housing **101** utilizing recess **309** and tobacco below window **107**, grasp case **207**, and push push-button switch **109**. In certain embodiments, within several seconds of pushing push-button switch **109** a heater (describe subsequently) within vaporizer **100** emits visible light through window **107** and through air inlet **105** to indicate that a proper vaporizing temperature has been reached and that the user should inhale through opening **311** in mouthpiece **103**. The action of inhaling causes air to be drawn in through air inlet **105** where it is first heated in the heater and then vaporizes the tobacco, the vapors of which are inhaled by the user through the mouthpiece. In addition, power switch **201** may include several settings, such as a power off setting, a low power setting and a high temperature setting for controlling a temperature of vaporizer **100**, and power connector **305** allows for recharging of an internal battery.

[0040] Figure 6 as a top perspective view of vaporizer 100 illustrating that the vaporizer includes an upper portion 210 and a lower portion 220. Upper portion 210 includes elongated portion 205, bezel 203, and window 107. In addition, elongated portion 205 forms surfaces 611, lip 613, recess 615, and includes magnets 621 and a window fixture 631. Window fixture 631 further includes include flat surfaces 633 and grooves 635, and is held onto elongated portion 205 with screws 637, as shown in more detail in FIG. 7.

[0041] Lower portion 220 includes case 207, bottom panel 303, mouthpiece 103, air inlet 105, push-button switch 109, power switch 201, power connector 305, indicator lights 307, and recess 309. As shown in FIG. 7, air inlet 105 is formed from a grill 703 that may be separate from case 207, and a wire mesh 705 to prevent contaminants from entering vaporizer 100. In addition, lower portion 220 includes a surface 601 and a ledge 603. Surface 601 includes openings into the interior of the housing, and specifically a first opening 607 and a second opening 605 exposing a recessed bowl 640 having an upper surface 604, which is contiguous with surface 601 and a bottom mesh 717.

[0042] Surface 601 is, or includes, a material that is attracted to magnets 621. When upper portion 210 is placed on lower portion 220, as in FIG. 1, magnets 621 are attracted to a top 601 such that lip 613 contacts ledge 603, surfaces 611 contact surface 601, surfaces 601 and 604 contact surface 633, and recess 615 and grooves 635 do not contact either surface 601 or 604, providing a gap that provides for air flow between opening 605 and 607.

[0043] A more detailed description of one embodiment of upper portion 210 and lower portion 220 are illustratively shown in Figure 7, which is a sectional view 7-7 of FIG. 2, and Figure 8, which is a sectional view 8-8 of FIG. 3.

[0044] Upper portion 210 includes window fixture 631, which is attached to elongated portion 205 with screws 637. Window fixture may also include gaskets or O-rings to provide a gas-tight seal for window 107.

[0045] Surface 601 of lower portion 220 is held onto case 207 using screws 701. Grill 703 forming air inlet 105 is attached to case 207, and a wire mesh 705 is placed against grill 703 and inside vaporizer 100 to prevent contaminants from entering the vaporizer.

[0046] Lower portion 220 also includes a heater section 710, control electronics 720, and an energy storage section 730. Heater section 710 further includes a heater block 711 including a lower core 702 and upper core 704 that form having a passageway 713 including a heating

element 715, and bowl 640 having a mesh 717 bottom, bowl sides 719, opening 605, a temperature sensor, as shown and discussed subsequently.

[0047] In one embodiment, heating element 715 is a resistive coil, such as nickel-chromium alloys such as NICHROME™, INCONEL™, or a FeCrAl alloy, such as KANTHAL™, and cores 702 and 704 are transparent to visible light, and may be constructed, for example, from borosilicate glass, crystal quartz or fused quartz. Thus when power is dissipated within heating element 715, a glow may be visible through window 107 and/or air inlet 105.

[0048] Control electronics 720 includes a circuit board 723 on which are mounted a programmable processor 725, a power controller 727, and other digital and/or analogue circuitry for controlling and powering vaporizer 100, such as power switch 201, power connector 305, and indicator lights 307. In addition, other switches, buttons, and sensors, such as temperature sensors, may be dispersed throughout vaporizer 100 and may be wired into control electronics 720. Energy storage section 730 includes a battery frame 733 attached to case 207 and battery 731.

[0049] In one embodiment, battery 731 is a 7.4 V, 800 mAh battery with a discharge rate of 7 C.

[0050] Figure 9 is an exploded view of heater block 711, which includes a bottom heat transfer mat 910, a lower core 920, a middle heat transfer mat 930, power and control components 940, an upper core 950, and a top heat transfer mat 960. Lower core 920 and upper core 950 may be, for example and without limitation, lower core 702 and upper core 704, respectively.

[0051] Lower mat 910 includes an opening 911 and a slot 913. Lower core 920 includes an opening 921 that is positioned above slot 913, a groove 922, a heating element support 923, a circular recess 934 with a central mesh support 925, a temperature sensor receptacle 927, and element ground receptacle 926 and a heating element power receptacle 928. Middle heat transfer mat 930 includes an outer portion 931 and an inner portion 935 that supports mesh 717.

[0052] Power and control components 940 include heating element 715 attached to a compression fitting 945 connected to a ground wire 947, and to a compression fitting 943 connected to a power lead 949, and a temperature sensor 942. Upper core 950 includes opening 605 and bowl sides 719. Top heat transfer mat 960 includes an opening 961.

[0053] Mats 910, 930, and 950 are preferably formed from a high-temperature food-safe silicone rubber. Lower core 920 and upper core 950 are preferable formed from borosilicate glass or quartz crystal. Mesh 717 is preferably formed from stainless steel. Temperatures sensor 942 is preferably a glass-coated thermistor, such as a model G100K4000C1 manufactured by Measurement Specialties Inc., of Hampton, VA.

[0054] Figure 10 is a perspective view of a partially assembled heater block 711. As shown in FIG. 10, upper core 950 also includes a groove 1001, a heating element support 1003, a heating element power receptacle 1005, a heating element ground receptacle 1003, and a temperature sensor receptacle 1009. Heating element 715 is placed with grooves 922 and 1001, and is supported midway by heating element supports 923 and 1003, compression fitting 945 is sandwiched between receptacles 926 and 1007, and compression fitting 943 sandwiched between receptacles 928 and 1005. When assembled, passageway 713 is formed by mated grooves 922 and 1001. In addition, temperature sensor 942 is sandwiched between temperature sensor receptacles 927 and 1009 such that the temperature of a gas may be sensed near mesh 717.

[0055] The operation of vaporizer 100 will now be discussed with reference to Figure 11, which is the view of FIG. 6 illustrating air flow through the vaporizer, Figure 12, which is a cut-away perspective sectional view of the embodiment of FIG. 1, and Figure 13, which is a schematic view of one embodiment of the electronics within the vaporizer.

[0056] Figures 11 and 12 illustrate the placement of tobacco M within bowl 640, and the flow of air and vapors through vaporizer 100. Specifically, FIG. 11 shows upper portion 210 removed from lower portion 220. This configuration provides access to bowl 640 for cleaning and placing fresh a fresh tobacco M and to clean otherwise internal surfaces 601 and 611, recess 615 and window fixture 631.

[0057] When upper portion 210 and lower portion 220 are assembled, as in FIG. 1, recesses 615 and 635 form an air passage between bowl 640 and opening 607. Specifically, FIG. 11 illustrates portions of surfaces 601 and 604 which contact surfaces 611 and 633 (shown as 601a), restriction or prohibiting air flow, while other portions of surfaces 601 and 604 do not contact recesses 615 or 635 (shown as surface 601b) and thus provide an air flow passageway. Thus, as illustrated with arrows, air flow is shown an entering air inlet 105, moving up through bowl 640 and opening 605, between upper portion 210 and lower portion 220 along surfaces 601b, down through opening 607, and then through opening 501.

