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(54) **ELECTRONIC VAPING DEVICE AND KIT**

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(57) **ABSTRACT**

An electronic vaping device includes a roll of material that is impregnated with or includes a coating of at least one additive. The roll of material is positioned between a heater and a mouth-end insert. The additive may include a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine. The roll of material may be formed of a sheet of material. A plurality of sheets of material may be included in a kit.

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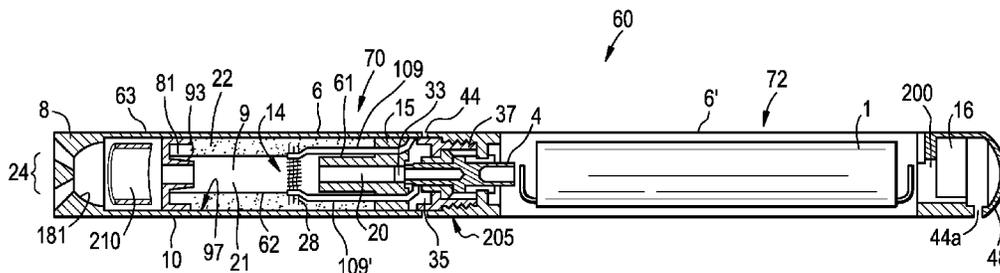


FIG. 1

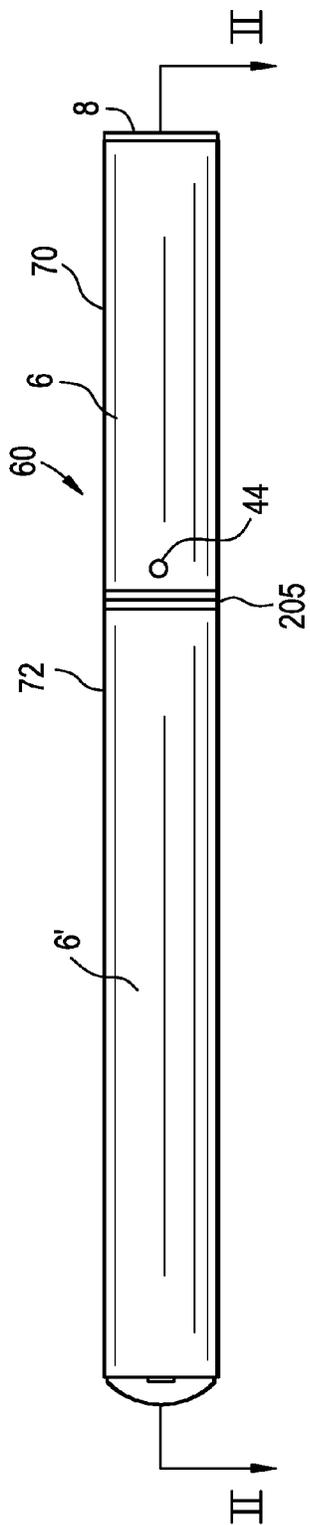


FIG. 2

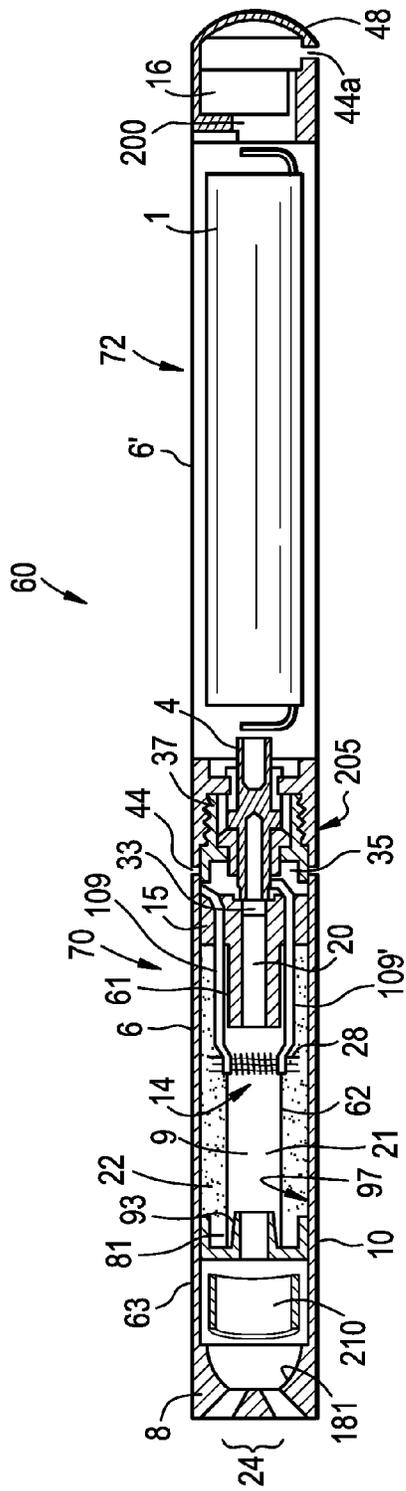


FIG. 3A

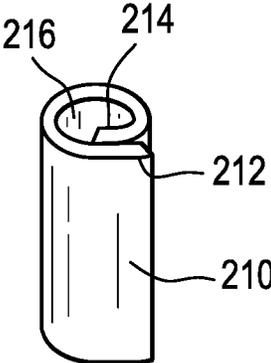


FIG. 3B

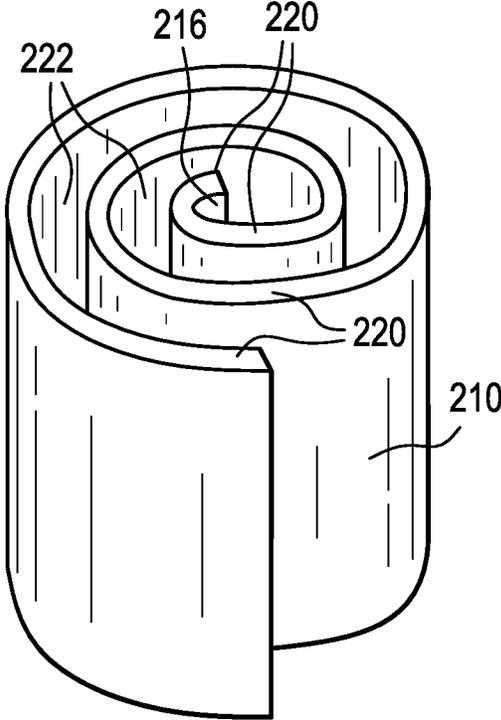


FIG. 4

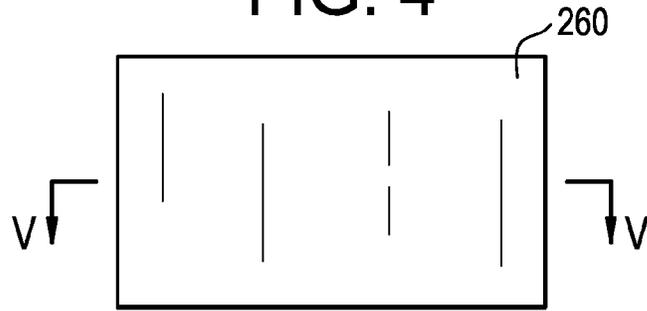


FIG. 5

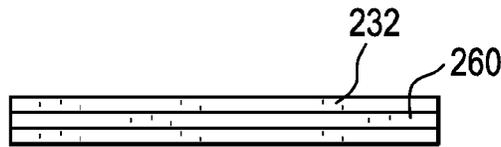


FIG. 6

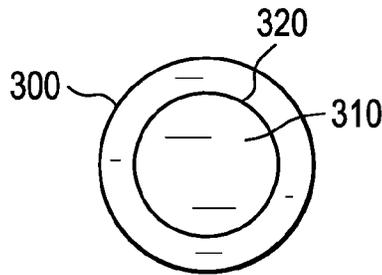


FIG. 7

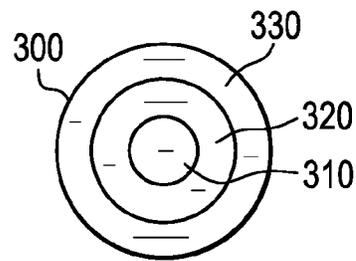


FIG. 8

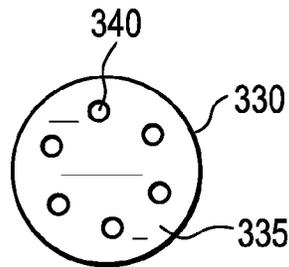


FIG. 9A

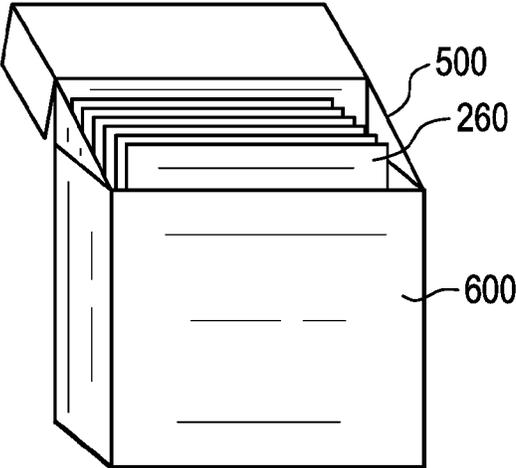


FIG. 9B

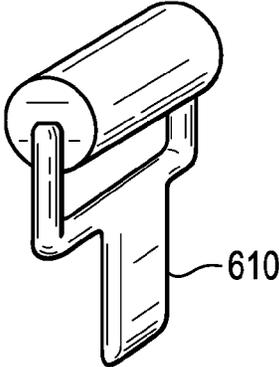


FIG. 9C

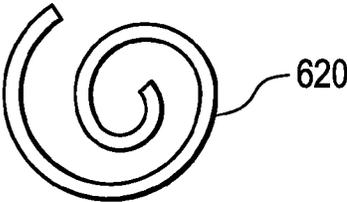
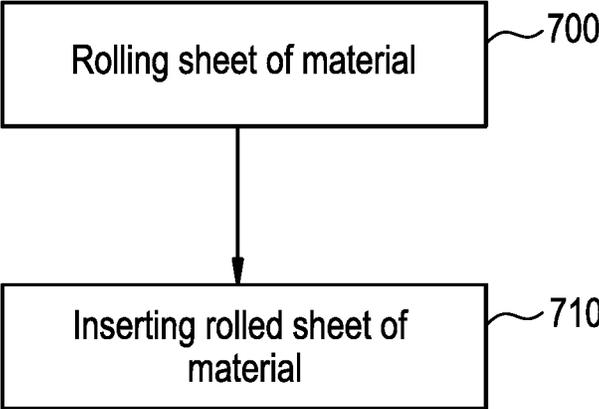


FIG. 10



ELECTRONIC VAPING DEVICE AND KIT

BACKGROUND

Field

[0001] The present disclosure relates to an electronic vaping or e-vaping device configured to deliver a pre-vapor formulation to a vaporizer.

Description of Related Art

[0002] An e-vaping device includes a heater element which vaporizes a pre-vapor formulation to produce a "vapor." The heater element may include a resistive heater coil, with a wick extending there through.

[0003] The e-vaping device includes a power supply, such as a battery, arranged in the device. The battery is electrically connected to the heater, such that the heater heats to a temperature sufficient to convert the pre-vapor formulation to a vapor. The vapor exits the e-vaping device through a mouthpiece including at least one outlet.

SUMMARY

[0004] At least one example embodiment relates to a cartridge of an electronic vaping device including a roll of material that is coated and/or impregnated with at least one additive.

[0005] In at least one example embodiment, a cartridge of an electronic vaping device includes a housing extending in a longitudinal direction, a reservoir containing a pre-vapor formulation, a heating element in the housing, and a roll of material having a channel extending longitudinally there-through. The heating element is in fluid communication with the reservoir, and the heating element is configured to generate a vapor. The housing includes a mouth end and a connection end. The reservoir is contained in the housing. The roll of material includes at least one of a coating and an impregnated material. The roll of material is positioned in the housing such that at least some of the vapor passes through the roll of material. The roll of material is removable from the cartridge.

