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(54) **SHISHA CARTRIDGE WITH ABSORBENT CARRIER**

(71) Applicant: **PHILIP MORRIS PRODUCTS S.A.**, Neuchâtel (CH)

(72) Inventors: **Robert Emmett**, Neuchâtel (CH); **Ana Isabel Gonzalez Florez**, St. Sulpice (CH)

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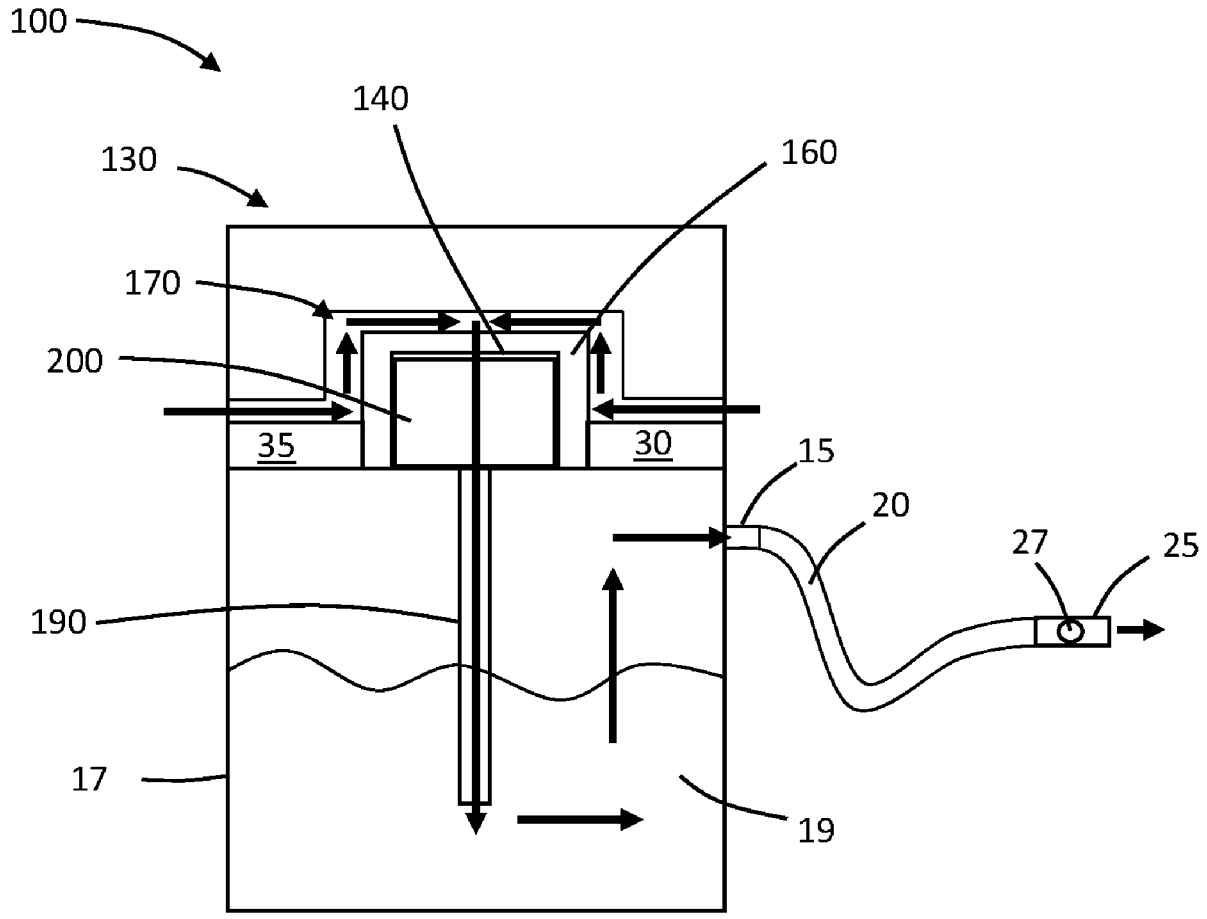
(57) **ABSTRACT**

A shisha cartridge (**200**) comprises a body defining a cavity (**218**). An aerosol-forming substrate (**300**) and an absorbent carrier (**310**) forming a sheet impregnated with an aerosol former are disposed in the cavity. The absorbent carrier may be disposed adjacent or in contact with the internal cavity surface, the aerosol-forming substrate, or both the internal cavity surface and the aerosol-forming substrate. As the cartridge is heated, the aerosol former impregnated in the absorbent carrier may improve aerosol formation.