[0058] FIG. 12 illustrates the flow of air from air inlet 105 through bowl 640. Air is drawn through opening 911, along slot 913, up through opening 921, through passageway 713, where the air is heated by contact with heating element 715, up through mesh 717 into bowl 640, along surface 601 to opening 607 and through opening 311 of mouthpiece 103.

[0059] FIG. 13 is a schematic 1300 illustrating control electronics 720 of vaporizer 100. Thus, for example and without limitation, schematic 1300 shows connections between power switch 201, push-button switch 109, indicator lights 307, battery 731, programmable processor 725, power controller 727, temperature sensor 942, and heating element 715.

[0060] In addition to providing temperature control for the process of vaporizing tobacco, control electronics 720 may also prevent the vaporizer body and internal components from overheating and causing damage to the battery, computer, or other internal components.

[0061] Processor 725 is powered from battery 731 and is programmed to accept input from power switch 201, push-button switch 109 and temperature sensor 942, provide power to one or more indicator lights 307, and provide a signal to power controller 727. Power controller 727 accepts command signals from processor 725 to provide power from battery 731 to heating element 715.

[0062] Power switch 201 may have 2 or more settings, such as an “off” setting, and an “on” setting, or an “off” setting, a “low temperature” setting and a “high temperature” setting. With power switch 201 in the “off” setting, all electronics in vaporizer 100 are powered off. With power switch 201 in an “on,” “low temperature” or “high temperature” setting, processor 725 has a corresponding stored on temperature (TON), low temperature (TL) or high temperature (TH) which are target temperatures for controlling a temperature measured by temperature sensor 942. As described above, temperature sensor 942 measures the air temperature just before the heated air flows through bowl 640.

[0063] Indicator lights 307 may include lights that are programmed to provide an indication of the operation of vaporizer 100. Thus, for example and without limitation, indicator lights 307 may include a dim green light that is powered to indicate that vaporizer 100 is powered on in a low temperature setting, a bright green light that is powered to indicate that the vaporizer is powered in a high temperature setting, blinking blue light to indicate that the vaporizer is charging, a red light to indicate that battery power is low, and a solid red light to indicate the device is overheated and has been automatically shut down.

[0064] In addition, with power switch **201** in an “on,” “low temperature” or “high temperature” setting, and with push-button switch **109** pressed, processor **725** provides signals to power controller **727** to provide electric power from battery **731** to heating element **715**. In certain embodiments, processor **725** uses a control algorithm, such as a PID control algorithm, to power heating element **715** such that the temperature, T, measured by temperature sensor **942** is maintained at the temperature indicated by power switch **201**.

[0065] It is understood that the operation of vaporizer **100** may be optimized according to a desired vaporization temperature. Thus, the target temperature of temperature sensor **942** is selected to effectively drive off volatiles from tobacco, or other botanical materials of interest. While not meant to limit the use of the present invention, the Table I contains effective vaporization temperatures of some botanical materials, grouped as having low, medium, or high vaporization temperatures. These groups are for reference only, and it is seen that each material may have a range of vaporization temperatures, which may span different groups. Thus, for example, tobacco spans the low, medium, and high range, due to number and type of volatile substances found in tobacco. Vaporizer **100** allows the user to control how the biological material is vaporized according to the temperature setting of vaporizer **100**.

LOW TEMPERATURE: 100 °C 150 °C

Name	Scientific Name	Plant Part	Vaporization Temp.
Eucalyptus	Eucalyptus globulus	Leaves	130 °C
Clove:	Syzygium Aromaticum	Dried Flower Buds	123 °C to 150 °C
Lavender	Lavendula angustifolia	Leaves	100 °C to 130 °C
Lemon balm	Melissa officinalis	Leaves	142°C
Sage:	Salvia Officinalis	Leaves	125 °C to 150 °C
Thyme:	Thymus Vulgaris	Herb	100 °C to 150 °C

MEDIUM TEMPERATURE: 150 °C-175 °C

Name	Scientific Name	Plant Part	Vaporization Temp.
Hops	Humulus lupulus	Cone	154°C
Ginkgo:	Ginkgo Biloba	Leaves, Seeds	125 °C to 175 °C

HIGH TEMPERATURE: 175 °C- 200 °C

Name	Scientific Name	Plant Part	Vaporization Temp.
Tobacco:	Nicotiana Tabacum	Leaf	125 °C to 200 °C
Camomile	Matriarca chamomilla	Flowers	190 °C
Sage	Salvia officinalis	Leaves	190 °C
Thyme	Thymus vulgaris	Herb	190 °C
Aloe Vera:	Aloe Vera	Gelatinous	175 °C to 200 °C
		From Leaves	175 °C to 200 °C
Garlic:			175 °C to 200 °C
Ginger			175 °C to 200 °C
Ginseng:			175 °C to 200 °C
Licorice:			175 °C to 200 °C

Table I. Vaporization Temperature of Common Botanical Materials

[0066] In general, the target temperature as measured by temperature sensor 942 is in the range of from 145 °C to 205 °C, and may be, for example and without limitation, be approximately 145 °C, 150 °C, 155 °C, 160 °C, 165 °C, 170 °C, 175 °C, 180 °C, 185 °C, 195 °C, 200 °C or 205 °C. For multiple temperature settings, such as a “low temperature” and “high temperatures,” the low temperature setting maybe suitable for vaporizing low temperature volatiles such as tobacco and have a temperature in the range of from 150 °C to 165 °C, with a value, for example of 150 °C, 155 °C, 160 °C, or 165 °C. The high temperature setting maybe suitable for vaporizing higher temperature volatiles, such as ginseng, and have a temperature of 190 °C to 205 °C, with a value, for example of 190 °C, 195 °C, 200 °C, or 205 °C.

EXAMPLES OF THE USE OF THE VAPORIZER

[0067] The following are examples of the user of vaporizer 100. With reference to FIGS. 1 and 3, with power switch 201 in an “off position,” a user grasps lower portion 220 in one hand and places their thumb in recess 309 to remove upper portion 210. With reference to FIG. 6, a

user may then clean the various internal surfaces and bowl 640, and place a fresh sample of a botanical material in the bowl. Upper portion 210 may then be securely placed on top of lower portion 220.

[0068] As shown in FIGS. 6 and 7, a user may, at any time, look through window 107 to verify the presence of a botanical material.

[0069] Next, the user switches power switch 201 to an appropriate non “off” setting (such as “on,” “low temperature,” or “high temperature”).

[0070] Next, the user presses push-button switch 109. Within a few seconds, control electronics 720 has provided sufficient power to raise the air near temperature sensor 942 to the target temperature, as stored within processor 725. The glow from heating element 715 may be seen by the user through window 107 and/or through air inlet 105. For certain botanical materials the extracted vapor may also be viewed through window 107.

[0071] With the visible indication of a proper temperature, the user may then inhale through mouthpiece 103. Air is then drawn into air inlet 105, through passageway 713, through the botanical material in bowl 640, between grooves 635 and surface 601, along surface 601 into opening 607, and then through opening 311 to the user’s mouth.

[0072] The majority of power provided to heating element 715 heats air within passageway 713, and thus the botanical material within bowl 640 is vaporized convectively as the hot air flows through the botanical material.

[0073] The surfaces which contact the heated air as it flows between surface 601 and upper portion 210 will act as a “heat sink,” causing the gases to cool from high temperature of heating element 715 to approximately room temperature. After inhaling, the user then releases push-button switch 109, which reduces the power though heating element 715.

[0074] It will be understood that the apparatus described herein includes, but is not limited to, certain digital and analog components. It will be understood that the invention is not limited to any particular implementation, programming technique, or combination of analog or digital components, and that the invention may be implemented using any appropriate devices or techniques for implementing the functionality described herein.