[0006] In at least one example embodiment, the roll of material comprises at least one of a polymeric film, paper, and a film of reconstituted tobacco material. The roll of material may be positioned between the heating element and the mouth end of the housing.

[0007] In at least one example embodiment, the coating and the impregnated material each include at least one additive, the additive including at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine. In at least one example embodiment, the roll of material includes the coating and the impregnated material, and the coating and the impregnated material includes different additives.

[0008] In at least one example embodiment, the additive is an encapsulated additive. The encapsulated additive may include at least one shell layer and an inner core. The encapsulated additive may be configured to release the additive in response to one or more release activation mechanisms, such as heat and moisture.

[0009] In at least one example embodiment, at least one of the at least one shell layer and the inner core includes the additive. The encapsulated additive may include a plurality of capsules. The at least one shell layer of some of the

plurality of capsules may have different thicknesses from the at least one shell layer of others of the plurality of capsules so as to release the additives at different times.

[0010] In at least one example embodiment, the encapsulated additive may include a plurality of capsules. The at least one shell layer of some of the plurality of capsules formed of different polymers than the at least one shell layer of others of the plurality of capsules so as to release the additives at different times. The different polymers may have different dissolution and/or release rates.

[0011] In at least one example embodiment, the encapsulated additive includes a plurality of capsules, and each of the plurality of capsules releases the additives at the same time.

[0012] In at least one example embodiment, the encapsulated additive includes tobacco and/or tobacco flavors and at least one polymer. The polymer includes at least one of microcrystalline cellulose, pectin, hydroxypropyl methyl cellulose, and sodium alginate.

[0013] In at least one example embodiment, the pre-vapor formulation excludes nicotine and the additive includes nicotine.

[0014] At least one example embodiment relates to a kit including a plurality of sheets of material.

[0015] In at least one example embodiment, a kit includes a plurality of sheets of material configured to be rolled and placed in a cartridge of an electronic vaping device. Each of the plurality of sheets of material includes at least one of a coating and an impregnated material. Each of the plurality of sheets of material comprises at least one of a polymeric film, paper, and a film of reconstituted tobacco material. The coating and the impregnated material may each include at least one additive. The additive may include at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine.

[0016] In at least one example embodiment, at least one of the plurality of sheets of material includes the coating and the impregnated material, and the coating and the impregnated material include different additives.

[0017] In at least one example embodiment, the additive is an encapsulated additive. The encapsulated additive may be configured to release the additive in response to at least one of heat and moisture. The encapsulated additive may include at least one shell layer and an inner core. The encapsulation additive may be in the form of matrix encapsulation, i.e. dispersed within a polymer film, such as a coating.

[0018] In at least one example embodiment, each of the plurality of sheets includes different additives. In another example embodiment, each of the plurality of sheets includes the same additive.

[0019] At least one example embodiment relates to a method of enhancing a vapor of an electronic vaping device.

[0020] In at least one example embodiment, a method of enhancing a vapor of an electronic vaping device includes rolling a sheet of material to form a rolled sheet of material, and inserting the rolled sheet of material between a heater and a mouth end of a cartridge. The sheet of material includes at least one of a coating and an impregnated material.

[0021] In at least one example embodiment, the sheet of material comprises at least one of a polymeric film, paper, and a film of reconstituted tobacco material. The coating and the impregnated material may each include at least one

additive, the additive including at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The various features and advantages of the non-limiting embodiments herein may become more apparent upon review of the detailed description in conjunction with the accompanying drawings. The accompanying drawings are merely provided for illustrative purposes and should not be interpreted to limit the scope of the claims. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted. For purposes of clarity, various dimensions of the drawings may have been exaggerated.

[0023] FIG. 1 is a side view of an e-vaping device according to at least one example embodiment.

[0024] FIG. 2 is a cross-sectional view along line II-II of the e-vaping device of FIG. 1.

[0025] FIGS. 3A and 3B are perspective views of rolls of material according to at least one example embodiment.

[0026] FIG. 4 is a top view of a sheet of material that forms a roll of material according to at least one example embodiment.

[0027] FIG. 5 is a cross-sectional view along line V-V of the material of FIG. 4.

[0028] FIG. 6 is a cross-sectional view of a flavor capsule impregnated in and/or coated on a sheet of material according to at least one example embodiment.

[0029] FIG. 7 is a cross-sectional view of a flavor capsule impregnated in and/or coated on a sheet of material according to at least one example embodiment.

[0030] FIG. 8 is a cross-sectional view of a flavor capsule in the form of an encapsulated matrix according to at least one example embodiment.

[0031] FIG. 9A is a perspective view of a kit including a plurality of sheets of material according to at least one example embodiment.

[0032] FIG. 9B is a perspective view of a roller for inclusion in the kit of FIG. 9A according to at least one example embodiment.

[0033] FIG. 9C is a side view of an inflexible guide for inclusion in the kit of FIG. 9A according to at least one example embodiment.

[0034] FIG. 10 is a flow chart illustrating a method of enhancing a vapor of an electronic vaping device.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0035] Some detailed example embodiments are disclosed herein. However, specific structural and functional details disclosed herein are merely representative for purposes of describing example embodiments. Example embodiments may, however, be embodied in many alternate forms and should not be construed as limited to only the example embodiments set forth herein.

[0036] Accordingly, while example embodiments are capable of various modifications and alternative forms, example embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit example embodiments to the particular forms disclosed, but to the contrary, example embodiments are to cover all modifications, equivalents, and alternatives falling

within the scope of example embodiments. Like numbers refer to like elements throughout the description of the figures.

[0037] It should be understood that when an element or layer is referred to as being “on,” “connected to,” “coupled to,” or “covering” another element or layer, it may be directly on, connected to, coupled to, or covering the other element or layer or intervening elements or layers may be present. In contrast, when an element is referred to as being “directly on,” “directly connected to,” or “directly coupled to” another element or layer, there are no intervening elements or layers present. Like numbers refer to like elements throughout the specification. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0038] It should be understood that, although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers, and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer, or section from another region, layer, or section. Thus, a first element, component, region, layer, or section discussed below could be termed a second element, component, region, layer, or section without departing from the teachings of example embodiments.

