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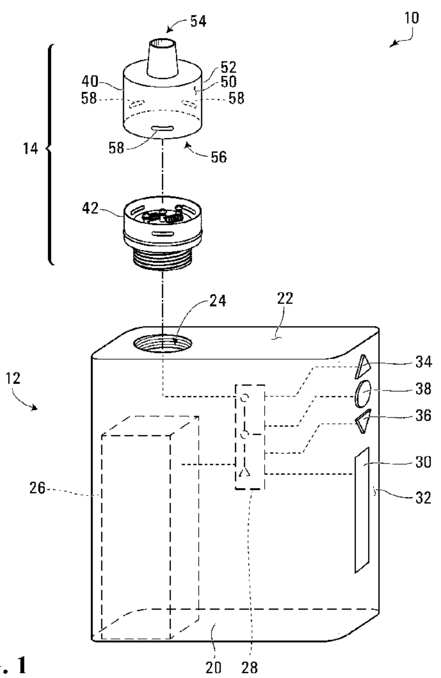

FIG. 1

(57) Abstract: A method of producing an inhalable vapour. The method involves placing an amount of a substance in a low-melting point solid phase on at least one heating element suspended to allow for free-flow of air around and through the at least one heating element. The substance contains active ingredients for producing a physiological effect in a human. The method further involves causing the at least one heating element to melt at least a portion of the substance in the solid phase into a liquid phase, absorbing at least some of the substance in the liquid phase in an absorbent material contained substantially entirely within the at least one heating element to hold at least a portion of the at least some of the substance in the liquid phase at a temperature that vapourizes the substance in the liquid phase into a vapour phase, and causing at least some of the substance in the vapour phase to be carried by air drawn through the absorbent material to enter a respiratory system of the human.

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METHOD AND APPARATUS FOR PRODUCING AN INHALABLE VAPOUR

Field

This disclosure relates generally to producing an inhalable vapour and more particularly to methods and apparatuses therefor.

Background

Some vapourizing devices for vapourizing marijuana derivatives or nicotine derivatives are limited to vapourizing these derivatives in their liquid form. Such vapourizing devices may produce vapours having an inconsistent dosage, or may produce vapours having low potency of active ingredients, or may lead to waste of the derivatives, or all of the above.

Summary

In one embodiment there is provided a method of producing an inhalable vapour. The method involves placing an amount of a substance in a low-melting point solid phase on at least one heating element suspended to allow for free-flow of air around and through the at least one heating element. The substance contains active ingredients for producing a physiological effect in a human. The method further involves causing the at least one heating element to melt at least a portion of the substance in the solid phase into a liquid phase, absorbing at least some of the substance in the liquid phase in an absorbent material contained substantially entirely within the at least one heating element to hold at least a portion of the at least some of the substance in the liquid phase at a temperature that vapourizes the substance in the liquid phase into a vapour phase, and causing at least some of the substance in the vapour phase to be carried by air drawn through the absorbent material to enter a respiratory system of the human.

Placing the amount of the substance in the solid phase on at least one heating element suspended to allow for free-flow of air may involve placing the amount of the substance in the solid phase on the at least one heating element suspended above a well having a bottom surface.

The method may further involve collecting a portion of the substance in the liquid phase not vapourized into the vapour phase on the bottom surface.

The method may further involve causing the portion of the substance in the liquid phase collected on the bottom surface to solidify back into the solid phase.

The method may further involve retrieving the portion of the substance in the solid phase on the well surface for re-use.

Causing the at least one heating element to melt at least a portion of the substance in the solid phase into the liquid phase may involve causing a temperature of the at least one heating element to be increased at a rate such that the substance in the solid phase is melted into the liquid phase without a combustion reaction.

Placing the amount of the substance in the solid phase on the at least one heating element may involve placing the amount of the substance in the solid phase on at least one coil operable to be heated when an electrical current is applied to the at least one coil.

Placing the amount of the substance in the solid phase on the at least one coil may involve placing the amount of the substance in the solid phase on a coil comprising a wire helically wound about a coil axis and defining a coil volume.

Absorbing the at least some of the substance in the liquid phase in the absorbent material contained substantially entirely within the at least one heating element may involve absorbing the at least some of the substance in the liquid phase in an absorbent material contained substantially entirely within the coil volume.

Placing the amount of the substance in the solid phase on the at least one heating element may involve placing an amount of the substance in the solid phase on each one of a plurality of heating elements.

Absorbing at least some of the substance in the liquid phase in the absorbent material may involve causing at least some of the substance in the liquid phase to be retained a distance from the at least one heating element such that the substance in the liquid phase is vapourized into the vapour phase without a combustion reaction.