[0075] Reference throughout this specification to “one embodiment,” “an embodiment,” or “certain embodiments” means that a particular feature, structure or characteristic described in

connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment,” “in an embodiment,” or “in certain embodiments” in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

[0076] It is to be understood that the invention includes all of the different combinations embodied herein. Throughout this specification, the term “comprising” shall be synonymous with “including,” “containing,” or “characterized by,” is inclusive or open-ended and does not exclude additional, unrecited elements or method steps. “Comprising” is a term of art which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the statement. “Comprising” leaves open for the inclusion of unspecified ingredients even in major amounts.

[0077] Similarly, it should be appreciated that in the above description of exemplary embodiments of the invention, various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the Detailed Description are hereby expressly incorporated into this Detailed Description, with each claim standing on its own as a separate embodiment of this invention.

[0078] Thus, while there has been described what is believed to be the preferred embodiments of the invention, those skilled in the art will recognize that other and further modifications may be made thereto without departing from the spirit of the invention, and it is intended to claim all such changes and modifications as fall within the scope of the invention.

WE CLAIM:

1. A vaporizer to provide a user with a vapor from a botanical material, said vaporizer comprising:
 - a housing;
 - a heater substantially within said housing including an electrical energy storage device, a user-operable switch, a heating element, and an electrical circuit including said electrical energy storage device, said user-operable switch, and said heating element, where said electrical circuit is adapted to provide energy from the electrical energy storage device to said heating element when said user-operable switch is actuated; and
 - a passageway with said housing, said passageway including an air inlet, a heater section to provide thermal contact with air within said heater and said heating element, a receptacle for containing a botanical material, and an air outlet,
 - such that the user may actuate said user-operable switch and inhale through said outlet to draw air external to said vaporizer to sequentially, heat air in contact with said heating element to a heated air temperature, at least partially vaporize the botanical material with the heated air, then provide at least a portion of the vaporized botanical material through said outlet to the user.
2. The vaporizer of Claim 1, wherein the botanical material is tobacco.
3. The vaporizer of Claim 1,
 - where said heater further includes a sensor to provide an indication of the temperature within the vaporizer,
 - where said electrical circuit further includes said sensor, and
 - where said electrical circuit is adapted to provide energy from said electrical energy storage device to said heating element according to said indication of the temperature within the vaporizer.
4. The vaporizer of Claim 1, where said heating element is disposed about an edge of said receptacle.
5. The vaporizer of Claim 1, where at least a portion of the heater section is transparent to at least a portion of visible light, such that a portion of the glow of the heating element is transmitted through said heater section.
6. The vaporizer of Claim 1, where the glow of the heating element is visible through said housing.
7. The vaporizer of Claim 6, where said housing includes a window disposed adjacent to said receptacle, and where the glow of the heating element is visible through said window.

8. The vaporizer of Claim 6, where the glow of the heating element is visible through said air inlet.
9. The vaporizer of Claim 2,
 - where said heater further includes a user-operable power level switch,
 - where said electrical circuit further includes said user-operable power level switch, and
 - where said electrical circuit is adapted to provide energy from said electrical energy storage device to said heating element according to said indication of the temperature within the vaporizer and a setting of said user-operable power level switch.
10. The vaporizer of Claim 9, where said electrical circuit is adapted to limit the maximum temperature as determined by said sensor and said user-operable power level switch.
11. The vaporizer of Claim 2, where said electrical circuit is adapted to limit the maximum temperature as determined by said sensor.
12. A method of providing a vapor of a botanical material using a vaporizer, said method comprising:
 - manually actuating the vaporizer, where said where said vaporizer includes stored electric energy, a receptacle for containing the botanical material, and a flow passageway extending from an inlet, through a manually actuable heater to accept the stored electric energy and heat air, through the receptacle, to an outlet; and
 - inhaling through the outlet,
 - such that air is drawn external to the vaporizer into the passageway and sequentially, has the air temperature increased in the heater, heats and extract a vapor from the botanical material, and provides the vapor to the user.
13. The method of Claim 12, further comprising manually selecting a heater temperature setting.
14. The method of Claim 12, where the botanical material is tobacco.

15. A vaporizer to provide a user with a vapor from a botanical material, said vaporizer comprising:

a heating element, and

a passageway including

an air inlet;

a heater section to provide thermal contact with air within said heater and said heating element;

a receptacle for containing a botanical material;

a window to transmit thermal radiation from the heater section to the user;

and

an air outlet,

such that the user has a visual cue that inhaled air may be heated to a temperature sufficient to vaporize the botanical material.

16. The vaporizer of Claim 15, where said vaporizer further includes:

an electrical energy storage device,

a user-operable switch,

a heating element, and

an electrical circuit including said electrical energy storage device, said user-operable switch, and said heating element,

where said heater further includes a sensor to provide an indication of the temperature within the vaporizer,

where said electrical circuit further includes said sensor, and

where said electrical circuit is adapted to provide energy from said electrical energy storage device to said heating element according to said indication of the temperature within the vaporizer.

17. The vaporizer of Claim 15, where said electrical circuit is adapted to limit the maximum temperature as determined by said sensor.

18. The vaporizer of Claim 15, where said heating element is disposed about an edge of said receptacle.

19. The vaporizer of Claim 15, where at least a portion of the heater section is transparent to at least a portion of visible light, such that a portion of the glow of the heating element is transmitted through said heater section.

20. The vaporizer of Claim 15, where the glow of the heating element is visible to a user of the vaporizer.

21. The vaporizer of Claim 20, where said vaporizer includes a window disposed adjacent to said receptacle, and where the glow of the heating element is visible through said window.
22. The vaporizer of Claim 21, where the glow of the heating element is visible through said air inlet.
23. The vaporizer of Claim 15,
 - where said heater further includes a user-operable power level switch,
 - where said electrical circuit further includes said user-operable power level switch, and
 - where said electrical circuit is adapted to provide energy from said electrical energy storage device to said heating element according to said indication of the temperature within the vaporizer and a setting of said user-operable power level switch.
24. The vaporizer of Claim 15, wherein said botanical material is tobacco.
25. A method of providing a vapor of a botanical material using a vaporizer, said method comprising:
 - manually actuating the vaporizer, where said vaporizer includes a receptacle for containing the botanical material, and a flow passageway extending from an inlet, through a heater to heat air, through the receptacle, to an outlet, and a window to allow a user to view thermal radiation from said heater; and
 - when a user perceives a glow from the heater through the window, inhaling through the outlet,
 - such that the user has a visual cue that inhaled air may be heated to a temperature sufficient to vaporize the botanical material.
26. The method of Claim 25, further comprising manually selecting a heater temperature setting.
27. The method of Claim 25, further comprising providing tobacco to said receptacle.
28. A device substantially as shown and described.
29. A method substantially as shown and described.