[0039] Spatially relative terms (e.g., “beneath,” “below,” “lower,” “above,” “upper,” and the like) may be used herein for ease of description to describe one element or feature’s relationship to another element(s) or feature(s) as illustrated in the figures. It should be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as “below” or “beneath” other elements or features would then be oriented “above” the other elements or features. Thus, the term “below” may encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0040] The terminology used herein is for the purpose of describing various example embodiments only and is not intended to be limiting of example embodiments. As used herein, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms “includes,” “including,” “comprises,” and/or “comprising,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0041] Example embodiments are described herein with reference to cross-sectional illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of example embodiments. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, example embodiments should not be construed as limited to the shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing.

[0042] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which example embodiments belong. It will be further understood that terms, including those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0043] FIG. 1 is a side view of an e-vaping device according to at least one example embodiment.

[0044] In at least one example embodiment, as shown in FIG. 1, an electronic vaping device (e-vaping device) 60 may include a replaceable cartridge (or first section) 70 and a reusable battery section (or second section) 72, which may be coupled together at a threaded connector 205. It should be appreciated that the connector 205 may be any type of connector, such as a snug-fit, detent, clamp, bayonet, and/or clasp. The first section 70 may include a housing 6 and the second section 72 may include a second housing 6'. The e-vaping device 60 includes a mouth-end insert 8.

[0045] In at least one example embodiment, the housing 6 and the second housing 6' may have a generally cylindrical cross-section. In other example embodiments, the housings 6, 6' may have a generally triangular cross-section along one or more of the first section 70 and the battery section 72.

[0046] FIG. 2 is a cross-sectional view along line II-II of the e-vaping device of FIG. 1.

[0047] In at least one example embodiment, as shown in FIG. 2, the first section 70 may include a reservoir 22 configured to contain a pre-vapor formulation and a heater 14 that may vaporize the pre-vapor formulation, which may be drawn from the reservoir 22 by a wick 28. The e-vaping device 60 may include the features set forth in U.S. Patent Application Publication No. 2013/0192623 to Tucker et al. filed Jan. 31, 2013, the entire contents of which is incorporated herein by reference thereto.

[0048] In at least one example embodiment, the pre-vapor formulation is a material or combination of materials that may be transformed into a vapor. For example, the pre-vapor formulation may be a liquid, solid and/or gel formulation including, but not limited to, water, beads, solvents, active ingredients, ethanol, plant extracts, natural or artificial flavors, and/or vapor formers such as glycerin and propylene glycol.

[0049] In at least one example embodiment, the first section 70 may include the housing 6 extending in a longitudinal direction and an inner tube (or chimney) 62 coaxially positioned within the housing 6.

[0050] At an upstream end portion of the inner tube 62, a nose portion 61 of a gasket (or seal) 15 may be fitted into the inner tube 62, while at the other end, an outer perimeter of the gasket 15 may provide a seal with an interior surface of the outer housing 6. The gasket 15 may also include a central, longitudinal air passage 20, which opens into an interior of the inner tube 62 that defines a central channel 21. A transverse channel 33 at a backside portion of the gasket 15 may intersect and communicate with the air passage 20 of the gasket 15. This transverse channel 33 assures communication between the air passage 20 and a space 35 defined between the gasket 15 and a cathode connector piece 37.

[0051] In at least one example embodiment, the cathode connector piece 37 may include a threaded section for effecting the connection between the first section 70 and the battery section 72.

[0052] In at least one example embodiment, more than two air inlet ports 44 may be included in the housing 6. Alternatively, a single air inlet port 44 may be included in the outer housing 6. Such arrangement allows for placement of the air inlet ports 44 close to the connector 205 without occlusion by the presence of the cathode connector piece 37. This arrangement may also reinforce the area of air inlet ports 44 to facilitate precise drilling of the air inlet ports 44.

[0053] In at least one example embodiment, the air inlet ports 44 may be provided in the connector 205 instead of in the outer housing 6.

[0054] In at least one example embodiment, the at least one air inlet port 44 may be formed in the outer housing 6, adjacent the connector 205 to minimize the chance of an adult vaper's fingers occluding one of the ports and to control the resistance-to-draw (RTD) during vaping. In an example embodiment, the air inlet ports 44 may be machined into the housing 6 with precision tooling such that their diameters are closely controlled and replicated from one e-vaping device 60 to the next during manufacture.

[0055] In at least one example embodiment, the air inlet ports 44 may be sized and configured such that the e-vaping device 60 has a RTD in the range of from about 60 mm H₂O to about 150 mm H₂O.

[0056] In at least one example embodiment, a nose portion 93 of a downstream gasket 10 may be fitted into a downstream end portion 81 of the inner tube 62. An outer perimeter of the gasket 10 may provide a substantially tight seal with an interior surface 97 of the housing 6. The downstream gasket 10 may include a central channel 63 disposed between the inner passage 21 of the inner tube 62 and the interior of a mouth-end insert 8, which may transport the vapor from the inner passage 21 to the mouth-end insert 8.

[0057] In at least one example embodiment, the space defined between the gaskets 10 and 15 and the outer housing 6 and the inner tube 62 may establish the confines of a reservoir 22. The reservoir 22 may contain a pre-vapor formulation, and optionally a storage medium (not shown) configured to store the pre-vapor formulation therein. The storage medium may include a winding of cotton gauze or other fibrous material about the inner tube 62.

[0058] In at least one example embodiment, the reservoir 22 may be contained in an outer annulus between the inner tube 62 and the housing 6 and between the gaskets 10 and 15. Thus, the reservoir 22 may at least partially surround the central inner passage 21. The heater 14 may extend transversely across the inner passage 21 between opposing portions of the reservoir 22. In some example embodiments, the heater 14 may extend parallel to a longitudinal axis of the inner passage 21.