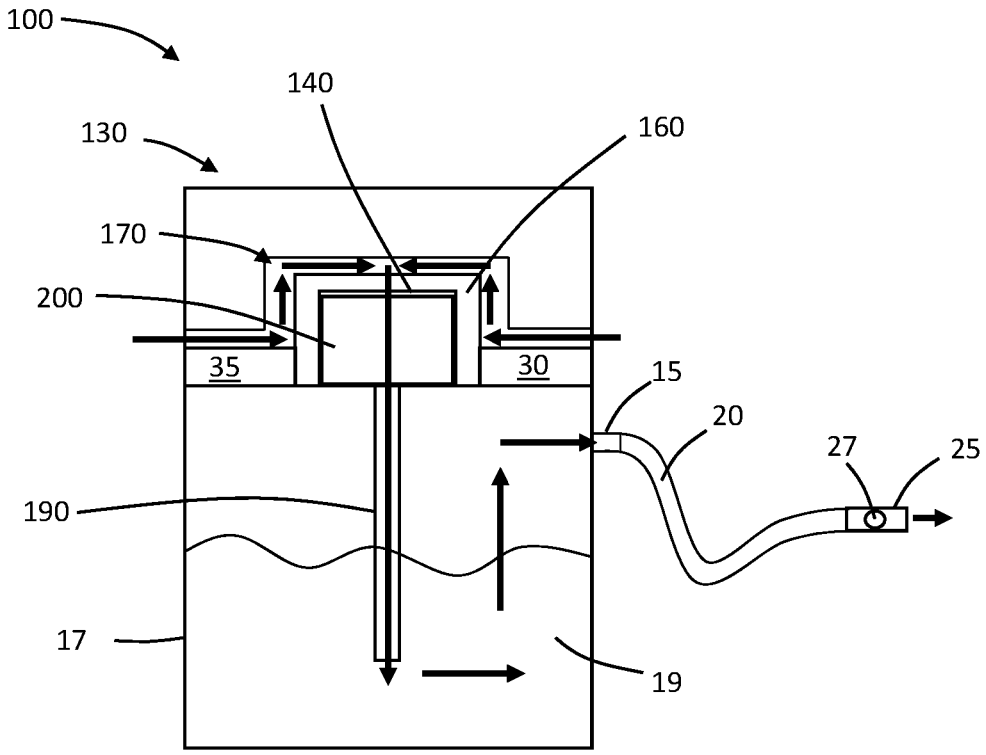


FIG. 1

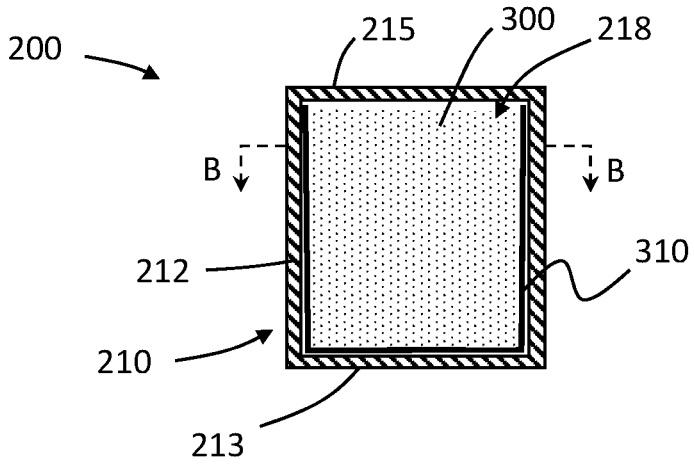


FIG. 2A

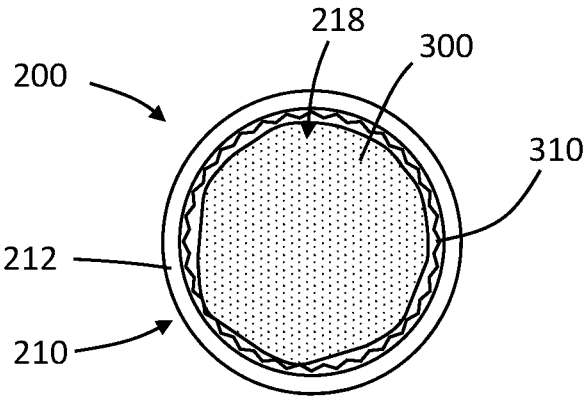


FIG. 2B

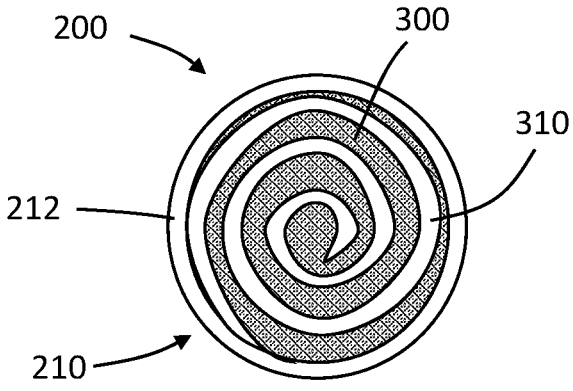


FIG. 2C

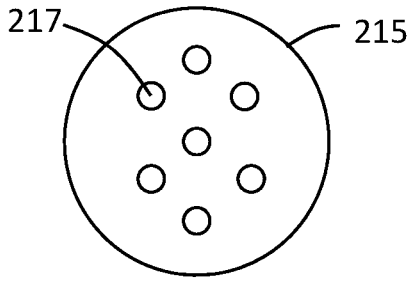


FIG. 3A

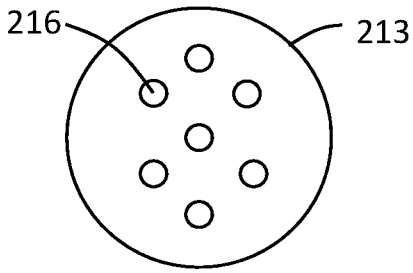


FIG. 3B

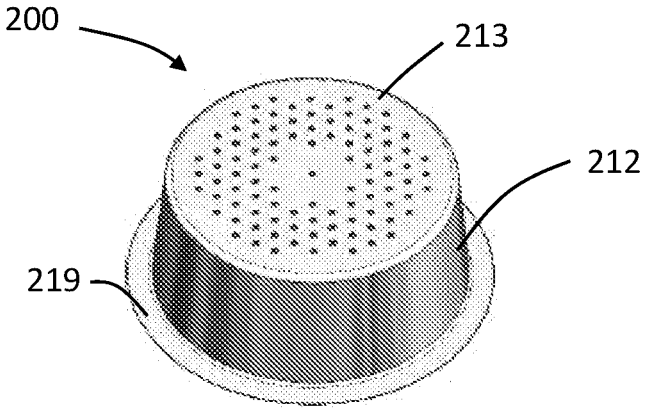


FIG. 4

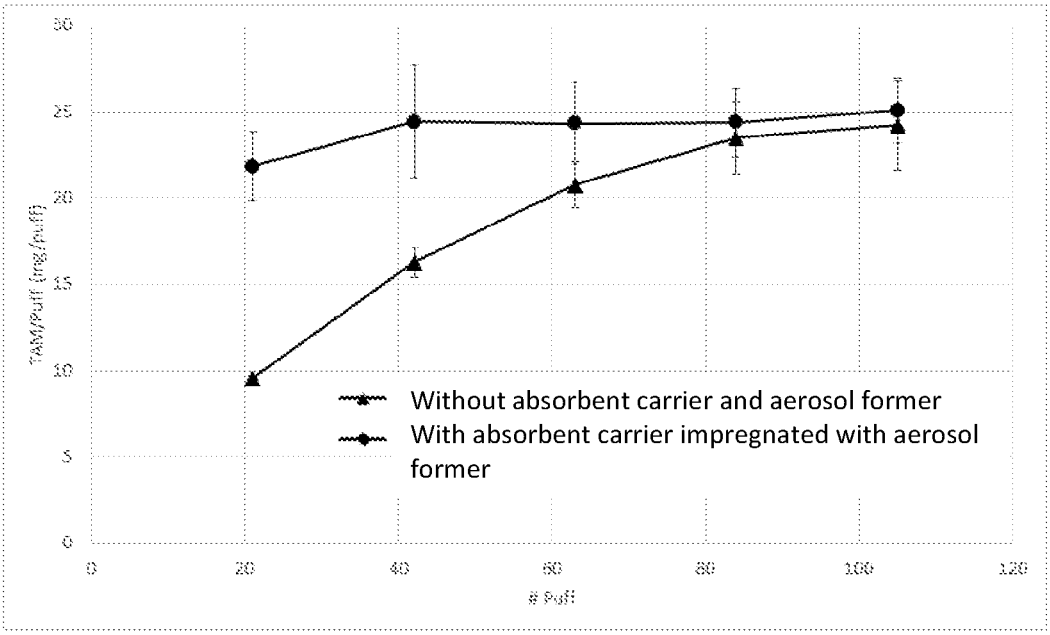

30
25
20
15
10
5
0
0
20
40
60
80
100
120
Puff
Without absorbent carrier and aerosol former
With absorbent carrier impregnated with aerosol former

FIG. 5

SHISHA CARTRIDGE WITH ABSORBENT CARRIER

[0001] This disclosure relates to shisha devices and to cartridges comprising an aerosol-forming substrate for use in shisha devices; and more particularly, to an absorbent carrier impregnated with an aerosol former for use in such cartridges.

[0002] Traditional shisha devices are used to smoke tobacco and are configured such that vapor and smoke pass through a water basin before inhalation by a consumer. Shisha devices may include one outlet, or more than one outlet so that the device may be used by more than one consumer at a time. Use of shisha devices is considered by many to be a leisure activity and a social experience.

[0003] The tobacco used in shisha devices may be mixed with other ingredients to, for example, increase the volume of the vapor and smoke produced, to alter flavor, or both. Charcoal pellets are typically used to heat the tobacco in a traditional shisha device, which may cause full or partial combustion of the tobacco or other ingredients. Additionally, charcoal pellets may generate harmful or potentially harmful products, such as carbon monoxide, which may mix with the shisha vapor and pass through the water basin.

[0004] Some shisha devices have been proposed that use electric heat sources to consume the tobacco to, for example, avoid by-products of burning charcoal or to improve the consistency with which the tobacco is heated. Other shisha devices have been proposed that employ e-liquids rather than tobacco. Shisha devices that employ e-liquids eliminate combustion by-products but deprive shisha consumers of the traditional tobacco-based experience.

[0005] Other shisha devices have been proposed that employ electric heaters to heat, but not combust, tobacco. Such heat-not-burn shisha devices reduce or eliminate by-products associated with combustion of tobacco. However, such devices may suffer a reduction in aerosol production compared to traditional charcoal-based shisha devices. A production of aerosol may refer to any of: visible aerosol, aerosol mass aerosol volume, or any combination thereof. Therefore, such devices may not meet a user's expectation of a traditional shisha experience. The reduced production of aerosol may be more pronounced during initial puffs. The reduced production of aerosol may be due to inefficient heat conduction between the heater and the tobacco-based substrate.

[0006] Some heat-not-burn shisha devices are used in combination with a substrate that substantially departs from the traditional tobacco-based molasses. For example, the substrate for electronic shishas may include dry stones or e-liquid. These substrates usually have a more homogenous morphology and a higher thermal conductivity than molasses. Molasses tends to be relatively more inhomogeneous and thus difficult to homogeneously heat. However, users may perceive non-molasses substrates as deteriorating the typical ritual and experience.

[0007] Inefficient heat conduction between an electric heater and the substrate may result in an overall low amount of total aerosol matter (TAM), particularly during the first ~20 puffs.

[0008] It would be desirable to provide an aerosol-generating system for electrically heated shisha devices that improves aerosolization. It would also be desirable to provide an aerosol-generating system for electrically heated shisha devices that increases TAM. It would further be desirable to provide an aerosol-generating system for electrically heated shisha devices that reduces the time until a user may take a first puff (time to first puff, also referred to as TT1P). It would further be desirable to provide an aerosol-generating system that allows for the use of traditional substrates (for example, molasses) while one or more of improving aerosolization, increasing TAM, and decreasing TT1P.