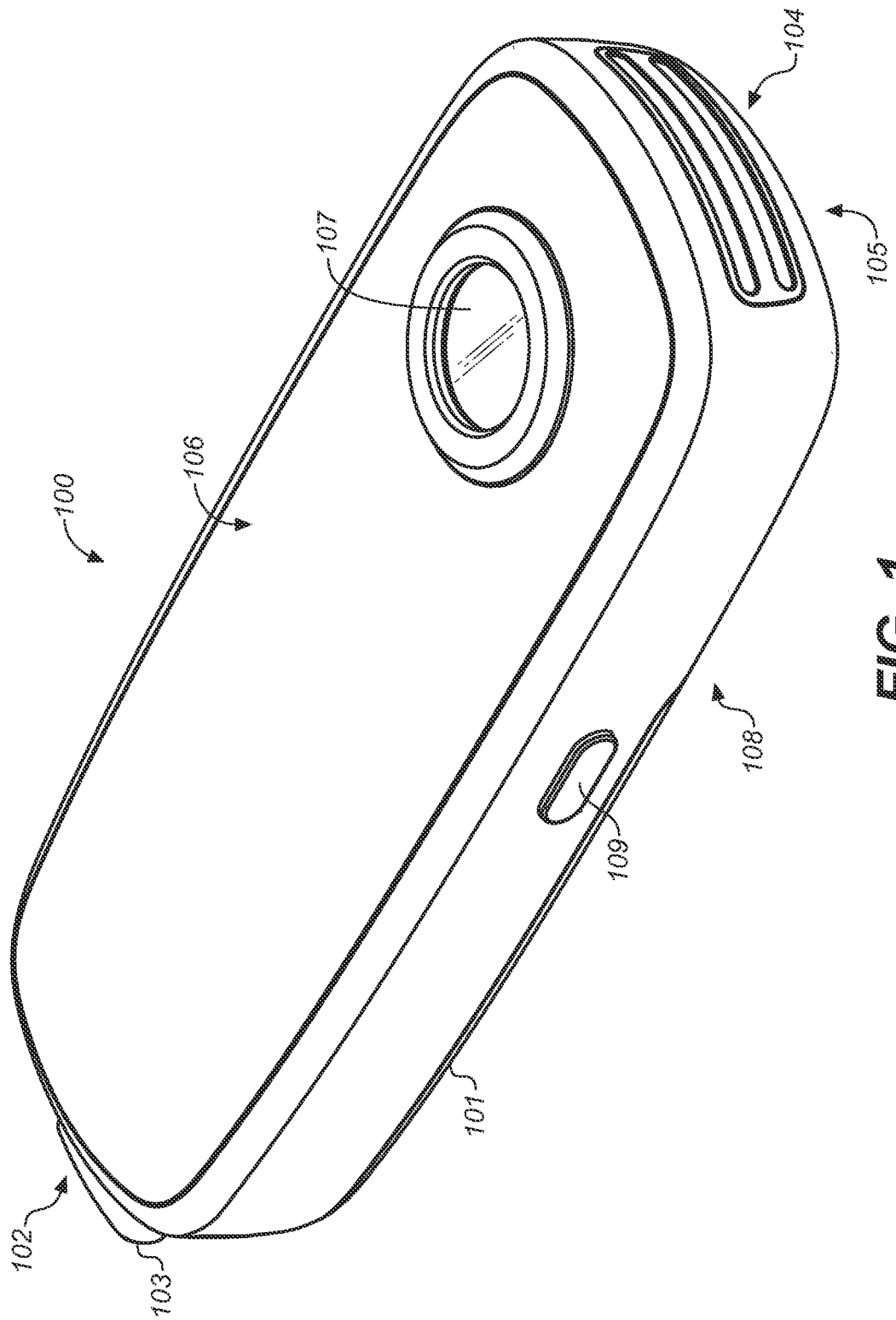


FIG. 1

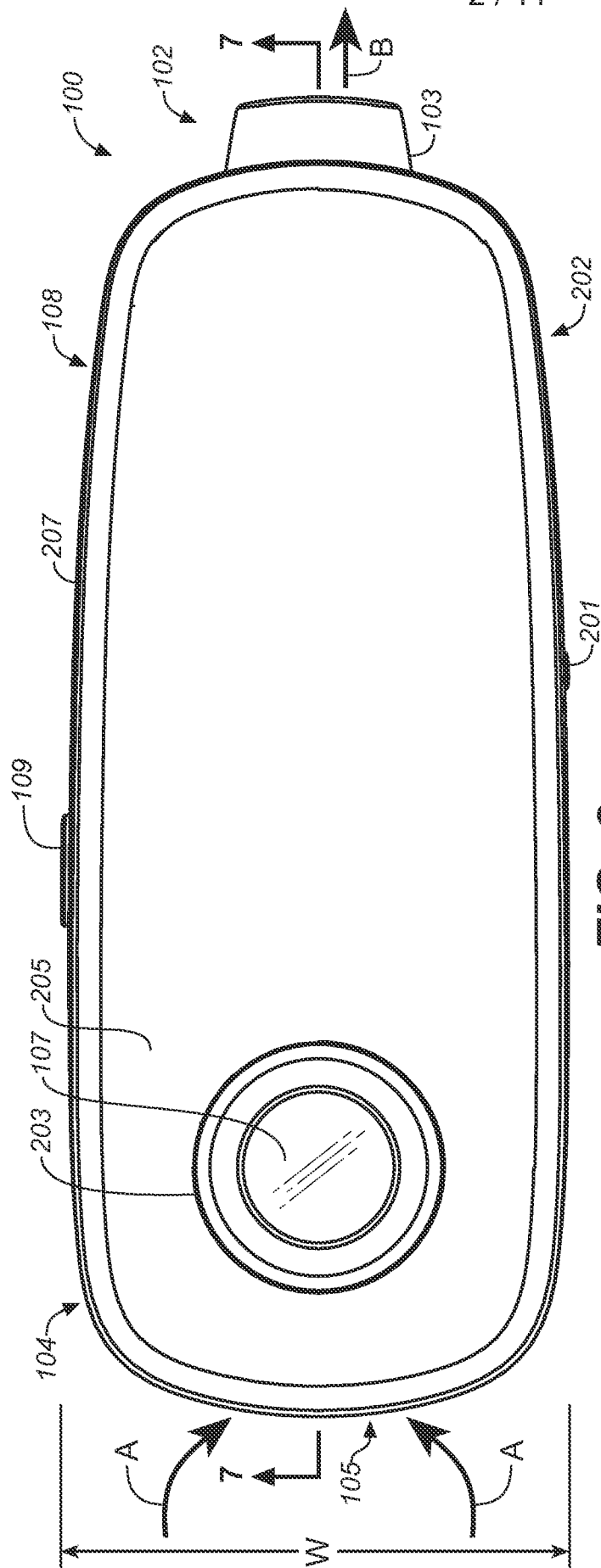
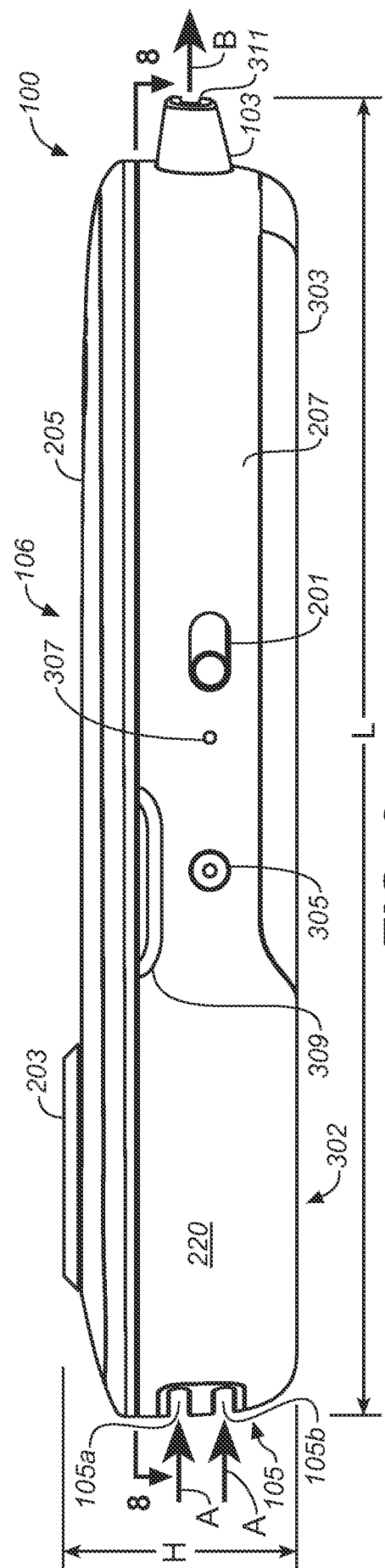
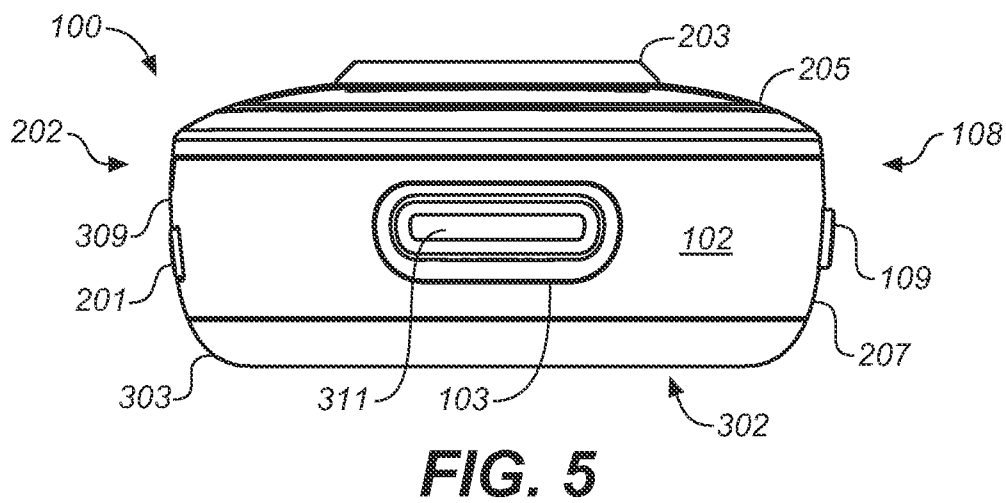
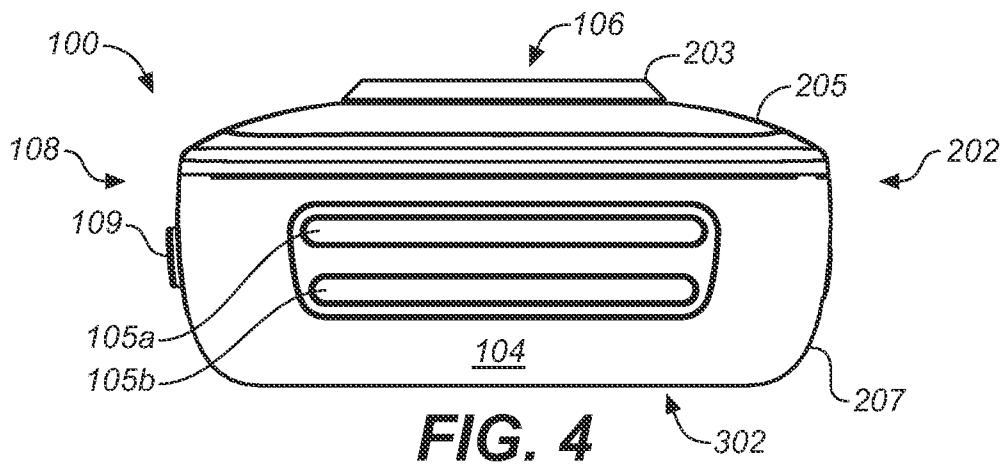