[0059] In at least one example embodiment, the reservoir 22 may be sized and configured to hold enough pre-vapor formulation such that the e-vaping device 60 may be configured for vaping for at least about 200 seconds. Moreover, the e-vaping device 60 may be configured to allow each puff to last a maximum of about 5 seconds.

[0060] In at least one example embodiment, the storage medium may be a fibrous material including at least one of cotton, polyethylene, polyester, rayon and combinations

thereof. The fibers may have a diameter ranging in size from about 6 microns to about 15 microns (e.g., about 8 microns to about 12 microns or about 9 microns to about 11 microns). The storage medium may be a sintered, porous or foamed material. Also, the fibers may be sized to be irrespirable and may have a cross-section which has a Y-shape, cross shape, clover shape or any other suitable shape. In at least one example embodiment, the reservoir **22** may include a filled tank lacking any storage medium and containing only pre-vapor formulation.

[0061] During vaping, pre-vapor formulation may be transferred from the reservoir **22** and/or storage medium to the proximity of the heater **14** via capillary action of the wick **28**. The wick **28** may include at least a first end portion and a second end portion, which may extend into opposite sides of the reservoir **22**. The heater **14** may at least partially surround a central portion of the wick **28** such that when the heater **14** is activated, the pre-vapor formulation in the central portion of the wick **28** may be vaporized by the heater **14** to form a vapor.

[0062] In at least one example embodiment, the wick **28** may include filaments (or threads) having a capacity to draw the pre-vapor formulation. For example, the wick **28** may be a bundle of glass (or ceramic) filaments, a bundle including a group of windings of glass filaments, etc., all of which arrangements may be capable of drawing pre-vapor formulation via capillary action by interstitial spacings between the filaments. The filaments may be generally aligned in a direction perpendicular (transverse) to the longitudinal direction of the e-vaping device **60**. In at least one example embodiment, the wick **28** may include one to eight filament strands, each strand comprising a plurality of glass filaments twisted together. The end portions of the wick **28** may be flexible and foldable into the confines of the reservoir **22**. The filaments may have a cross-section that is generally cross-shaped, clover-shaped, Y-shaped, or in any other suitable shape.

[0063] In at least one example embodiment, the wick **28** may include any suitable material or combination of materials. Examples of suitable materials may be, but not limited to, glass, ceramic- or graphite-based materials. The wick **28** may have any suitable capillarity drawing action to accommodate pre-vapor formulations having different physical properties such as density, viscosity, surface tension and vapor pressure. The wick **28** may be non-conductive.

[0064] In at least one example embodiment, the heater **14** may include a wire coil which at least partially surrounds the wick **28**. The wire may be a metal wire and/or the heater coil may extend fully or partially along the length of the wick **28**. The heater coil may further extend fully or partially around the circumference of the wick **28**. In some example embodiments, the heater coil **14** may or may not be in contact with the wick **28**.

[0065] In at least one example embodiment, the heater coil may be formed of any suitable electrically resistive materials. Examples of suitable electrically resistive materials may include, but not limited to, copper, titanium, zirconium, tantalum and metals from the platinum group. Examples of suitable metal alloys include, but not limited to, stainless steel, nickel, cobalt, chromium, aluminum-titanium-zirconium, hafnium, niobium, molybdenum, tantalum, tungsten, tin, gallium, manganese and iron-containing alloys, and super-alloys based on nickel, iron, cobalt, stainless steel. For example, the heater **14** may be formed of nickel aluminide,

a material with a layer of alumina on the surface, iron aluminide and other composite materials, the electrically resistive material may optionally be embedded in, encapsulated or coated with an insulating material or vice-versa, depending on the kinetics of energy transfer and the external physicochemical properties required. The heater **14** may include at least one material selected from the group consisting of stainless steel, copper, copper alloys, nickel-chromium alloys, super alloys and combinations thereof. In an example embodiment, the heater **14** may be formed of nickel-chromium alloys or iron-chromium alloys. In another example embodiment, the heater **14** may be a ceramic heater having an electrically resistive layer on an outside surface thereof.

[0066] In at least one example embodiment, the heater **14** may heat pre-vapor formulation in the wick **28** by thermal conduction. Alternatively, heat from the heater **14** may be conducted to the pre-vapor formulation by means of a heat conductive element or the heater **14** may transfer heat to the incoming ambient air that is drawn through the e-vaping device **60** during vaping, which in turn heats the pre-vapor formulation by convection.

[0067] It should be appreciated that, instead of using a wick **28**, the heater **14** may include a porous material which incorporates a resistance heater formed of a material having a high electrical resistance capable of generating heat quickly.

[0068] In at least one example embodiment, as shown in FIG. 2, the second section **72** of the e-vaping device **60** may include a puff sensor **16** responsive to air drawn into the second section **72** via an air inlet port **44a** adjacent a free end or tip of the e-vaping device **60**. The second section **72** may also include a battery **1** and a control circuit **200**.

[0069] Upon completing the connection between the first section **70** and the second section **72**, the battery **1** may be electrically connectable with the heater **14** of the first section **70** upon actuation of the puff sensor **16**. Air is drawn primarily into the first section **70** through one or more air inlets **44**, which may be located along the housing or at the connector **205**.

[0070] The power supply **1** may include a battery arranged in the e-vaping device **60**. The power supply **1** may be a Lithium-ion battery or one of its variants, for example a Lithium-ion polymer battery. Alternatively, the power supply **1** may be a nickel-metal hydride battery, a nickel cadmium battery, a lithium-manganese battery, a lithium-cobalt battery or a fuel cell. The e-vaping device **60** may be usable by an adult vaper until the energy in the power supply **1** is depleted or in the case of lithium polymer battery, a minimum voltage cut-off level is achieved.

[0071] In at least one example embodiment, the power supply **1** may be rechargeable and may include circuitry configured to allow the battery to be chargeable by an external charging device. To recharge the e-vaping device **60**, an USB charger or other suitable charger assembly may be used.