Absorbing at least some of the substance in the liquid phase in the absorbent material may involve absorbing at least some of the substance in the liquid phase in at least one absorbent body.

Absorbing at least some of the substance in the liquid phase in the at least one absorbent body may involve absorbing at least some of the substance in the liquid phase in at least one absorbent body including a plurality of fiberglass threads carrying an oil.

Absorbing at least some of the substance in the liquid phase in the absorbent material contained substantially entirely within the at least one heating element may involve absorbing the at least some of the substance in the liquid phase in the plurality of fiberglass threads. Each of the plurality of fiberglass threads may be contained substantially entirely within the at least one heating element.

Placing the amount of the substance in the solid phase on the at least one heating element may involve placing an amount of a low-melting-point marijuana derivative in a solid phase on the at least one heating element.

Placing the amount of the low-melting-point marijuana derivative in the solid phase on the at least one heating element may involve placing a low-melting-point solid marijuana derivative having a tetrahydrocannabinol content of between about **70** to **99** percent by weight in a solid phase on the at least one heating element.

In another embodiment there is provided an apparatus for producing an inhalable vapour. The apparatus includes at least one heating element suspended to allow for free-flow of air thereabout and through the at least one heating element. The at least one heating element is configured to facilitate placement thereon, of an amount of a substance in a low-melting point solid phase, the substance containing active ingredients for producing a physiological effect in a human, the at least one heating element being operable to melt at least a portion of the substance in the solid phase into a liquid phase. The apparatus further includes an absorbent material for absorbing at least some of the substance in the liquid phase. The absorbent material is contained substantially entirely within the at least one heating element to hold at least a portion of the at least some of the substance in the liquid phase at a temperature that vapourizes the substance in the liquid phase into a vapour phase. The apparatus further includes an enclosure enclosing the at least one heating element and having an air inlet and an air outlet for enabling air to be drawn through the air inlet and through the absorbent material such that at least some of the substance in the vapour phase is carried by the air drawn through the absorbent material and out of the air outlet for inhalation into a respiratory system of the human.

The apparatus may further include a well having a bottom surface, wherein the at least one heating element is suspended above the well such that the bottom surface is configured to collect a portion of the substance in the liquid phase not vapourized into the vapour phase.

The bottom surface may be spaced from the at least one heating element by a distance such that the bottom surface is operable to cool the portion of the substance in the liquid phase collected on the bottom surface.

The bottom surface may be further operable to solidify the portion of the substance in the liquid phase back into the solid phase for retrieval.

The at least one heating element being operable to melt the substance in the solid phase into the liquid phase may include the at least one heating element being operable to increase temperature at a rate such that the substance in the solid phase is melted into the liquid phase without a combustion reaction.

Each of the at least one heating element may include a respective coil operable to be heated when an electrical current is applied to the coil.

The coil may include a wire helically wound about a coil axis and defining a coil volume.

The coil may have a coil diameter of about **2**mm to about **6**mm.

The coil may have a coil length of about **6**mm to about **10**mm.

The absorbent material being contained substantially entirely within the at least one heating element may include the absorbent material being contained substantially entirely within the coil volume.

The coil may further include a first wire end operably configured to be electrically connected to a negative contact and a second wire end operably configured to be electrically connected to a positive contact to receive the electrical current.

The wire may be helically wound for at least about **3** coil wraps to at least about **20** coil wraps.

The wire may be helically wound for **10** coil wraps.

The wire may be formed from an alloy of at least iron, chromium and aluminium.

The wire may be formed from Kathanl™.

The wire may be formed from an alloy of at least nickel and chromium.

The wire may be formed from titanium.

The wire may have a diameter of about **20** AWG to about **38** AWG.

The wire may have a diameter of about **22** AWG.

The at least one heating element may include a plurality of heating elements.

The at least one heating element may include two heating elements.

The absorbent material may hold the at least some of the substance in the liquid phase by retaining a portion of the at least some of the substance in the liquid phase a distance from the at least one heating element such that the substance in the liquid phase is vapourized into the gas phase without a combustion reaction.

The absorbent material may include at least one absorbent body.

The at least one absorbent body may include plurality of fiberglass threads carrying an oil.

The absorbent material being contained substantially entirely within the at least one heating element may include each of the plurality of fiberglass threads of the at least one absorbent body being contained substantially entirely within the at least one heating element.

The at least one absorbent body may be shaped into generally an elongate pellet shape.