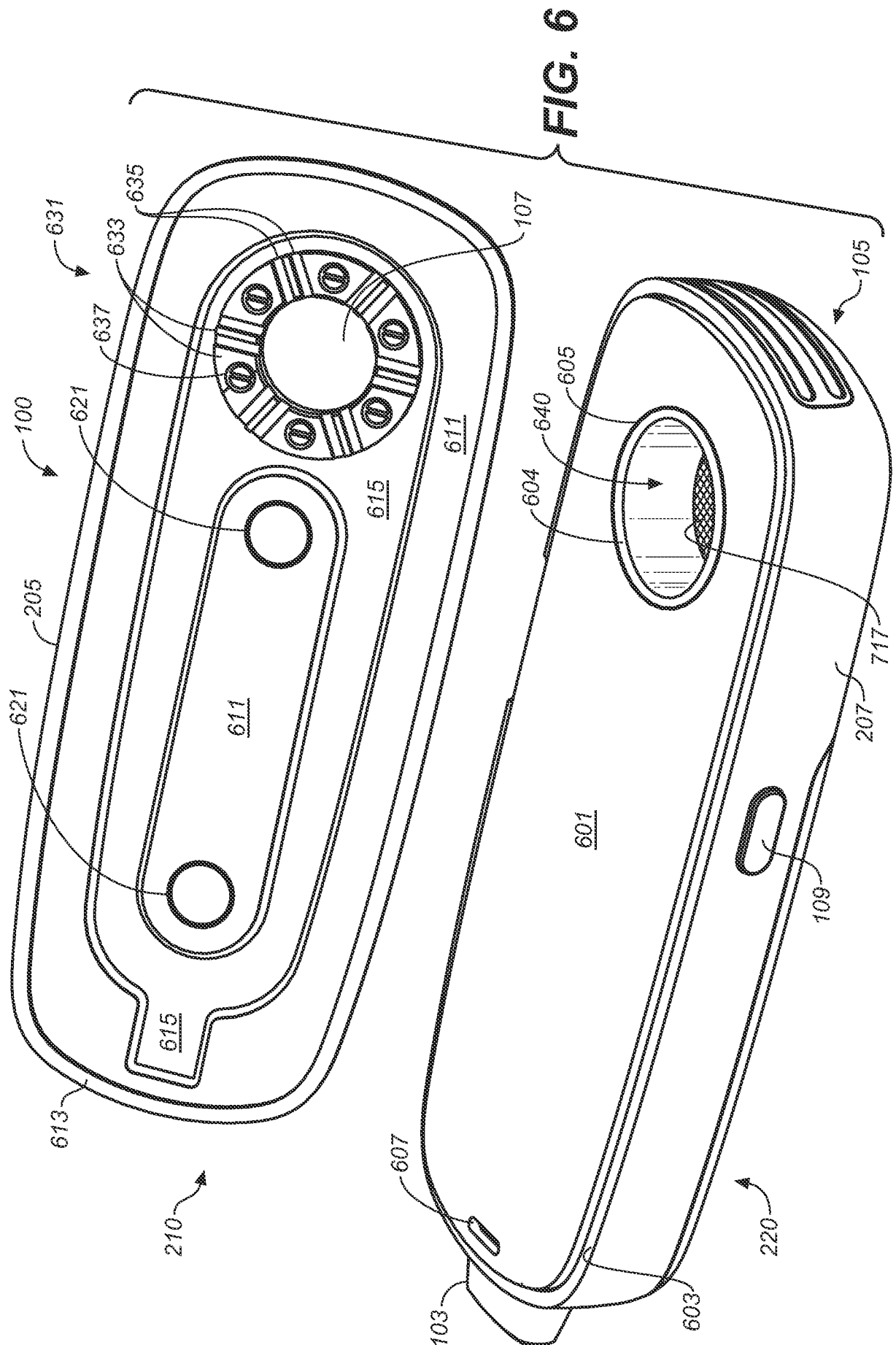
FIG. 2

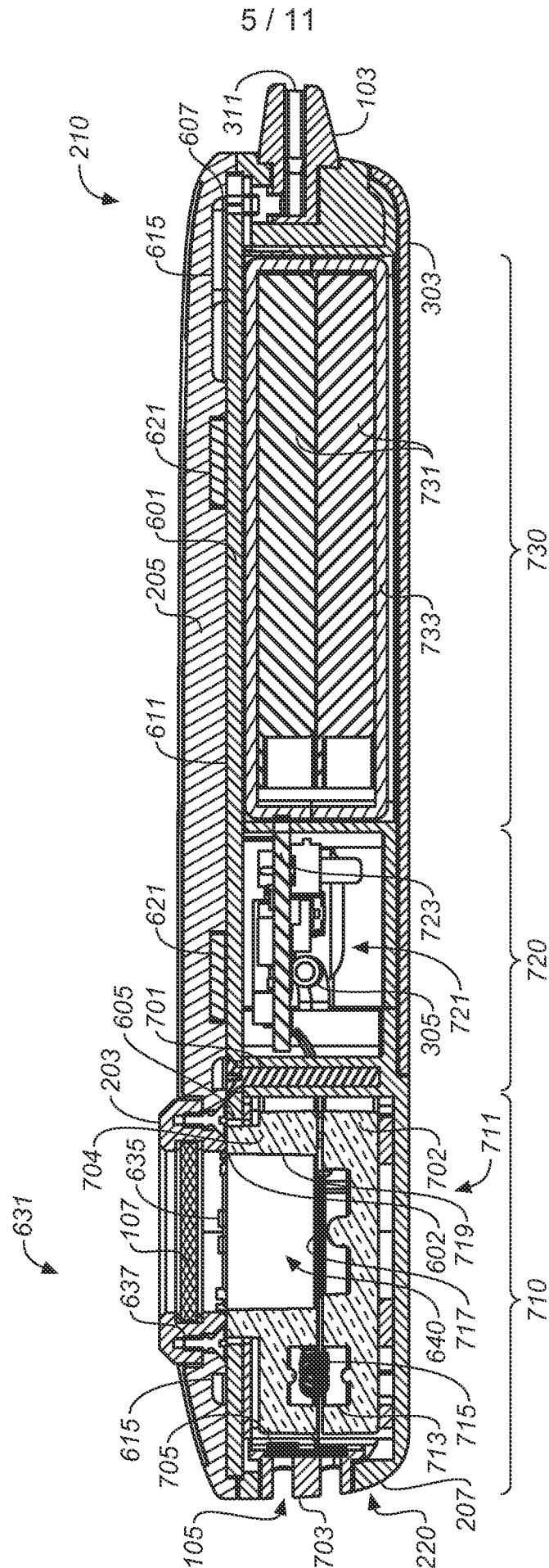