[0072] Furthermore, the e-vaping device **60** may include the control circuit **200** and the puff sensor **16**. The puff sensor **16** may be configured to sense an air pressure drop and initiate application of voltage from the power supply **1** to the heater **14**. The control circuit **200** may also include a heater activation light **48** configured to glow when the heater **14** is activated. The heater activation light **48** may include a light-emitting diode (LED) and may be at an upstream end

of the e-vaping device 60. Moreover, the heater activation light 48 may be arranged to be visible to an adult vaper during vaping. In addition, the heater activation light 48 may be utilized for e-vaping system diagnostics or to indicate that recharging is in progress. The heater activation light 48 may also be configured such that the adult vaper may activate and/or deactivate the heater activation light 48 for privacy. The heater activation light 48 may be on a tip end of the e-vaping device 60 or on a side of the housing 6.

[0073] In at least one example embodiment, the at least one air inlet 44a may be located adjacent the puff sensor 16, such that the puff sensor 16 may sense air flow indicative of an adult vaper taking a puff and activates the power supply 1 and the heater activation light 48 to indicate that the heater 14 is working. The heater activation light 48 may be located at and/or on the tip end of the e-vaping device. In other example embodiments, the heater activation light 48 may be located on a side portion of the housing 6.

[0074] In at least one example embodiment, the control circuit 200 may supply power to the heater 14 responsive to the puff sensor 16. In one example embodiment, the control circuit may include a maximum, time-period limiter. In another example embodiment, the control circuit 200 may include a manually operable switch for an adult vaper to initiate a puff. The time-period of the electric current supply to the heater 14 may be pre-set depending on the amount of pre-vapor formulation desired to be vaporized. In yet another example embodiment, the circuitry may supply power to the heater 14 as long as the puff sensor 16 detects a pressure drop.

[0075] When activated, the heater 14 may heat a portion of the wick 28 surrounded by the heater for less than about 10 seconds.

[0076] The inner tube 62 may include a pair of opposing slots, such that the wick 28 and the leading end 109, 109' of the heater 14 may extend out from the respective opposing slots. The provision of the opposing slots in the inner tube 62 may facilitate placement of the heater 14 and wick 28 into position within the inner tube 62 without impacting edges of the slots and the coiled section of the heater 14. Accordingly, edges of the slots may not be allowed to impact and alter the coil spacing of the heater 14, which would otherwise create potential sources of hotspots.

[0077] In at least one example embodiment, the inner tube 62 may have a diameter of about 4 mm and each of the opposing slots may have major and minor dimensions of about 2 mm by about 4 mm.

[0078] In at least one example embodiment, the first section 70 may be replaceable. In other words, once the pre-vapor formulation of the cartridge is depleted, only the first section 70 may be replaced. An alternate arrangement may include an example embodiment where the entire e-vaping device 60 may be disposed once the reservoir 22 is depleted.

[0079] In at least one example embodiment, the e-vaping device 60 may be about 80 mm to about 110 mm long and about 7 mm to about 8 mm in diameter. For example, in one example embodiment, the e-vaping device may be about 84 mm long and may have a diameter of about 7.8 mm.

[0080] In at least one example embodiment, a mouth-end insert 8 may be positioned at a mouth end 32 of the first section 70. The mouth-end insert 8 includes at least two outlets, which may be located off-axis from the longitudinal axis of the e-vaping device 60. The outlets may be angled

outwardly in relation to the longitudinal axis of the e-vaping device 60. The outlets may be substantially uniformly distributed about the perimeter of the mouth-end insert 8 so as to substantially uniformly distribute vapor in an adult vaper's mouth during vaping and create a greater perception of fullness in the mouth. Thus, as the vapor passes into the adult vaper's mouth, the vapor may enter the mouth and may move in different directions so as to provide a full mouth feel.

[0081] In at least one example embodiment, the mouth-end insert 8 may be removable to allow for the insertion and/or removal of a roll of material 210 that is formed of a sheet of material 260 (shown in FIGS. 4 and 5) that is impregnated with and/or coated with one or more additives. Once the additives in the roll of material 210 have been eluted to the vapor, the roll of material 210 may be removed. If desired, an adult vaper may replace the roll of material 210 with a new roll of material 210. The adult vaper may alter the flavor profile of the vapor by choosing a roll of material 210 with the desired additives that provide desired vapor characteristics. Thus, the adult vaper may customize the vaping experience.

[0082] In at least one example embodiment, the roll of material 210 may be positioned between the heater 14 and the mouth-end insert 8. The roll of material 210 may include a coating of a material and/or may be impregnated with a material. The material may include an additive and/or one or more carriers and/or binders.

[0083] In at least one example embodiment, the additive may include at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine. The additive may be included in the roll of material 210 in an amount ranging from about 0.01% to about 50% by weight based on the weight of the roll of material 210.

[0084] In at least one example embodiment, the flavorant may include any suitable flavor including menthol, mint flavors, fruit flavors, herb flavors, vegetable flavors, and the like, or combinations thereof.

[0085] In at least one example embodiment, the vapor former may include polyhydric alcohols, such as propylene glycol, triethylene glycol, 1,3-butanediol and glycerin; esters of polyhydric alcohols, such as glycerol mono-, di- or triacetate; and aliphatic esters of mono-, di- or polycarboxylic acids, such as dimethyl dodecanedioate, and/or dimethyl tetradecanedioate. Example vapor formers are polyhydric alcohols or mixtures thereof, such as propylene glycol, triethylene glycol, 1,3-butanediol and glycerin.

[0086] In at least one example embodiment, the pH modifying agent includes at least one of an acid or a base. The pH modifying agent is selected to adjust a pH of the vapor to a desired level.

[0087] In at least one example embodiment, the tobacco material may include material from any member of the genus *Nicotiana*. In at least one example embodiment, the tobacco material includes a blend of two or more different tobacco varieties.

[0088] Examples of suitable types of tobacco materials that may be used include flue-cured tobacco, Burley tobacco, Dark tobacco, Maryland tobacco, Oriental tobacco, rare tobacco, specialty tobacco, and blends thereof. The tobacco material may be provided in any suitable form, including tobacco lamina, processed tobacco materials, such as volume expanded or puffed tobacco, processed tobacco

stems, such as cut-rolled or cut-puffed stems, reconstituted tobacco materials, and blends thereof.