[0009] Various aspects of the invention relate to a shisha cartridge comprising a body defining a cavity and an internal cavity surface. The cartridge comprises an aerosol-forming substrate disposed in the cavity. The cartridge comprises an absorbent carrier disposed in the cavity. The absorbent carrier may form a sheet. The absorbent carrier is impregnated with a volatile aerosol former. The absorbent carrier may be placed adjacent the internal cavity surface, adjacent the aerosol-forming substrate, or adjacent both the internal cavity surface and the aerosol-forming substrate (for example, between the internal cavity surface and the aerosol-forming substrate). When the cartridge and the volatile aerosol former in the absorbent carrier are heated during use, the aerosol former evaporates to form aerosols.

[0010] According to an aspect of the present disclosure, an absorbent carrier impregnated with an aerosol former is placed inside the cartridge to improve aerosolization and the release of sensory active compounds from the aerosol-forming substrate. The absorbent carrier may be impregnated with one or more aerosol formers. Optionally, the absorbent carrier may also be impregnated with one or more sensory active compounds or precursors thereof. An aerosol former is a compound which, in use, facilitates formation of an aerosol. Such compounds include, although are not limited to glycerine and propylene glycol. A sensory active compound is a compound that allows triggering of a sensory response, for example a flavor.

[0011] According to some aspects, the absorbent carrier may be placed adjacent the internal surface of the cavity. For example, the absorbent carrier may be placed along the walls, such as side walls, at the bottom, or along the top of the cartridge, or any combination thereof, such that it comes in direct contact with a heated surface when the cartridge is in use. In a preferred embodiment, the absorbent carrier comes in direct contact with a heated surface when the cartridge is in use.

[0012] The term "sheet" is used here to refer to a material that is generally flat and has a width and height that are greater (for example, orders of magnitude greater) than the thickness of the material. An example of a sheet is a sheet of paper. It will be understood that the term "sheet" may also encompasses materials with a larger thickness than paper. A sheet of material may be bent, folded, crimped, scrunched, etc.

[0013] The absorbent carrier may assume any form or shape. The absorbent carrier may be flat, curved, rolled, folded, pleated, crimped, scrunched, bent, etc., or may include a combination of forms and shapes (for example, a flat portion and a pleated or bent portion).

[0014] When the cartridge and the absorbent carrier inside the cartridge are heated during use, the aerosol former impregnated into (for example, absorbed into) the absorbent carrier partially or entirely vaporize. The vaporized compounds contribute to the formation of the aerosol. The aerosol former may improve aerosolization by increasing the total aerosolized matter generated by the shisha device,

particularly during the first few puffs. As such, aerosol production more similar to charcoal-based shisha devices may be obtained with heat-not-burn shisha devices using the traditional substrate (molasses) and employing the absorbent carrier impregnated with an aerosol former. This helps to preserve as much as possible of the flavors, aromas, and the rituals associated with traditional shisha devices and substrates. Without the absorbent carrier impregnated with a volatile aerosol former, traditional molasses substrates may yield a relatively low amount of total aerosol mass in heat-not-burn shisha devices, particularly during the first few puffs, compared to a conventional, charcoal heated shisha device.

[0015] The term "aerosol" is used here to refer to a suspension of fine solid particles or liquid droplets in a gas, such as air, which may contain volatile flavor compounds.

[0016] The absorbent carrier may act as a carrier for volatile compounds such as the aerosol former. Use of the absorbent carrier impregnated with a volatile aerosol former in the cartridge may reduce the time to the first puff, increases the total aerosol matter (TAM), or both reduce the time to first puff and increase TAM. TAM is preferentially increased particularly during the first few puffs because it is usually the first few puffs wherein TAM is low with electrically heated shisha devices.

[0017] The cartridge may be of any suitable shape. For example, the cartridge may have a shape configured to be received by a shisha device. The shisha device is configured to heat the aerosol-forming substrate and the absorbent carrier in the cartridge. The device may be configured to heat the absorbent carrier and the aerosol-forming substrate in the cartridge by conduction. The cartridge is preferably shaped and sized to allow contact with, or minimize distance from, a heating element of shisha device to provide efficient heat transfer from the heating element to the aerosol-generating substrate in the cartridge. The heat may be generated by any suitable mechanism, such as by resistive heating or by induction. In order to facilitate inductive heating, the cartridge may be provided with a susceptor. For example, the cartridge body may be made from a material (for example, aluminum) that is capable of acting as a susceptor, or a susceptor material may be provided within the cavity of the cartridge. A susceptor material may be provided within the cavity of the cartridge in any form, for example a powder, a solid block, shreds, etc.

[0018] The cartridge may have a substantially cuboidal shape, cylindrical shape, frustro-conical shape, or any other suitable shape. Preferably, the cartridge has a generally cylindrical shape or a frustro-conical shape.

[0019] The cartridge may comprise any suitable body defining a cavity in which the aerosol-forming substrate is disposed. The body is preferably formed from one or more heat resistant materials, such as a heat resistant polymer or metal. Preferably, the body comprises a thermally conductive material. For example, the body may comprise any of: aluminum, copper, zinc, nickel, silver, any alloys thereof, and combinations thereof. Preferably, the body comprises aluminum.

[0020] The body may comprise a top, a bottom, and a sidewall. The body may comprise one or more part. For example, the sidewall and the bottom may be an integral single part. The sidewall and the bottom may be two parts configured to engage one another in any suitable manner. For example, the sidewall and the bottom may be configured to engage one another by threaded engagement or interference fit. The sidewall and the bottom may be two parts joined together. For example, the sidewall and the bottom may be joined together by welding or by an adhesive. The top and sidewall may be a single integral part. The sidewall and the top may be two parts configured to engage one another in any suitable manner. For example, sidewall and the top may be configured to engage one another by threaded engagement or interference fit. The sidewall and the top may be two parts joined together. For example, the sidewall and the top may be joined together by welding or by an adhesive. The top, sidewall and bottom may all be a single integral part. The top, the sidewall, and the bottom may be three separate parts configured to engage one another in any suitable manner. For example, the top, the sidewall, and the bottom may be configured to engage by threaded engagement interference fit, welding, or an adhesive.

[0021] The body defines a cavity in which the aerosol-forming substrate and the absorbent carrier impregnated with an aerosol former may be disposed. A portion of the body defining the cavity may comprise a heatable wall or surface. As used herein, "heatable wall" and "heatable surface" mean an area of a wall or a surface to which heat may be applied, either directly or indirectly. The heatable wall or surface may function as a heat transfer surface. For example, the heatable wall or surface of the portion of the body defining the cavity is a surface through which heat may be transferred from outside of the cavity through the body to the cavity or to an internal surface of the cavity.

[0022] The aerosol-forming substrate may occupy any suitable volume of the cavity. The volume of the aerosol-forming substrate in the cartridge may be varied by altering the amount, composition, shape, packing density, or format of the aerosol-forming substrate placed in the cartridge.

[0023] Any suitable aerosol-forming substrate may be provided in the cavity defined by the body of the cartridge. The aerosol-forming substrate is preferably a substrate capable of releasing volatile compounds. The aerosol-forming substrate is preferably a substrate capable of releasing compounds that may form an aerosol. The volatile compounds may be released by heating the aerosol-forming substrate. The aerosol-forming substrate may be solid or liquid or comprise both solid and liquid components. Preferably, the aerosol-forming substrate comprises at least a solid.

[0024] The aerosol-forming substrate may comprise nicotine. The nicotine containing aerosol-forming substrate may comprise a nicotine salt matrix. The aerosol-forming substrate may comprise plant-based material. The aerosol-forming substrate preferably comprises tobacco, and preferably the tobacco containing material contains volatile tobacco flavor compounds, which are released from the aerosol-forming substrate upon heating. The aerosol-forming substrate may comprise homogenized tobacco material. Homogenized tobacco material may be formed by agglomerating particulate tobacco. The aerosol-forming substrate may alternatively or additionally comprise a non-tobacco-containing material. The aerosol-generating substrate may comprise homogenized plant-based material.