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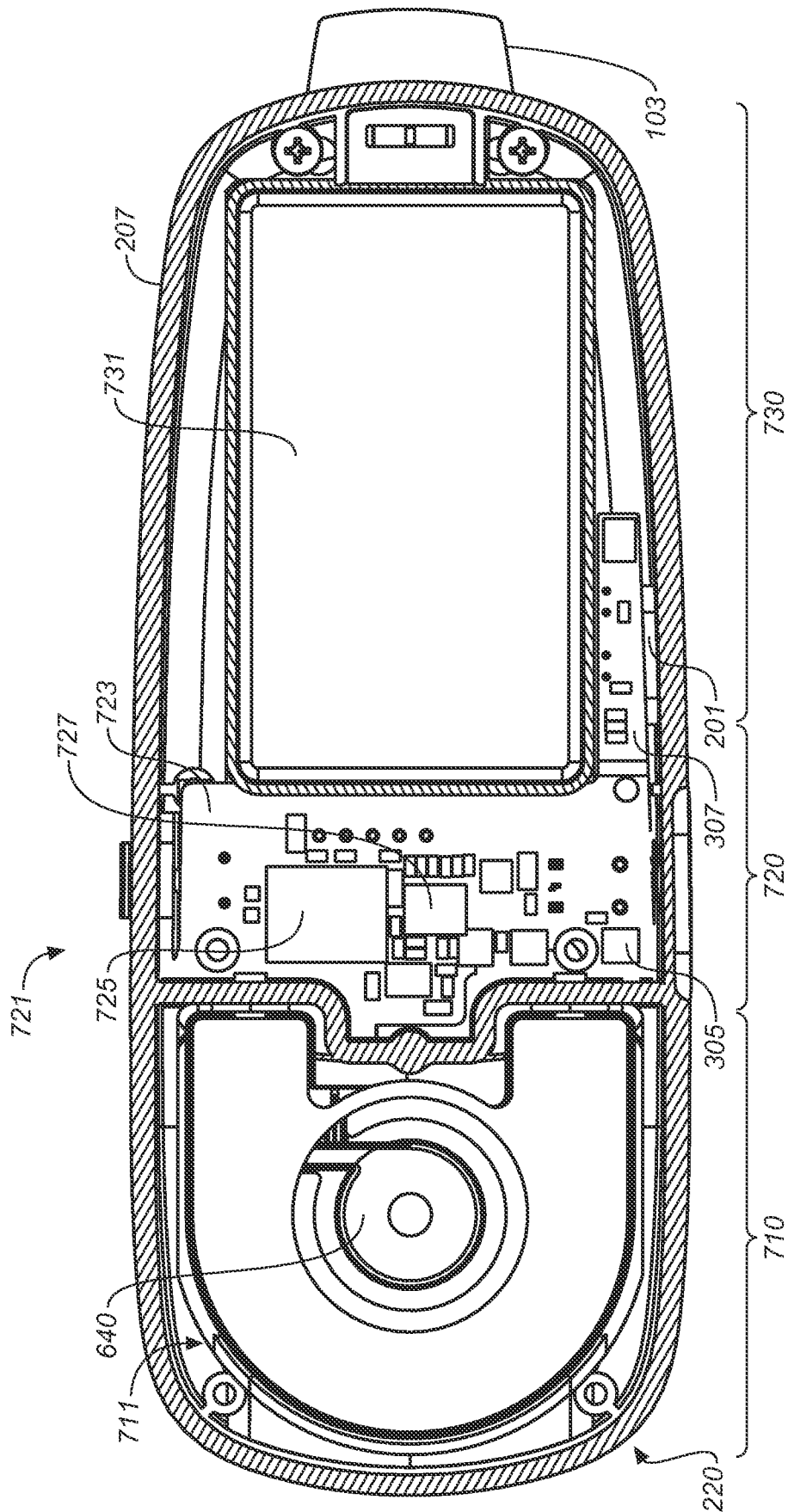
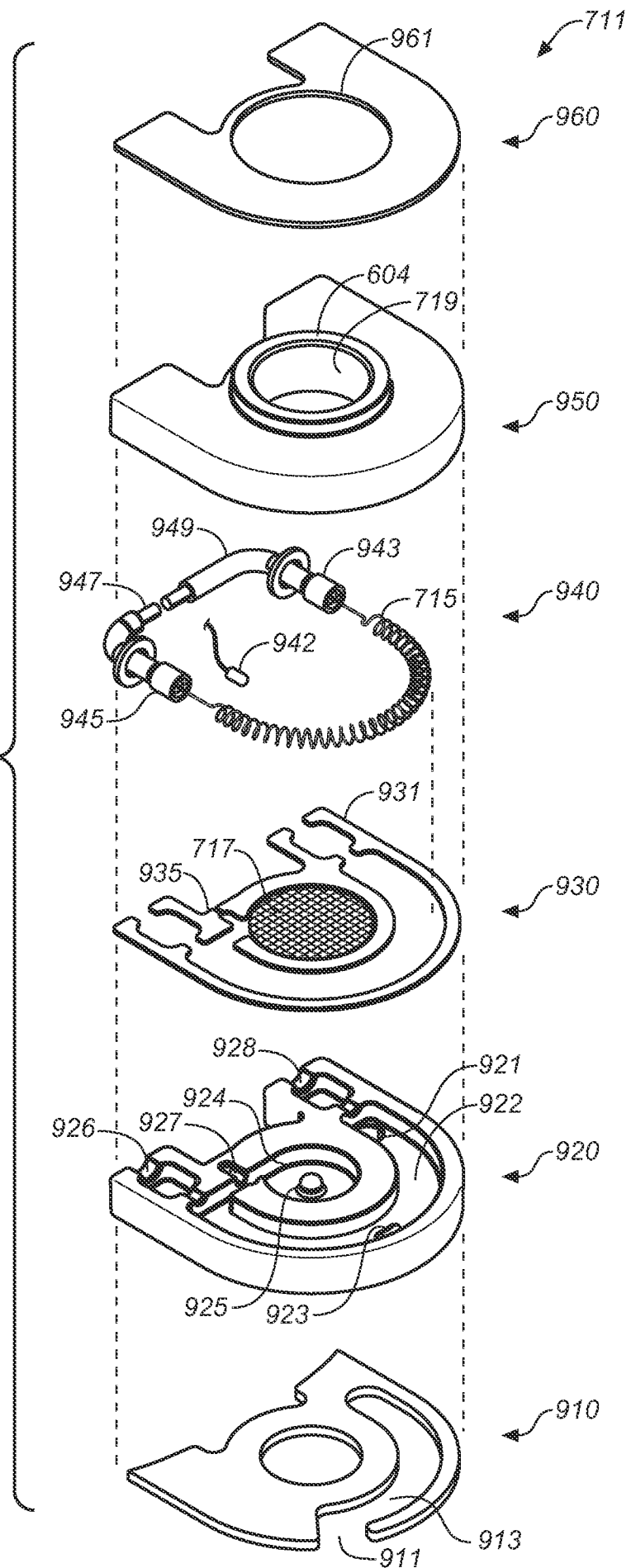