[0089] In at least one example embodiment, the additive includes nicotine. In at least one example embodiment, the pre-vapor formulation does not include nicotine, and nicotine is impregnated in the roll of material **210** and/or is coated on the roll of material **210**.

[0090] The additives may include volatile, heat sensitive additives that are not easily included in the pre-vapor formulation and/or additives that are difficult to store. Inclusion of such additives in the roll of material **210** may reduce and/or prevent undesired chemical reactions with other ingredients of the pre-vapor formulation and loss of the additives prior to vaping.

[0091] In at least one example embodiment, the carrier and/or binder may include food-grade adhesives, polymers, and/or solvents.

[0092] FIGS. 3A and 3B are perspective views of rolls of material according to at least one example embodiment.

[0093] In at least one example embodiment, as shown in FIG. 3A, when the sheet of material **260** (shown in FIG. 4) is rolled to form the roll of material **210**, the roll of material **210** may include overlapping edges **212**, **214** and an opening **216** extending through the roll of material **210**. During vaping, vapor travels through the opening **216** in the roll of material **210** and the materials coated and/or impregnated in the roll of material **210** are eluted to the vapor.

[0094] In at least one example embodiment, as shown in FIG. 3B, the roll of material **210** may include a plurality of layers **220** of rolled material. The layers **220** of the roll of material **210** may include spaces **222** between each adjacent layer **220**, such that the vapor passes through the central opening **216** and/or through the channels **222** between the layers **220**.

[0095] FIG. 4 is a top view of a sheet of material that forms a roll of material according to at least one example embodiment.

[0096] In at least one example embodiment, as shown in FIG. 4, the roll of material **210** is formed from a sheet of material **260** that is rollable by an adult vaper. In at least one example embodiment, the sheet of material **260** includes at least one of a polymeric film, paper, and a film of reconstituted tobacco material. The sheet of material **260** may be impregnated with at least one material including at least one additive.

[0097] In at least one example embodiment, the sheet of material **260** comprises a polymeric film. The film may be a water soluble film that dissolves when in contact with moisture and/or heat from the vapor. Thus, over time, the film may dissolve as the film releases additives during vaping and/or may be replaced by another film if desired. For example, the film may be a film of microcrystalline cellulose, hydroxypropylmethylcellulose, pullulan, chitosan, cellulose derivatives, alginate, and/or pectin including additives dispersed therethrough.

[0098] In at least one example embodiment, the sheet of material **260** has a length ranging from about 10 mm to about 50 mm and a width ranging from about 10 mm to about 50 mm. The sheet of material **260** may be sized such that when rolled, the roll of material fits between the gasket **10** and the mouth-end insert **8**.

[0099] FIG. 5 is a cross-sectional view along line V-V of the material of FIG. 4.

[0100] In at least one example embodiment, as shown in FIG. 5, the sheet of material **260** may include a coating **232** in lieu of or in addition to the impregnated additives. The coating **232** may include the same or different additives than the impregnated additives. For example, the coating **232** may include pieces of tobacco material adhered to the sheet of material **260** with food-grade binders and/or adhesives. Alternatively, the sheet of material **260** may be formed of reconstituted tobacco material that is impregnated with flavorants and/or other additives.

[0101] In at least one example embodiment, the sheet of material **260** has a thickness of up to about 150 microns. The coating **232** may also have a thickness of up to about 150 microns. The coating **232** may be on at least one surface of the sheet of material **260**.

[0102] FIG. 6 is a cross-sectional view of a flavor capsule impregnated in and/or coated on a sheet of material according to at least one example embodiment.

[0103] In at least one example embodiment, as shown in FIG. 6, the additives may be encapsulated. The encapsulated additives may include a first outer shell **320** and an inner core **310**. Encapsulated additives embedded in the material may refer to different types of encapsulation including: 1) a matrix-type of encapsulation in which the flavor is dispersed within an encapsulation matrix, 2) a core/shell-type encapsulation in which the flavor is contained within a core surrounded by an encapsulant material, and 3) an adsorbent material in which the flavor has been adsorbed onto and/or into (i.e., silica gel, activated carbon, molecular sieves, etc.). The encapsulated additives may be available in different forms such as powders, spherical particles or other geometries, needle-like or fiber-like structure, etc.

[0104] FIG. 7 is a cross-sectional view of a flavor capsule impregnated in and/or coated on a sheet of material according to at least one example embodiment.

[0105] In at least one example embodiment, as shown in FIG. 7, the additives may be encapsulated, and the capsules may include the first outer shell **320**, a second outer shell **330**, and the inner core **310**.

[0106] In at least one example embodiment, the encapsulated additives may be formed to release the additive in response to one or more of heat from the vapor and/or moisture from the vapor.

[0107] In at least one example embodiment, the first outer shell **320** and/or the second outer shell may be formed of water soluble materials having varying levels of water solubility so as to provide controlled release of the additive over a desired period of time. The first outer shell **320** and/or the second outer shell **330** may include one or more of gelatin, pectin, and sodium alginate. The polymers may be cross-linked with a cross-linking agent, such as calcium salts including calcium acetate, calcium chloride, and the like.

[0108] In at least one example embodiment, the first outer shell **320** and/or the second outer shell **330** may have varying thicknesses so as to release the additives at different times.

[0109] In at least one example embodiment, the encapsulated additives have similar shells so as to release the additives from the inner core **310** at the same time. Thus, the shells **320**, **330** may be formed of substantially the same materials and have substantially the same thicknesses.

[0110] FIG. 8 is a cross-sectional view of a flavor capsule in the form of an encapsulated matrix **330**. Flavor particles

340 may be dispersed uniformly or non-uniformly in a matrix **335** of a food-grade polymer.

[0111] FIG. 9A is a perspective view of a kit including a plurality of sheets of material according to at least one example embodiment.

[0112] In at least one example embodiment, as shown in FIG. 9A, a kit **500** may include a plurality of sheets of material **260** as described above. The kit **500** may include a plurality of the same types of sheets of material **260** or the kit **500** may include different types of sheets of material **260**. The sheets of material **260** may be packaged in a hinged-lid pack **600** or other suitable packaging. The sheets of material **260** may be individually wrapped or wrapped according to type of additives included therein to avoid and/or reduce loss of volatile additives and/or cross-contamination.