[0025] The aerosol-forming substrate may comprise, for example, one or more of: powder, granules, pellets, shreds, spaghettis, strips or sheets containing one or more of: herb

leaf, tobacco leaf, fragments of tobacco ribs, reconstituted tobacco, homogenized tobacco, extruded tobacco and expanded tobacco.

[0026] The aerosol-forming substrate may comprise at least one aerosol former. The aerosol former in the substrate may be the same or different from the aerosol former impregnated into the absorbent carrier. The aerosol former may be any suitable known compound or mixture of compounds which, in use, facilitates formation of a dense and stable aerosol and which is substantially resistant to thermal degradation at the operating temperature of the shisha device. Suitable aerosol formers are well known in the art and include, but are not limited to: polyhydric alcohols, such as triethylene glycol, 1,3-butanediol and glycerine; 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 dimethyl tetradecanedioate. Particularly preferred aerosol formers are polyhydric alcohols or mixtures thereof, such as triethylene glycol, 1,3-butanediol and, most preferred, glycerine. The aerosol-forming substrate may comprise other additives and ingredients, such as flavorants. The aerosol-forming substrate preferably comprises nicotine and at least one aerosol former. In some embodiments, the aerosol former is glycerine or a mixture of glycerine and one or more other suitable aerosol formers, such as those listed above.

[0027] The aerosol-forming substrate may comprise any suitable amount of an aerosol former. For example, the aerosol former content may be equal to or greater than 5% on a dry weight basis, and preferably between greater than 30% by weight on a dry weight basis. The aerosol former content may be less than about 95% on a dry weight basis. Preferably, the aerosol former content is up to about 55%.

[0028] The aerosol-forming substrate may be provided on or embedded in a thermally stable carrier. The term "thermally stable" is used here to indicate a material that does not substantially degrade at temperatures to which the substrate is typically heated (for example, about 150° C. to about 300° C.). The thermally stable carrier may be separate and distinct from the absorbent carrier. The thermally stable carrier may be used to provide support for the aerosol-forming substrate (for example, molasses). The aerosol-forming substrate and thermally stable carrier may be disposed in the center of the cartridge. The absorbent carrier, on the other hand, may be used as a carrier for an aerosol former. The absorbent carrier and the aerosol former may be placed adjacent the side walls, bottom, or both, of the cartridge. The absorbent carrier and the aerosol former may at least partially surround the aerosol-forming substrate and thermally stable carrier.

[0029] The thermally stable carrier may comprise a thin layer on which the substrate deposited on a first major surface, on a second major surface, or on both the first and second major surfaces. The thermally stable carrier may be formed of, for example, paper or paper like material, a non-woven carbon fiber mat, a low mass open mesh metallic screen, or a perforated metallic foil or any other thermally stable polymer matrix. Alternatively, the thermally stable carrier may take the form of powder, granules, pellets, shreds, spaghettis, strips or sheets. The carrier may be a non-woven fabric or fiber bundle into which tobacco components have been incorporated. The non-woven fabric or fiber bundle may comprise, for example, carbon fibers, natural cellulose fibers, or cellulose derivative fibers.

[0030] In some examples, the aerosol-forming substrate comprises one or more sugars in any suitable amount. Preferably, the aerosol-forming substrate comprises invert sugar, which is a mixture of glucose and fructose obtained by splitting sucrose. Preferably, the aerosol-forming substrate comprises from about 1% to about 40% sugar, such as invert sugar, by weight. In some example, one or more sugars may be mixed with a suitable carrier such as cornstarch or maltodextrin.

[0031] In some examples, the aerosol-forming substrate comprises one or more sensory-enhancing agents. Suitable sensory-enhancing agents include flavorants and sensation agents, such as cooling agents. Suitable flavorants include natural or synthetic menthol, peppermint, spearmint, coffee, tea, spices (such as cinnamon, clove, ginger, or combination thereof), cocoa, vanilla, fruit flavors, chocolate, eucalyptus, geranium, eugenol, agave, juniper, anethole, linalool, and any combination thereof.

[0032] In some examples, the aerosol-forming substrate is in the form of a suspension. For example, the aerosol generating substrate may comprise molasses. As used herein, "molasses" means an aerosol-forming substrate composition comprising about 20% or more sugar. For example, the molasses may comprise at least about 25% by weight sugar, such as at least about 35% by weight sugar. Typically, the molasses will contain less than about 60% by weight sugar, such as less than about 50% by weight sugar.

[0033] Aerosol-forming substrates for use with traditional shisha devices are in the form of a molasses, which may be nonhomogeneous and may contain lumps and cavities. Such cavities prevent direct thermal contact between the substrate and a heated surface making thermal conduction particularly inefficient. As a consequence, electronic heated shisha devices tend to depart from traditional molasses by using, for example, e-liquids or dry stones. Due to the use of an absorbent carrier forming a sheet and impregnated with a volatile aerosol former in the cartridge as described in the present disclosure, more traditional aerosol-forming substrates, such as molasses, may be used to preserve the typical ritual and shisha experience while using electric heating.

[0034] Any suitable amount of aerosol-forming substrate (for example, molasses or tobacco substrate) may be disposed in the cavity. In some preferred embodiments, about 3 g to about 25 g of the aerosol-forming substrate is disposed in the cavity. The cartridge may include at least 6 g, at least 7 g, at least 8 g, or at least 9 g of aerosol-forming substrate. The cartridge may include up to 15 g, up to 12 g; up to 11 g, or up to 10 g of aerosol-forming substrate. Preferably, from about 7 g to about 13 g of aerosol-forming substrate is disposed in the cavity. More preferably, about 10 g of aerosol-forming substrate is disposed in the cavity. The aerosol-forming substrate may be disposed within a space defined by the absorbent carrier.

[0035] Preferably, the body of the cartridge has a length of about 15 cm or less. The cartridge may have an inner diameter of about 1 cm or more. The cartridge may have a heatable surface area in the cavity from about 25 cm^2 to about 100 cm^2, such as from about 70 cm^2 to about 100 cm^2. The volume of the cavity may be from about 10 cm^3 to about 50 cm^3; preferably from about 25 cm^3 to about 40 cm^3. In one embodiment, the body has a length of about 10 cm or less. The inner diameter of the body may be about 1.75 cm or more. The body may have a heatable surface area in the cavity from about 30 cm^2 to about 100 cm^2, such as from

about 70 cm^2 to about 100 cm^2. The volume of the cavity may be from about 10 cm^3 to about 50 cm^3; preferably from about 25 cm^3 to about 40 cm^3. In one embodiment, the body has a length in a range from about 3.5 cm to about 7 cm. The inner diameter of the body may be from about 1.5 cm to about 4 cm. The body may have a heatable surface area in the cavity from about 30 cm^2 to about 100 cm^2, such as from about 70 cm^2 to about 100 cm^2. The volume of the cavity may be from about 10 cm^3 to about 50 cm^3; preferably from about 25 cm^3 to about 40 cm^3. Preferably, the body is cylindrical or frustro-conical.

[0036] Preferably, the cartridge comprises an amount of aerosol-forming substrate that will provide a sufficient amount of aerosol for a shisha experience lasting from about 10 minutes to about 60 minutes; preferably from about 20 minutes to about 50 minutes; and more preferably from about 30 minutes to about 40 minutes.

[0037] The cartridge may comprise one or more ventilation holes. The ventilation holes may be inlets, outlets, or both. The ventilation holes may be disposed at the bottom, top, sides, or a combination thereof, of the cartridge. In some embodiments, the cartridge comprises one or more inlets and one or more outlets to allow air to flow through the aerosol-forming substrate when the cartridge is used with a shisha device. In some embodiments, the top of the cartridge may define one or more apertures to form the one or more inlets of the cartridge. The bottom of the cartridge may define one or more apertures to form the one or more outlets of the cartridge. Preferably, the one or more inlets and outlets are sized and shaped to provide a suitable resistance to draw (RTD) through the cartridge. In some examples, the RTD through the cartridge, from the inlet or inlets to the outlet or outlets, may be from about 10 mm H_2O to about 50 mm H_2O, preferably from about 20 mm H_2O to about 40 mm H_2O. The RTD of a specimen refers to the static pressure difference between the two ends of the specimen when it is traversed by an air flow under steady conditions in which the volumetric flow is 17.5 milliliters per second at the output end. The RTD of a specimen may be measured using the method set out in ISO Standard 6565:2002 with any ventilation blocked.