FIG. 8

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FIG. 9



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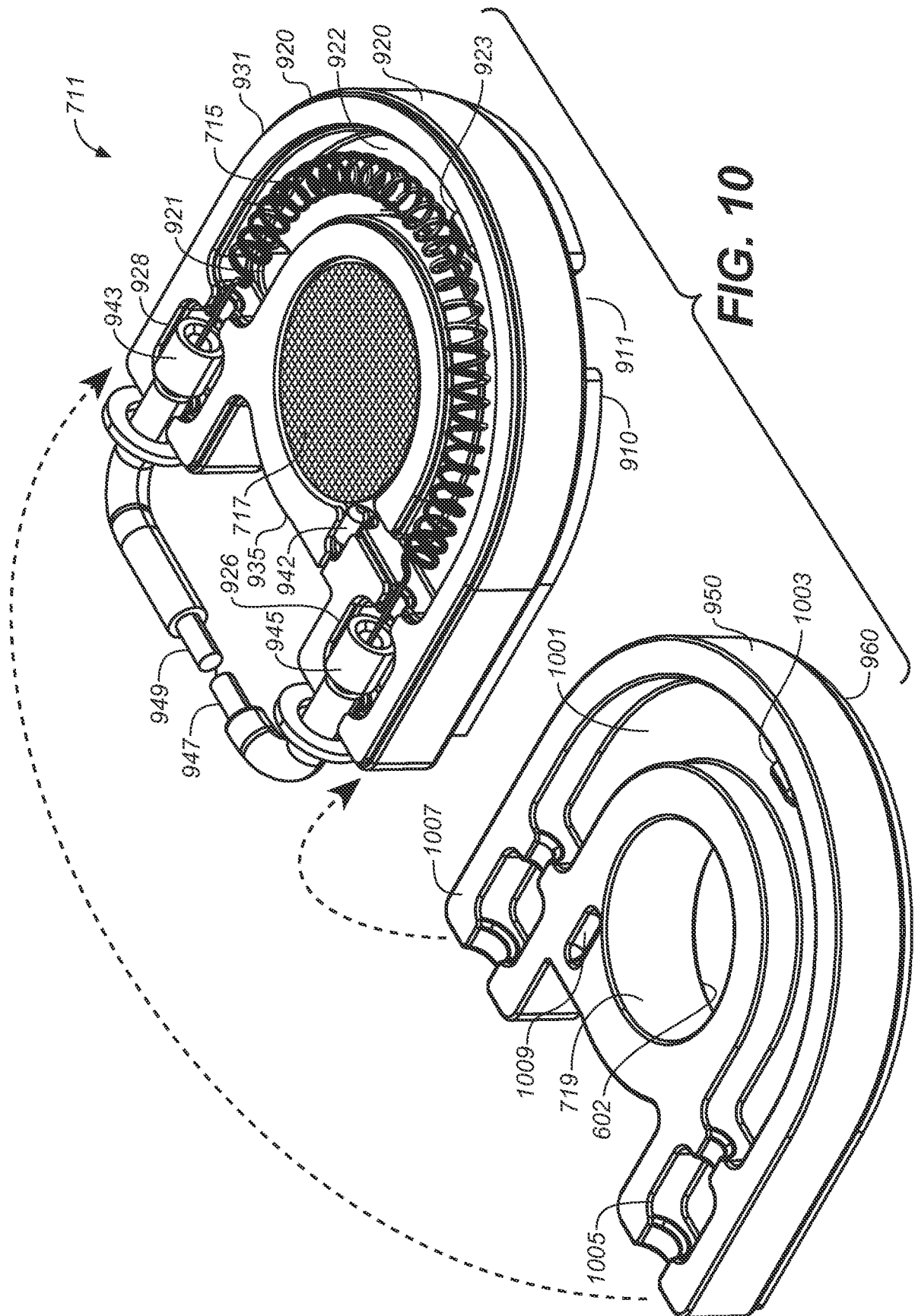
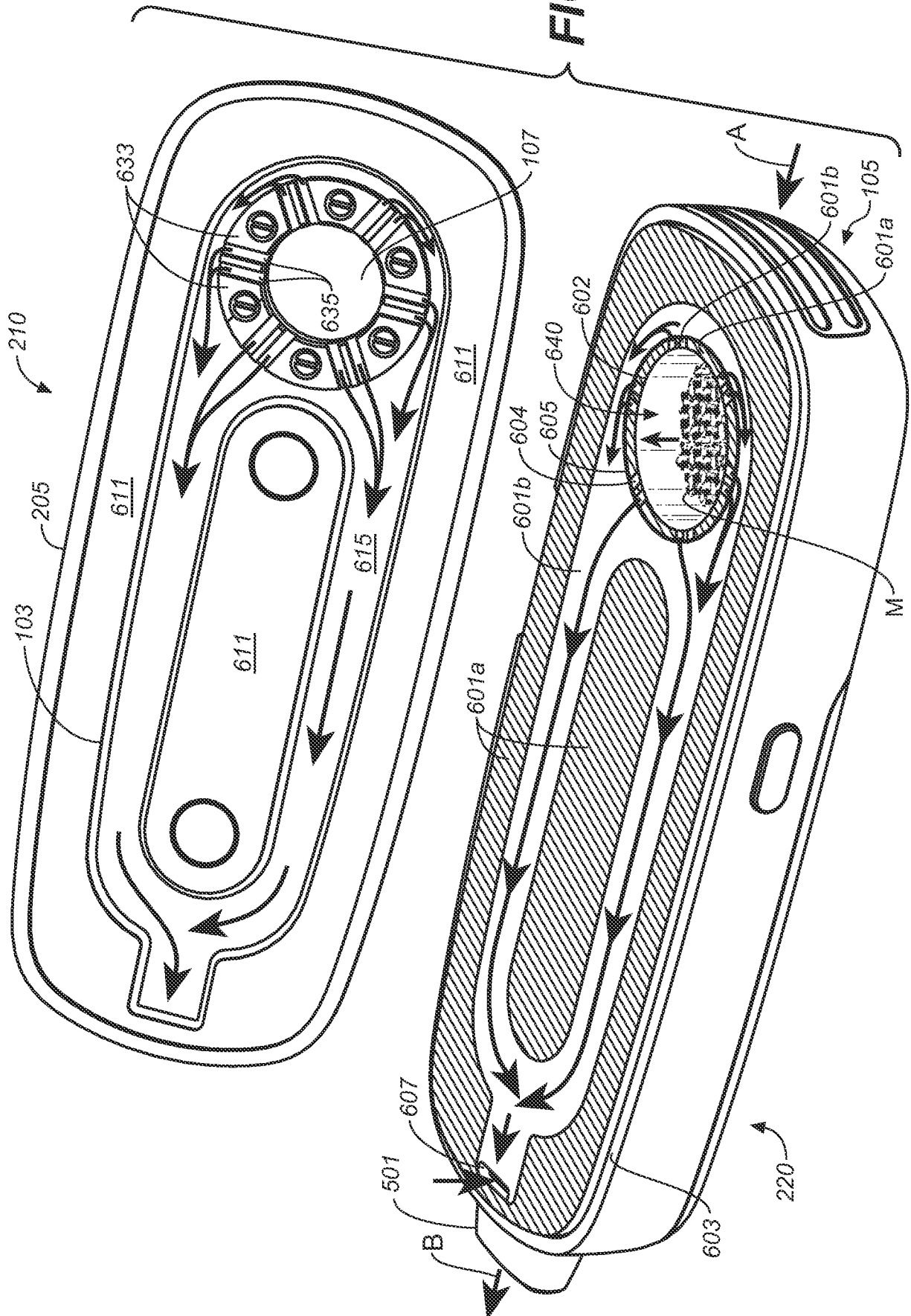
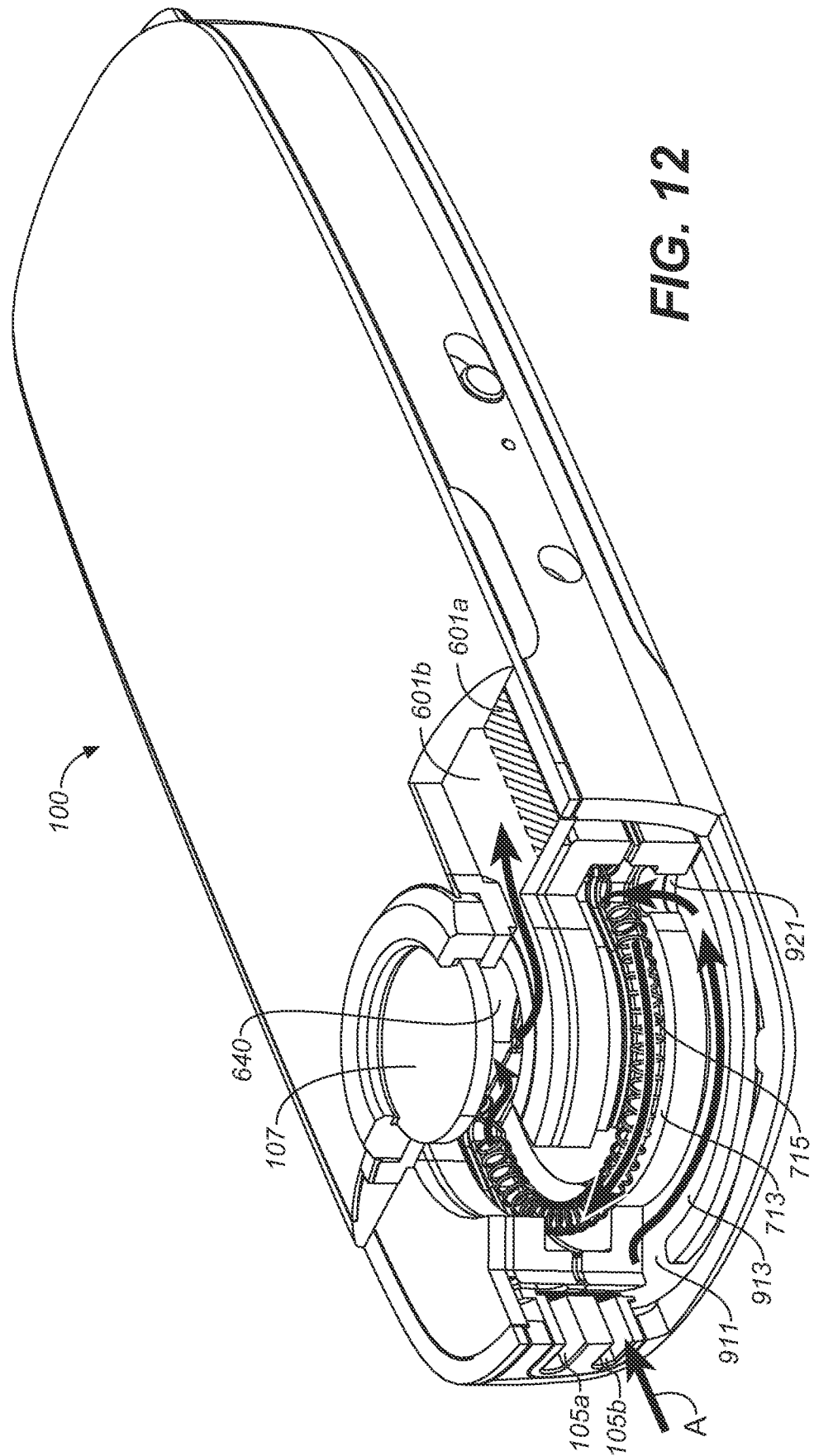