The at least at least one absorbent bodies may have a body density of about **0.5** grams per cm^3 to about **0.7** grams per cm^3.

The at least one absorbent body may include a plurality of absorbent bodies. Each of the plurality of absorbent bodies may be contained substantially entirely within the at least one heating element.

The substance may include a low-melting-point marijuana derivative.

The low-melting-point solid marijuana derivative may have a tetrahydrocannabinol content of between about **70** to about **99** percent by weight.

<u>Description of the Figures</u>

Figure **1** is an exploded view of an electronic vaporizer comprising an atomizer and a modifier according to an illustrative embodiment;

Figure **2** is a side perspective view of a base of the atomizer of Figure **1**;

Figure **3** is an exploded view of an electronic contact disposed on a bottom surface of a well of the base of the atomizer of Figure **2**;

Figure **4** is a top view of the base of the atomizer of Figure **2**;

Figure **5** is a side perspective view of a heating element of the atomizer of Figure **2**;

Figure **6** is an end view of the heating element of Figure **5**; and

Figure **7** is a sectional view of the atomizer of Figure **1**.

Detailed Description

Referring to Figure **1**, an electronic vaporizer system according to a first embodiment is shown generally at **10**. The system **10** generally includes a power source or a modifier **12** and an atomizer **14**.

Modifier

The modifier **12** includes a base **20** having a first receptacle **24** for receiving the atomizer **14** on an end **22** of the base **20**. The base **20** further includes a second receptacle **26** for receiving and holding at least one battery (not shown) to supply power to a power circuit **28** for supplying electrical power to the atomizer **14**.

The power circuit **28** includes an ohmmeter operable to measure a resistance of the atomizer **14,** a voltmeter operable to measure a voltage applied to the atomizer **14**, an ammeter operable to measure an electrical current supplied to the atomizer **14** and a wattmeter operable to measure electric power supplied to the atomizer **14**. Indication of the resistance, voltage, current and power may be provided on a display **30** on a side **32** of the modifier **12**, for example. Increasing or decreasing power buttons **34** and **36** and a control button **38** may also be provided on the side **32** of the modifier **12** to allow user selection of an amount of electrical power to be supplied to the atomizer **14**, and user actuation of the modifier **12**.

Atomizer

Still referring to Figure **1**, the atomizer **14** includes a cap shown generally at **40** and a base shown generally at **42**.

The cap **40** includes a cap wall **50** defining a generally cylindrical nozzle **52** having an air outlet opening **54** and an annular bottom opening **56** adapted to fit the cap **40** to the base **42**. The cap wall **50** further includes at least one cap air inlet opening **58**. For example, in the embodiment shown in Figure **1**, there may be three cap air inlet openings **58**.

Referring now to Figure **2**, the base **42** includes a threaded coupling portion **60** for coupling the base **42** to the receptacle **26** of the modifier **12** shown in Figure **1**. Once the base **42** is fully received in the modifier **12** such that electrical contacts (not shown) of the modifier **12** are electrically coupled to electrical contacts (not shown) of the atomizer **14**, the modifier **12** is operable to deliver power to the atomizer **14** by actuation of the control button **38** on the side **32** of the modifier **12**.

The base **42** further includes a cylindrical body portion **62** defining a heating chamber **64**. The body portion **62** includes a cylindrical wall **66** having an outer surface **68** dimensioned to be received in the annular bottom opening **56** of the cap **40** (shown in Figure **1**) securely. In some embodiments, the outer surface **68** may include an o-ring **70** in a groove in the outer surface **68**. The o-ring **70** may interact with ridges on an inside surface of the annular bottom opening **56** of the cap **40** (shown in Figure **1**) to enable the cap **40** to be securely coupled to the base **42** in a friction fit, for example.

The cylindrical wall **66** may have one or more base air inlet openings **72**. For example, in the embodiment shown in Figure **2**, there may be three base air inlets openings **72**. Each of the base air inlet openings **72** is configured to align with a corresponding cap air inlet opening **58** (shown in Figure **1**) in the cap **40** when the cap **40** is coupled to the base **42**. Alignment of air inlet openings **58** and **72** allows air to be drawn through the air inlet openings **58** and **72** into the base **42**, through the cap **40** (shown in Figure **1**) and out of the air outlet opening **54** (shown in Figure **1**) in the cap **40** when the system **10** is in operation.