[0038] According to an aspect of the present disclosure, the cartridge includes an absorbent carrier impregnated with an aerosol former, disposed inside the cartridge. The absorbent carrier may form a sheet. The absorbent carrier material may be selected to absorb, adsorb, or both absorb and adsorb the volatile compound. The absorbent carrier material may be selected to act as a support that may hold the volatile compound in close proximity of or in contact with the heated surface of the cartridge. Preferably absorbent carrier material is capable of holding the volatile compound in direct, homogenous contact with the heated surface of the cartridge. The absorbent carrier may at least partially surround the aerosol-forming substrate (for example, molasses).

[0039] According to an embodiment, the absorbent carrier is impregnated with one or more aerosol formers that may aid in forming aerosols as the absorbent carrier is heated. Suitable aerosol formers include, but are not limited to, polyols, glycol ethers, polyol ester, esters, and fatty acids. The aerosol former may comprise one or more of glycerol, propylene glycol, erythritol, 1,3-butylene glycol, tetraethylene glycol, triethylene glycol, triethyl citrate, propylene carbonate, ethyl laurate, triacetin, meso-Erythritol, a diacetin mixture, diethyl suberate, triethyl citrate, benzyl benzoate, benzyl phenyl acetate, ethyl vanillate, tributyrin, lauryl acetate, lauric acid, and myristic acid. Preferably, the aerosol former comprises compounds that are relatively highly volatile and exhibit relatively high hygroscopy. In some embodiments, the aerosol former comprises glycerol (for example, vegetable glycerine (VG)), propylene glycol, or a combination thereof.

[0040] The absorbent carrier may comprise any suitable amount of the one or more aerosol formers. For example, the absorbent carrier may include 0.3 g or greater, 0.5 g or greater, 0.8 g or greater, 1 g or greater, 1.2 g or greater, or 1.5 or greater of aerosol former. The absorbent carrier may include up to 8 g, up to 7 g, up to 6 g, up to 5.5 g, up to 5 g, up to 4.5 g, or up to 4 g of aerosol former. In one embodiment, the absorbent carrier includes between 0.5 and 5 g of aerosol former.

[0041] The one or more aerosol formers impregnated into (for example, absorbed into) the absorbent carrier may increase the number of condensation nuclei available at the beginning of the smoking experience. An increase in the number of condensation nuclei available at the beginning of the smoking experience may cause aerosol generation to start faster, and for more aerosol to be generated, particularly during the first few puffs. For example, the absorbent carrier impregnated with an aerosol former may increase the amount of aerosol to be generated during the first 5, first 10, first 15, first 20, or first 30 puffs.

[0042] The use of the aerosol formers impregnated into the absorbent carrier may also reduce the time it takes for the shisha device to be ready for the first puff (i.e., the time to first puff, or TT1P) that includes a suitable or desired TAM (usually about 15 mg/puff). For example, the TT1P may be approximately 17 minutes (including a 4 minute preheat time) when using cartridges employing a molasses without an absorbent carrier impregnated with an aerosol former. However, by using aerosol formers impregnated into the absorbent carrier to increase the amount of aerosols available during the first few puffs, the TT1P may be reduced by about 1 minute to about 15 minutes. In some embodiments, the (reduced) TT1P is about 5 minutes or greater, about 8 minutes or greater, or about 10 minutes or greater. The (reduced) TT1P may be to about 15 minutes, up to about 12 minutes, or up to about 10 minutes.

[0043] The absorbent carrier may be placed in direct contact with a surface of the cartridge directly heated by the shisha device. For example, the absorbent carrier may be placed in direct contact with an inside surface of the cartridge. The inside surface of the cartridge may be a bottom, a side wall, a top, or a combination thereof. The absorbent carrier may be placed around the periphery of the aerosol-forming substrate. Placement around the periphery of the aerosol-forming substrate allows for the effect of the aerosol former in the absorbent carrier to be targeted towards the first few puffs taken from the cartridge during use in a shisha device. In some embodiments, at least a portion of the absorbent carrier surrounds the substrate within the cartridge.

[0044] The absorbent carrier may have any suitable form or shape. For example, the absorbent carrier may include a cylindrical portion that at least partially lines the inside surface of the cylindrical cartridge wall, at least partially surrounds the aerosol-forming substrate, or both. The absorbent carrier may further include a portion that covers the bottom of the cartridge. The absorbent carrier may include

portions that are flat (for example, planar), curved, rolled, folded, pleated, crimped, scrunched, bent, etc., or may include a combination of forms and shapes (for example, a flat portion and a pleated or bent portion). In one embodiment, the absorbent carrier has a rolled shape. For example, the absorbent carrier may be layered with aerosol-forming substrate and rolled into a spiral cylinder shape that includes a plurality of alternating layers of absorbent carrier and aerosol-forming substrate. The rolled-up cylindrical shape may be placed inside the cartridge.

[0045] The absorbent carrier may be made from a porous material. In some embodiments, the absorbent carrier comprises fibers. For example, the absorbent carrier may be made from a refined cellulosic material. The term "refined cellulosic material" is used here to refer to a material that is cellulose-based (for example, derived from a plant) but has been processed (for example, refined) to remove compounds, to alter the chemical structure of the material, or both. The removed compounds may be compounds other than water such that the refining process includes steps other than or in addition to drying. Examples of suitable refined cellulosic materials for use in the absorbent carrier include paper, filter paper, paperboard, cardboard, rayon (for example, lyocell, viscose, modal), and the like. According to some embodiments, the absorbent carrier may include other fibrous materials, such as silk, wool, cotton, linen, etc.

[0046] The absorbent carrier may have any suitable thickness. For example, the absorbent carrier may have a thickness of about 0.1 mm or greater, about 0.2 mm or greater, about 0.5 mm or greater, or about 1 mm or greater. The absorbent carrier may have a thickness of up to about 5 mm, up to about 4 mm, up to about 3.5 mm, up to about 3 mm, up to about 2.5 mm, or up to about 2 mm. In one embodiment, the absorbent carrier has a thickness from about 0.1 mm to about 3 mm.

[0047] The absorbent carrier may have any suitable surface area. For example, the absorbent carrier may have a surface area of about 2 cm^2 or greater, about 3 cm^2 or greater, about 3.5 cm^2 or greater, about 4 cm^2 or greater, about 5 cm^2 or greater, about 6 cm^2 or greater, or about 8 cm^2 or greater. The absorbent carrier may have a surface area of up to about 50 cm^2, up to about 40 cm^2, up to about 30 cm^2, up to about 25 cm^2, up to about 20 cm^2, up to about 18 cm^2, up to about 15 cm^2, or up to about 10 cm^2. In one embodiment, the absorbent carrier has a surface area from about 4 cm^2 to about 20 cm^2.

[0048] The absorbent carrier may also include a layer of thermally conductive or inductive material. For example, the absorbent carrier may be coated or laminated with a thermally conductive or inductive material. Examples of suitable thermally conductive or inductive materials include various metals, such as aluminum, copper, zinc, nickel, silver, stainless steel, or a combination thereof. Susceptor materials may also comprise or be made of graphite, molybdenum, silicon carbide, niobium, INCONEL® alloys (austenitic nickel-chromium-based superalloys), metallized films, ceramics such as for example zirconia, transition metals such as for example Fe, Co, Ni, or metalloids components such as for example B, C, Si, P, Al. Such thermally conductive or inductive materials may act as a thermal bridge and provide more uniform temperature profile. Use of a thermally conductive or inductive material layer is preferred if the absorbent carrier is provided in a rolled-up form.