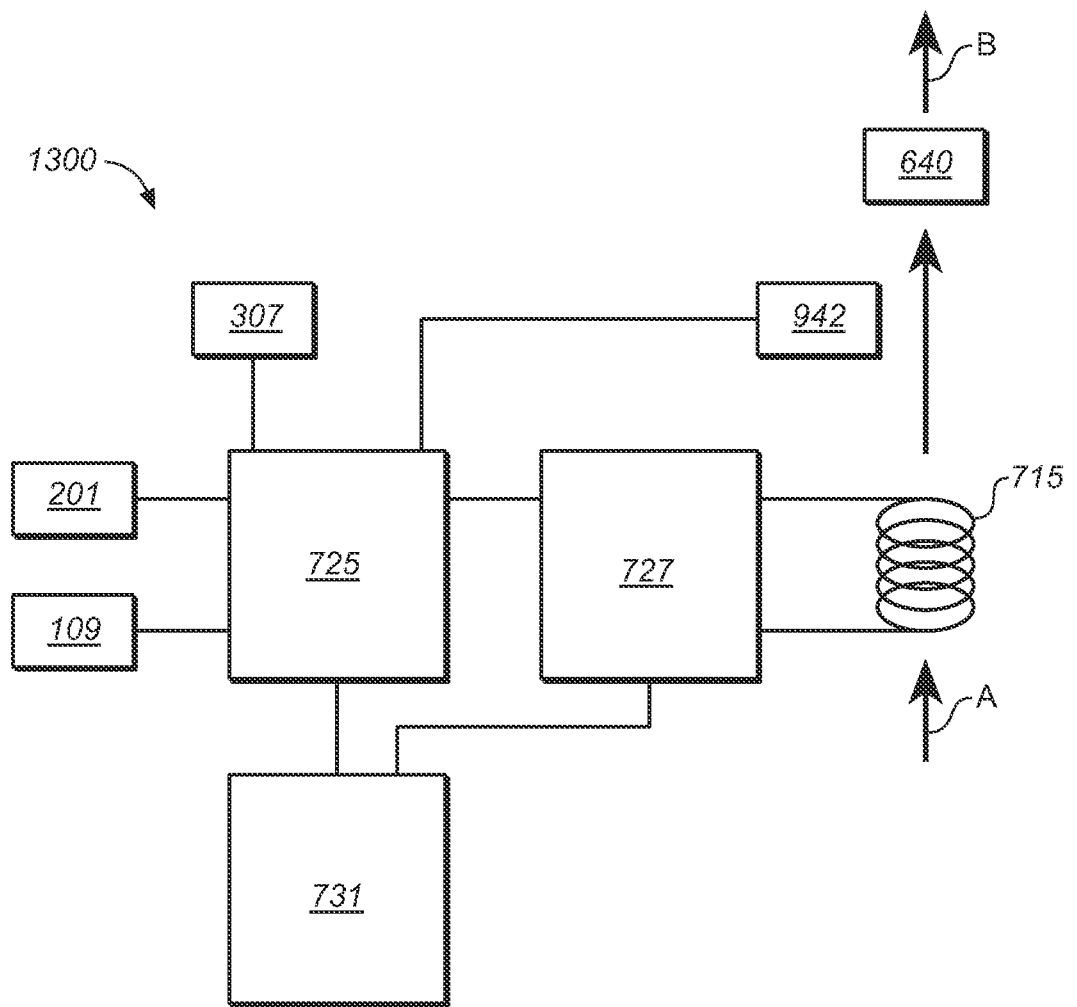
FIG. 11



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**FIG. 13**