The cap **40** may be rotated relative to the base **42** when the cap **40** is coupled to the base **42** to control the alignment of the base air inlet openings **72** with the corresponding cap air inlet openings **58** to control air flow through the heating chamber **64**. For example, if the cap air inlet openings **58** are completely aligned with the base air inlet openings **72**, then air flow would be significantly available. However, if the cap **40** is rotated such that the cap air inlet openings **58** are completely unaligned with the base air inlet openings **72**, resulting in a substantially sealed cap **40**, then air flow would be restricted or unavailable. Intermediate positions are also contemplated in the disclosed embodiments.

The heating chamber **64** includes a well shown generally at **76** including a bottom surface **78** from which first, second and third electrical contacts **80, 82** and **84** project upwardly. The first, second and third electrical contacts **80**, **82** and **84** are arranged in a generally linear configuration. The first and third contacts **80** and **84** are configured to be connected to a negative power supply terminal of the modifier **12** while the second contact **82** is configured to be connected to a positive power supply terminal of the modifier **12**. Consequently, any first electrical load connected between the first and second contacts **80** and **82** and any second electrical load connected between the second and third contacts **82** and **84** are connected to each other to form a parallel load circuit to which electrical power can be supplied by the modifier **12**.

Referring now to Figure **3**, the first contact **80** will be described in detail, with the understanding that the second contact **82** and the third contact **84** operate in a similar fashion. The first contact **80** includes cylindrical projection **90** having a cylindrical wall **92** defining an inner, axially threaded bore **94** and first and second aligned transversely extending openings **96** and **98** extending through the cylindrical wall **92** on generally opposite sides thereof. The axially threaded bore **94** is terminated by a seat **100** disposed in the threaded bore **94** slightly below the first and second aligned transversely extending openings **96** and **98**.

The first contact **80** further includes a fastener, which in this embodiment is a screw **102** having a shaft **103** with threads **104** and removably receivable in the threaded bore **94**. After a piece of wire associated with a heating element (described in greater detail below) is passed through the first and second aligned transverse openings **96** and **98**, such as shown in Figure **3**, for example, threads **104** of the screw **102** can be engaged with threads **106** in the threaded bore **94** such that tightening of the screw **102** in the threaded bore **94** causes an end **106** of the screw **102** to bear upon a portion of the wire passing through the threaded bore **94**, thereby clamping the wire down on the seat **100** to secure the wire to the first contact **80**. The first and third contacts **80** and **84** are intended to hold a single wire portion, while the second contact **82** is intended to hold two wire portions simultaneously extending through the first and second aligned transversely extending openings.

Referring to Figure **4**, the heating chamber **64** may, in the embodiment shown, hold first and second heating elements **110** and **112** comprised of coils of heating wire. A first coil **120** of the first heating element **110** has first and second wire ends **122** and **124** which are connected to the first and second contacts **80** and **82** respectively, and a second coil **126** of the second heating element **112** comprises third and fourth wire ends **128** and **130** which are connected to the second and third contacts **82** and **84** respectively. Further, the first and second heating elements **110** retain first and second absorbent materials **114** and **116** respectively contained substantially entirely within the heating elements **110** and **112**. In other embodiments, the heating chamber **64** may have more than two heating elements or only a single heating element.

Referring now to Figure **5**, the first heating element **110** and the first absorbent material **114** will be described in detail, with the understanding that the second heating element **112** and the second absorbent material **116** are generally the same.

Referring to Figure **5**, the coil **120** of the first heating element **110** may be formed by helically winding a wire **150** about **7** to about **10** wraps around a coil axis **152** such that the wire **150** defines a generally cylindrical volume coil volume **154** having a coil length **156** and a coil diameter **158**. In other embodiments, the coil **120** may have more or less wraps, such that it may be helically wound to include about **3** coil wraps to about **20** coil wraps, for example. As the number of coil wraps increase, the resistance of the first heating element **110** increases.

In other embodiments, the wire **150** may be wound in other ways, such that it defines a generally rectangular form or a generally triangular from, for example, to define the coil **120** and the coil volume **154**. In the embodiment shown, the coil diameter **158** is about **4**mm and the coil length **156** is about **7**mm. In other embodiments, the coil diameter **158** may range between about **2**mm to about **6**mm and the coil length **156** may range between about **6**mm to **10**mm. As the coil length **156** and the coil diameter **158** is increased, the resistance of the first heating element **110** increases.

In the embodiment shown, the first and second wire ends **122** and **124** of the coil **120** are each about **2**mm. In other embodiments, the first and second wire ends **122** and **124** may each range from about **0**.**5**mm to about **4**mm. As the length of the wire ends is increased, the resistance of the first heating element **110** also increases.