[0049] According to one embodiment, the cartridge comprises a body defining a cavity and an internal surface, and the cartridge contains the substrate and the absorbent carrier impregnated with the aerosol former within the cavity. The absorbent carrier may form a sheet. The absorbent carrier may be disposed at the bottom, top, sidewalls, or a combination thereof, of the cartridge. The cartridge may include at least 6 g, at least 7 g, at least 8 g, or at least 9 g; or up to 15 g, up to 12 g; up to 11 g, or up to 10 g of aerosol-forming substrate. The cartridge may include 0.3 g or greater, 0.5 g or greater, 0.8 g or greater, 1 g or greater, 1.2 g or greater, or 1.5 or greater; or up to 8 g, up to 7 g, up to 6 g, up to 5.5 g, up to 5 g, up to 4.5 g, or up to 4 g of one or more aerosol formers impregnated into the absorbent carrier. The absorbent carrier may be disposed below the substrate or surrounding (for example, at least partially surrounding) the substrate, or both. For example, the absorbent carrier may form a cup or pouch shape with the substrate disposed inside. In one embodiment, the absorbent carrier is disposed as alternating layers (for example, is rolled up) with the substrate. The absorbent carrier forming a sheet may be flat, curved, rolled, folded, pleated, crimped, scrunched, bent, etc., or may include a combination of forms and shapes (for example, a flat portion and a pleated or bent portion).

[0050] The cartridge may include a first removable seal covering the one or more inlets and a second removable seal covering the one or more outlets. The first and second seals are preferably sufficient to prevent air flow through the inlets and outlets to prevent leakage of the contents of the cartridge and to extend shelf life. The seal may comprise a peelable label of sticker, foil, or the like. The label, sticker, or foil may be affixed to the cartridge in any suitable manner, such as with an adhesive, crimping, welding, or otherwise being joined to the container. The seal may comprise a tab that may be grasped to peel or remove the label, sticker, or foil from the cartridge.

[0051] A shisha cartridge according to the present invention may be used with any suitable shisha device. Preferably, the shisha device is configured to sufficiently heat the aerosol-generating substrate in the cartridge to form an aerosol from the aerosol-forming substrate but not to combust the aerosol-forming substrate. For example, the shisha device may be configured to heat the aerosol-forming substrate to a temperature in a range from about 150° C. to about 300° C.; more preferably from about 180° C. to about 250° C. or from about 200° C. to about 230° C.

[0052] The shisha device may comprise a receptacle for receiving the cartridge. The shisha device comprises a heating element configured to contact or to be in proximity to the body of the cartridge when the cartridge is received in the receptacle. The heating element may form at least part of the receptacle. For example, the heating element may form at least a portion of the surface of the receptacle. The shisha cartridge may be configured to transfer heat from the heating element to the aerosol-forming substrate in the cavity by conduction. In some embodiments, the heating element comprises an electric heating element. In some embodiments, the heating element comprises a resistive heating component. For example, the heating element may comprise one or more resistive wires or other resistive elements. The resistive wires may be in contact with a thermally conductive material to distribute heat produced over a broader area. Examples of suitable conductive materials include alumi-

num, copper, zinc, nickel, silver, and combinations thereof. The heating element may form at least a portion of the surface of the receptacle.

[0053] The shisha device may comprise control electronics operably coupled to the heating element. The control electronics may be configured to control heating of the heating element. The control electronics may be configured to control the temperature to which the aerosol-forming substrate in the cartridge is heated. The control electronics may be provided in any suitable form and may, for example, include a controller or a memory and a controller. The controller may include one or more of an Application Specific Integrated Circuit (ASIC) state machine, a digital signal processor, a gate array, a microprocessor, or equivalent discrete or integrated logic circuitry. Control electronics may include memory that contains instructions that cause one or more components of the circuitry to carry out a function or aspect of the control electronics. Functions attributable to control electronics in this disclosure may be embodied as one or more of software, firmware, and hardware.

[0054] The electronic circuitry may comprise a microprocessor, which may be a programmable microprocessor. The electronic circuitry may be configured to regulate a supply of power. The power may be supplied to the heater element in the form of pulses of electrical current.

[0055] In some examples, the control electronics may be configured to monitor the electrical resistance of the heating element and to control the supply of power to the heating element depending on the electrical resistance of the heating element. In this manner, the control electronics may regulate the temperature of the resistive element.

[0056] The shisha device may comprise a temperature sensor, such as a thermocouple. The temperature sensor may be operably coupled to the control electronics to control the temperature of the heating element. The temperature sensor may be positioned in any suitable location. For example, the temperature sensor may be configured to insert into the cartridge when received within the receptacle to monitor the temperature of the aerosol-forming substrate being heated. In addition or alternatively, the temperature sensor may be in contact with the heating element. In addition or alternatively, the temperature sensor may be positioned to detect temperature at an aerosol outlet of the shisha device or a portion thereof. The sensor may transmit signals regarding the sensed temperature to the control electronics. The control electronics may adjust heating of the heating elements in response to the signal to achieve a suitable temperature at the sensor.

[0057] The control electronics may be operably coupled to a power supply. The shisha device may comprise any suitable power supply. For example, a power supply of a shisha device may be a battery or set of batteries. The batteries of the power supply may be rechargeable, removable and replaceable, or rechargeable and removable and replaceable. Any suitable battery may be used. For example, heavy duty type or standard batteries existing in the market, such as used for industrial heavy duty electrical power-tools. Alternatively, the power supply may be any type of electric power supply including a super or hyper-capacitor. Alternatively, the assembly may be connected to an external electrical power source, and electrically and electronically designed for such purpose. Regardless of the type of power supply employed, the power supply preferably provides sufficient energy for the normal functioning of the assembly for at least one shisha session until aerosol is depleted from the aerosol-forming substrate in the cartridge before being recharged or needing to connect to an external electrical power source. Preferably, the power supply provides sufficient energy for the normal functioning of the assembly for at least about 70 minutes of continuous operation of the device, before being recharged or needing to connect to an external electrical power source.

[0058] In one example, a shisha device includes an aerosol-generating element that comprises a cartridge receptacle, a heating element, an aerosol outlet, and a fresh air inlet. The cartridge receptacle is configured to receive a cartridge containing the aerosol-forming substrate and the absorbent carrier impregnated with an aerosol former. The cartridge may be as above described. The heating element may define at least part of a surface of the receptacle.

[0059] The shisha device comprises a fresh air inlet channel in fluid connection with the receptacle. In use, when the absorbent carrier inside the cartridge is heated, the impregnated aerosol formers in the absorbent carrier vaporize. Air flowing from the fresh air inlet channel through the cartridge becomes entrained with aerosol generated from the aerosol former components and aerosol-forming substrate in the cartridge.

[0060] Some electrically heated shisha devices employ pre-heated air and typically employ an airflow path such that the air travels in the vicinity of the heat source upon puffing. Further, some electrically heated shisha devices employ elements that increase radiation heat transfer by increasing the heated surface area.

[0061] The fresh air inlet channel may comprise one or more apertures through the cartridge receptacle such that fresh air from outside the shisha device may flow through the channel and into the cartridge receptacle through the one or more apertures. If a channel comprises more than one aperture, the channel may comprise a manifold to direct air flowing through the channel to each aperture. Preferably, the shisha device comprises two or more fresh air inlet channels.

[0062] As described above, the cartridge comprises one or more inlets formed in the housing to allow air flow through the chambers of the cartridge when in use. If the receptacle comprises one or more inlet apertures, at least some of the inlets in the cartridge may align with the apertures in the top of the receptacle. The cartridge may comprise an alignment feature configured to mate with a complementary alignment feature of the receptacle to align the inlets of the cartridge with the apertures of the receptacle when the cartridge is inserted into the receptacle.

[0063] Air that enters the cartridge may flow across or through, or both across and through the absorbent carrier impregnated with an aerosol former. Air that enters the cartridge may flow across or through the aerosol-forming substrate, entraining aerosol, and exiting the cartridge and receptacle via an aerosol outlet. From the aerosol outlet, the air carrying the aerosol enters a vessel of the shisha device.

[0064] The shisha device may comprise any suitable vessel defining an interior volume configured to contain a liquid and defining an outlet in the head-space above a liquid fill level. The vessel may comprise an optically transparent or opaque housing to allow a consumer to observe contents contained in the vessel. The vessel may comprise a liquid fill demarcation, such as a liquid fill line. The vessel housing may be formed of any suitable material. For example, the

vessel housing may comprise glass or suitable rigid plastic material. Preferably, the vessel is removable from a portion of the shisha assembly comprising the aerosol-generation element to allow a consumer to fill, empty or clean the vessel.

[0065] The vessel may be filled to a liquid fill level by a consumer. The liquid preferably comprises water, which may optionally be infused with one or more colorants, flavorants, or colorants and flavorants. For example, the water may be infused with one or both of botanical or herbal infusions.