[0113] In at least one example embodiment, if the kit **500** includes a variety of different types of sheets of material **260**, each type may be a different color and the color may indicate the type of additive and/or flavor included in that sheet of material **260**.

[0114] In at least one example embodiment, as shown in FIG. 9B, the kit **500** may include a roller **610** that squeezes and/or scratches a surface of the sheets of material **260** prior to rolling so as to mechanically release encapsulated flavors.

[0115] In at least one example embodiment, as shown in FIG. 9C, the kit **500** may include an inflexible guide **620**. The guide **620** may be formed of metal or plastic. The guide **620** may be used to assure the resulting rolled material maintains open through-channels and is consistently rolled from one sheet or material to the next. The sheets may be available pre-rolled with the guide **620** or without the guide **620**. In a pre-rolled configuration, the mouth-end insert may be pre-attached for convenience and hygiene.

[0116] In at least one example embodiment, as shown in FIG. 10, a method of enhancing a vapor of an electronic vaping device may include rolling a sheet of material **700** to form a rolled sheet of material and inserting the rolled sheet of material between a heater and a mouth end of a cartridge **710**. The method may also include removing the mouth-end insert prior to inserting the rolled sheet of material.

[0117] In at least one example embodiment, an adult vaper may choose to roll two or more sheets of material **260** together to provide multiple different additives.

[0118] In at least one example embodiment, instead of a roll of material, additives may be impregnated in and/or coated on a plug of material, such as cellulose acetate. Plugs of material may include longitudinally extending channels extending therethrough, surfaces of which may also be coated and/or impregnated with additives.

[0119] While a number of example embodiments have been disclosed herein, it should be understood that other variations may be possible. Such variations are not to be regarded as a departure from the spirit and scope of the present disclosure, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

We claim:

1. A cartridge of an electronic vaping device, the cartridge comprising:

- a housing extending in a longitudinal direction, the housing including a mouth end and a connection end;
- a reservoir containing a pre-vapor formulation, the reservoir in the housing;

- a heating element in the housing, the heating element in fluid communication with the reservoir, the heating element configured to generate a vapor; and

- a roll of material having a channel extending longitudinally therethrough, the roll of material including at least one of a coating and an impregnated material, the roll of material positioned in the housing such that at least some of the vapor passes through the roll of material, the roll of material being removable from the cartridge.

2. The cartridge of claim 1, wherein the roll of material comprises at least one of a polymeric film, paper, and a film of reconstituted tobacco material.

3. The cartridge of claim 1, wherein the roll of material is positioned between the heating element and the mouth end of the housing.

4. The cartridge of claim 1, wherein the coating and the impregnated material each include at least one additive, the additive including at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine.

5. The cartridge of claim 4, wherein the roll of material includes the coating and the impregnated material, and the coating and the impregnated material includes different additives.

6. The cartridge of claim 4, wherein the additive is an encapsulated additive, the encapsulated additive including at least one shell layer and an inner core.

7. The cartridge of claim 6, wherein the encapsulated additive is configured to release the additive in response to one or more of heat and moisture.

8. The cartridge of claim 6, wherein at least one of the at least one shell layer and the inner core includes the additive.

9. The cartridge of claim 6, wherein the encapsulated additive includes a plurality of capsules, the at least one shell layer of some of the plurality of capsules having different thicknesses from the at least one shell layer of others of the plurality of capsules so as to release the additives at different times.

10. The cartridge of claim 6, wherein the encapsulated additive includes a plurality of capsules, the at least one shell layer of some of the plurality of capsules formed of different polymers than the at least one shell layer of others of the plurality of capsules so as to release the additives at different times.

11. The cartridge of claim 6, wherein the encapsulated additive includes a plurality of capsules, the plurality of capsules releasing the additives at the same time.

12. The cartridge of claim 6, wherein the encapsulated additive includes tobacco and at least one polymer, the polymer including at least one of microcrystalline cellulose, pectin, hydroxypropyl methyl cellulose, and sodium alginate.

13. The cartridge of claim 4, wherein the pre-vapor formulation excludes nicotine and the additive includes nicotine.

14. A kit comprising:

- a plurality of sheets of material configured to be rolled and placed in a cartridge of an electronic vaping device, each of the plurality of sheets of material including at least one of a coating and an impregnated material.

15. The kit of claim 14, wherein each of the plurality of sheets of material comprises at least one of a polymeric film, paper, and a film of reconstituted tobacco material.

16. The kit of claim **15**, wherein the coating and the impregnated material each include at least one additive, the additive including at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine.

17. The kit of claim **16**, wherein at least one of the plurality of sheets of material includes the coating and the impregnated material, and the coating and the impregnated material include different additives.

18. The kit of claim **16**, wherein the additive is an encapsulated additive, the encapsulated additive configured to release the additive in response to at least one of heat and moisture, the encapsulated additive including at least one shell layer and an inner core.

19. The kit of claim **18**, wherein each of the plurality of sheets includes different additives.

20. The kit of claim **18**, wherein each of the plurality of sheets includes the same additive.

22. The kit of claim **18**, further comprising:

a roller configured to release flavor from the encapsulated additives prior to placement in an electronic vaping device.

23. The kit of claim **14**, further comprising:

a guide configured to aid in rolling of the sheets and maintain the sheets in a rolled state, the guide being inflexible.

24. A method of enhancing a vapor of an electronic vaping device, the method comprising:

rolling a sheet of material to form a rolled sheet of material, the sheet of material including at least one of a coating and an impregnated material; and

inserting the rolled sheet of material between a heater and a mouth end of a cartridge.

25. The method of claim **24**, wherein the sheet of material comprises at least one of a polymeric film, paper, and a film of reconstituted tobacco material.

26. The method of claim **24**, wherein the coating and the impregnated material each include at least one additive, the additive including at least one of a flavorant, a pH adjusting agent, a vapor former, tobacco material, and nicotine.

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