[0066] Aerosol entrained in air exiting the aerosol outlet of the receptacle may travel through a conduit positioned in the vessel. The conduit may be coupled to the aerosol outlet of the aerosol generating element of the shisha assembly and may have an opening below the liquid fill level of the vessel, such that aerosol flowing through the vessel flows through the opening of the conduit, then through the liquid, into headspace of the vessel and exits through a headspace outlet, for delivery to a consumer.

[0067] The headspace outlet may be coupled to a hose comprising a mouthpiece for delivering the aerosol to a consumer. The mouthpiece may comprise an activation element, such as a switch activatable by a user, a puff sensor arranged to detect a user puffing on the mouthpiece, or both a switch activatable by the user and a puff sensor. The activation element is operably coupled to the control electronics of the shisha device. The activation element may be wirelessly coupled to the control electronics. Activation of the activation element may cause the control electronics to activate the heating element, rather than constantly supplying energy to the heating element. Activation of an activation element may cause the control electronics to activate the heating element, rather than constantly supplying energy to the heating element. Accordingly, the use of an activation element may serve to save energy relative to devices not employing such elements to provide on-demand heating rather than constant heating.

[0068] For purposes of example, one method for using a shisha device as described herein is provided below in chronological order. The vessel may be detached from other components of the shisha device and filled with water. One or more of natural fruit juices, botanicals, and herbal infusions may be added to the water for flavoring. The amount of liquid added should cover a portion of the conduit but should not exceed a fill level mark that may optionally exist on the vessel. The vessel is then reassembled to the shisha device. A portion of the aerosol generating element may be removed or opened to allow the cartridge to be inserted into the receptacle. The aerosol generating element is then reassembled or closed. The device may then be turned on. Turning on the device may initiate a heating profile of a heating element, to heat the absorbent carrier and the aerosol-forming substrate to a temperature at or above a vaporization temperature of the aerosol former impregnated in the absorbent carrier and the aerosol-forming substrate, but below a combustion temperature of the absorbent carrier and the aerosol-forming substrate. The aerosol former compounds impregnated in the absorbent carrier vaporize, generating an aerosol. The user may puff on the mouth piece as desired. The user may continue using the device until no more aerosol is visible or being delivered. In some embodiments, the device may be arranged to automatically shut off when the cartridge is depleted of usable aerosol-generating substrate. In some embodiments, the consumer may refill the device with a fresh cartridge after, for example, receiving the cue from the device that the aerosol-forming substrate in the cartridge is depleted or nearly depleted. If refilled with a fresh cartridge, the device may continue to be used. Preferably, the shisha device may be turned off at any time by a consumer by, for example, switching off the device.

[0069] The shisha device may have any suitable air management. In one example, puffing action from the user will create a suction effect causing a low pressure inside the device which will cause external air to flow through an air inlet of the device, into the fresh air inlet channel, and into the receptacle. The air may then flow through the cartridge in the receptacle to carry aerosol produced from the aerosol-forming substrate. The air with entrained aerosol then exits the aerosol outlet of the receptacle, flows through the conduit to the liquid inside the vessel. The aerosol will then bubble out of the liquid and into head space in the vessel above the level of the liquid, out the headspace outlet, and through the hose and mouthpiece for delivery to the consumer. The flow of external air and the flow of the aerosol inside the shisha device may be driven by the action of puffing from the user.

[0070] Reference will now be made to the drawings, which depict one or more aspects described in this disclosure. However, it will be understood that other aspects not depicted in the drawings fall within the scope and spirit of this disclosure. Like numbers used in the figures refer to like components. However, it will be understood that the use of a number to refer to a component in a given figure is not intended to limit the component in another figure labeled with the same number. In addition, the use of different numbers to refer to components in different figures is not intended to indicate that the different numbered components cannot be the same or similar to other numbered components. The figures are presented for purposes of illustration and not limitation. Schematic drawings presented in the figures are not necessarily to scale.

[0071] FIG. **1** is a schematic sectional view of a shisha device.

[0072] FIG. **2**A is a cross sectional side view of a cartridge with aerosol-forming substrate and an absorbent carrier forming a sheet and impregnated with an aerosol former.

[0073] FIG. **2**B is a cross sectional top view of a cartridge with aerosol-forming substrate and an absorbent carrier forming a sheet and impregnated with an aerosol former.

[0074] FIG. **2**C is a cross sectional top view of a cartridge with aerosol-forming substrate and an absorbent carrier forming a sheet in a rolled configuration, and impregnated with an aerosol former.

[0075] FIGS. **3**A and **3**B are schematic bottom and top views of a cartridge.

[0076] FIG. **4** is schematic perspective view of a cartridge.

[0077] FIG. **5** is a graphical representation of test data from Example 1.

[0078] FIG. **1** is a schematic sectional view of an example of a shisha device **100**. The device **100** includes a vessel **17** defining an interior volume configured to contain liquid **19** and defining a headspace outlet **15** above a fill level for the liquid **19**. The liquid **19** preferably comprises water, which may optionally be infused with one or more colorants, one or more flavorants, or one or more colorants and one or more flavorants. For example, the water may be infused with one or both of botanical infusions or herbal infusions.

[0079] The device **100** also includes an aerosol-generating element **130**. The aerosol-generating element **130** includes a receptacle **140** configured to receive a cartridge **200** containing an aerosol-generating substrate and an absorbent carrier forming a sheet and impregnated with an aerosol former. The aerosol-generating element **130** also includes a heating element **160** that forms at least one surface of the receptacle **140**. In the depicted embodiment, the heating element **160** defines the top and side surfaces of the receptacle **140**. The aerosol-generating element **130** also includes a fresh air inlet channel **170** that draws fresh air into the device **100**. In some embodiments, portion of the fresh air inlet channel **170** is formed by the heating element **160** to heat the air before the air enters the receptacle **140**. The pre-heated air then enters the cartridge **200**, which is also heated by heating element **160**, to carry aerosol generated by the aerosol former and the aerosol-generating substrate. The air exits an outlet of the aerosol-generating element **130** and enters a conduit **190**.

[0080] The conduit **190** carries the air and aerosol into the vessel **17** below the level of the liquid **19**. The air and aerosol may bubble through the liquid **19** and exit the headspace outlet **15** of the vessel **17**. A hose **20** may be attached to the headspace outlet **15** to carry the aerosol to the mouth of a user. A mouthpiece **25** may be attached to, or form a part of, the hose **20**.

[0081] An exemplary air flow path of the device, in use, is depicted by thick arrows in FIG. **1**.

[0082] The mouthpiece **25** may include an activation element **27**. The activation element **27** may be a switch, button or the like, or may be a puff sensor or the like. The activation element **27** may be placed at any other suitable location of the device **100**. The activation element **27** may be in wireless communication with the control electronics **30** to place the device **100** in condition for use or to cause control electronics to activate the heating element **160**; for example, by causing power supply **35** to energize the heating element **140**.

[0083] The control electronics **30** and power supply **35** may be located in any suitable position of the aerosol generating element **130** other than the bottom portion of the element **130** as depicted in FIG. **1**.

[0084] Referring to FIGS. **2**A-**2**C, a cartridge **200** has body **210** defining a cavity **218** in which an aerosol-forming substrate **300** and an absorbent carrier **310** forming a sheet impregnated with an aerosol former may be disposed. The body **210** includes a top **215**, bottom **213**, and a sidewall **212**. The body **210** may be formed from one or more parts. For example, the top **215** or bottom **213** may be removably attached from the sidewall **212** to allow the aerosol-forming substrate **300** and absorbent carrier **310** to be disposed in the cavity **218**.

[0085] The absorbent carrier **310** may be disposed along the side wall **212** and the bottom **213** of the cavity **218**. The absorbent carrier **310** may also be disposed along the top **215**, or along any combination of the bottom **213**, the top **215**, or the side wall **212**, or may cover any of these surfaces in part. In the example shown in FIG. **2**B, the absorbent carrier **310** has pleated sides that surround the perimeter of the aerosol-forming substrate **300**. FIG. **2**C shows an arrangement where the aerosol-forming substrate **300** and absorbent carrier **310** form a spiral cylinder shape that includes a plurality of alternating layers of absorbent carrier **310** and aerosol-forming substrate **300**. The rolled-up cylindrical shape is disposed inside the body **210** of the cartridge **200**.

[0086] The cartridge **200** has a heatable surface area inside the cavity **218**, which is a surface capable of transferring heat applied to the exterior of the body, for example, by a heating element of a shisha device, to the absorbent carrier **310** and the aerosol-forming substrate **300** in the cavity **218**.

[0087] Referring now to FIGS. **3**A and **3**B, the top **215** and bottom **213** of the body may have a plurality of apertures **217**, **216** to allow air flow through the cartridge, when the cartridge is in use. The apertures **216**, **217** of the top **215** and bottom **213** may be aligned. The cartridge **200** may also or alternatively include apertures along the sidewall **212**. The absorbent carrier **310** may be disposed along the bottom **213**, the top **215**, the side wall **212**, or a combination thereof, covering some or all of the apertures. The apertures **217**, **216** may further be blocked by a peelable seal or cover when the cartridge is stored prior to use.

[0088] FIG. **4** is a schematic perspective view of an exemplary cartridge **200**. The sidewall **212** defines a frustroconical shape. The bottom **213** defines a plurality of apertures. The top comprises a flange **219** that extends from the sidewall **212**. The flange **219** may rest on shoulder of a receptacle of a shisha device so that cartridge **300** may be readily removed from the receptacle after use by grasping the flange.

[0089] The specific embodiments described above are intended to illustrate the invention. However, other embodiments may be made without departing from the scope of the invention as defined in the claims, and it is to be understood that the specific embodiments described above are not intended to be limiting.

[0090] As used herein, the singular forms "a," "an," and "the" encompass embodiments having plural referents, unless the content clearly dictates otherwise.

[0091] As used herein, "or" is generally employed in its sense including "and/or" unless the content clearly dictates otherwise. The term "and/or" means one or all the listed elements or a combination of any two or more of the listed elements.

[0092] As used herein, "have," "having," "include," "including," "comprise," "comprising" or the like are used in their open-ended sense, and generally mean "including, but not limited to". It will be understood that "consisting essentially of," "consisting of," and the like are subsumed in "comprising," and the like.

[0093] The words "preferred" and "preferably" refer to embodiments of the invention that may afford certain benefits, under certain circumstances. However, other embodiments may also be preferred, under the same or other circumstances. Furthermore, the recitation of one or more preferred embodiments does not imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the disclosure, including the claims.

[0094] The term "substantially" as used here has the same meaning as "significantly," and can be understood to modify the term that follows by at least about 90%, at least about 95%, or at least about 98%. The term "not substantially" as used here has the same meaning as "not significantly," and can be understood to have the inverse meaning of "substantially," i.e., modifying the term that follows by not more than 10%, not more than 5%, or not more than 2%.

[0095] Any direction referred to herein, such as "top," "bottom," "left," "right," "upper," "lower," and other directions or orientations are described herein for clarity and brevity are not intended to be limiting of an actual device or system. Devices and systems described herein may be used in a number of directions and orientations.

EXAMPLES

Example 1

[0096] The effect of the absorbent carrier impregnated with an aerosol former on aerosol formation was evaluated. An absorbent carrier forming a sheet (cellulosic paper) with a surface area of 40 cm^2, impregnated with about 1.5 g of a 1:1 mixture of vegetable glycerine and propylene glycol was disposed inside a cartridge. The absorbent carrier had a cylindrical shape that was positioned adjacent the inside walls of the cartridge. The cartridge was then filled with 10 g of commercially available molasses (Al-Fakher) inside the cylinder of porous material. A control sample was prepared without the absorbent carrier impregnated with the aerosol former.

[0097] The cartridge was inserted into a testing shisha device, where the cartridge was heated using a ceramic resistive heating element with a set point temperature of 200° C. The set point temperature of the heater is selected to bring the molasses (between puffs) to a similar temperature as a charcoal operated shisha.

[0098] In order to improve the aerosolization process, a finned nozzle made of aluminum with an exit orifice of about 3 mm in diameter is placed at about 55 mm from the heating engine.

[0099] The generated aerosol is collected using a total of five Cambridge pads, and the weight of the pads is recorded before and after testing. At any given moment during the testing, only one of the pads collects the generated aerosol.

[0100] The total duration of the smoking test corresponds to 105 puffs. In order to achieve the desired puffing experience, four programmable dual syringe pumps (PDSP, available from Pomac B.V. in Tolbers, Netherlands) were used simultaneously to create the puffing regime. The puffing regime was as follows: the sample and the control are tested for 105 puffs. The number of puffs is divided into five consecutive parts of 21 puffs each, where the aerosol from each part is collected in a separate Cambridge pad. After every 21 puffs, a valve ensures that the aerosol is diverted to the correct Cambridge pad. As a consequence, the production of aerosol may be monitored as a function of time.

[0101] The results of total aerosol mass (TAM) collected over the first 21 puffs, and the total 105 puffs for the control and the sample are shown in TABLE 1 below and in FIG. **5**. The results for the first 21 puffs are calculated as mg/per puff, and the results for the total duration of the test (15 puffs) are given as an accumulated total mass in mg.

TABLE 1

TAM Results.

	Control (no absorbent carrier impregnated with an aerosol former)	Sample (with absorbent carrier impregnated with an aerosol former)
TAM (mg/puff), first 21 puffs	9.6 mg/puff	23.8 mg/puff
TAM (mg), 105 puffs	1980 mg	2670 mg

[0102] It was observed that a significant increase in aerosol generation was achieved during the first 21 puffs as well as throughout the experiment by the use of the absorbent carrier impregnated with an aerosol former. The total accumulated TAM during the test was also greater with the absorbent carrier impregnated with an aerosol former.

[0103] Thus, cartridges for shisha devices are described. Various modifications and variations of the invention will be apparent to those skilled in the art without departing from the scope and spirit of the invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are apparent to those skilled in the mechanical arts, chemical arts, and aerosol generating article manufacturing or related fields are intended to be within the scope of the following claims.

1. A shisha cartridge comprising:

a body comprising a cavity and an internal cavity surface;

an aerosol-forming substrate disposed in the cavity;

an absorbent carrier disposed in the cavity; and

an aerosol former impregnated into the absorbent carrier.

2. A shisha cartridge according to claim **1**, wherein the aerosol former comprises glycerine, propylene glycol, or a combination thereof.

3. A shisha cartridge according to claim **1**, wherein the absorbent carrier comprises from 0.1 g to 8 g of the aerosol former.

4. A shisha cartridge according to claim **1**, wherein the absorbent carrier is adjacent the internal cavity surface, the aerosol-forming substrate, or both the internal cavity surface and the aerosol-forming substrate.

5. A shisha cartridge according to claim **1**, wherein the absorbent carrier is in direct contact with the internal cavity surface.

6. A shisha cartridge according to claim **1**, wherein the absorbent carrier comprises refined cellulosic material.

7. A shisha cartridge according to claim **1**, wherein the absorbent carrier comprises paper.

8. A shisha cartridge according to claim **1**, wherein the absorbent carrier sheet is pleated.

9. A shisha cartridge according to claim **1**, wherein the absorbent carrier has a thickness of 0.1 mm to 5 mm.

10. A shisha cartridge according to claim **1**, wherein the absorbent carrier has a surface area of 2 cm^2 to 50 cm^2.

11. A shisha cartridge according to claim **1**, wherein the absorbent carrier and the aerosol-forming substrate form a spiral of alternating layers of absorbent carrier and aerosol-forming substrate.

12. A shisha cartridge according to claim **1**, wherein the absorbent carrier is lined with a thermally conductive or inductive material.

13. A shisha cartridge according to claim **1**, wherein the absorbent carrier forms a sheet.

14. A shisha cartridge according to claim **1**, wherein the absorbent carrier comprises a cylindrical portion disposed along an internal side wall of the cavity.

15. A shisha system comprising:

a shisha cartridge according to claim **1**; and

a shisha device comprising:

a receptacle for receiving the cartridge;

a heating element for heating the aerosol-generating substrate when the cartridge is received in the receptacle of the shisha device;

a vessel having a liquid fill level and defining a head space above the liquid fill level;

an aerosol conduit for conveying aerosol from the receptacle to below the liquid fill level in the vessel; and

an outlet in communication with the head space.

* * * * *