The wire **150** may be made from any resistance heating material. For example, in one embodiment, the wire **150** may be made from a metal alloy of iron, chromium and aluminium and may be specifically Kathanl™ wire. In other embodiments, the wire **150** may be made from a metal alloy of nickel and chromium or any other appropriate metal alloy. In yet further embodiments, the wire **150** may be made from titanium, or a metal alloy of titanium and some other substance. In the embodiment shown in Figure **4**, the wire **150** has a diameter of about **22** AWG. In other embodiments, the wire **150** may have a diameter of anywhere between about **20** AWG to about **38** AWG. As the diameter of the wire **150** used to form the coil **120** is increased, the resistance of the coil **120** decreases.

Still referring to Figure **5**, the first absorbent material **114** is positioned to be contained substantially entirely within the coil **120** of the first heating element **110**. In the embodiment shown, the first absorbent material **114** includes a first absorbent body **160** and a second absorbent body **162,** each having a generally elongated pellet shape, for example. In other embodiments, the first absorbent material **114** may be formed from a single absorbent body or more than two absorbent bodies. The absorbent bodies may further be of different shape configurations, such as a cylindrical shape, for example.

The first and second absorbent bodies **160** and **162** may be made from a plurality of flame-retardant fiberglass threads carrying an oil to prime the absorbent bodies for use in producing a vapour. For example, the first and second absorbent bodies **160** and **162** may be made from fiberglass threads derived from fiberglass rope manufactured by the Imperial Manufacturing Group under model no. GA**0159** and the first and second absorbent bodies **160** and **162** may carry a vegetable oil. The oil may facilitate formation and retention of the elongate pellet shape of the first and second absorbent bodies **160** and **162** and may further facilitate insertion of the first and second absorbent bodies **160** and **162** into the coil **120**. In some embodiments, the first and second absorbent bodies **160** and **162** may only be lightly coated with the oil.

The first and second absorbent bodies **160** and **162** are contained within the heating element **110** such that substantially each fiberglass thread of the plurality of fiberglass threads of both the first and second absorbent bodies **160** and **162** are contained substantially entirely within the coil volume **154** defined by the coil **120**. Each of the first and second absorbent bodies **160** and **162** may further be shaped to have a body density of between about **0.5** grams per cm^3 to about **0.7** grams per cm^3**.**

Referring back to Figure **2**, once the wire ends **122** and **124** of the first heating element **110** are securely coupled to, respectively, the negative first contact **80** and the positive second contact **82**, and the wire ends **128** and **130** of the second heating element **112** are securely coupled to the positive second contact **82** and negative third contact **84**, the heating elements **110** and **112** are suspended above the well **76** and away from the contacts **80**, **82** and **84** to allow for free-flow of air thereabout and through the heating elements **110** and **112**. Thus positioned, the first and second heating elements **110** define respective receiving surfaces **170** and **172** (shown in Figure **5**) configured for placement thereon of an amount of a vapourizable substance normally in a low-melting-point solid phase at room temperature.

The vapourizable substance may be a substance containing active ingredients for producing a physiological effect in a human. In some embodiments, the substance may be a low-melting-point solid marijuana derivative having a tertrahydrocannabinol (THC) content of between about **70** to about **99** percent by weight, for example. The substance may further have a melting point of about 50 degrees Celsius. The substance may be that which is commonly known as “shatter”, for example.

When the first wire end **122** of the first heating element **110** is secured to the negative first contact **80** and the second wire end **124** of the first heating element **110** is secured to the positive second contact **82**, an electrical circuit is formed by the first heating element **110** to connect the respective terminals of the power source of the modifier **12**. Similarly, when the third wire end **128** of the second heating element **112** is secured to the positive second contact **82** and the fourth wire end **130** of the second heating element is secured to the negative third contact **84**, an electrical circuit is formed by the second heating element **112** to connect the respective terminals of the power source of the modifier **12** in parallel to the electrical circuit formed by the first heating element **110**. Specifically, the heating elements **110** and **112** act as resistors to the power source of the modifier **12** and thus the coils **120** and **126** are heated by an application of an electrical current from the power source, by actuation of the control button **38** of the modifier **12**, for example. The precise supply of electrical current may be controlled by actuation of the increasing and decreasing power buttons **36** or **34**, for example. When the first and second heating elements **110** and **112** are heated, they are operable to reach a temperature where at least a portion of the substance in the low-melting-point solid phase is melted into a liquid phase.

The resistance of the first heating element **110** and the second heating element **112** is dependent on several factors, including the composition of the wire **150**, the gauge of the wire **150**, coil length **156**, the coil diameter **158**, the number of wraps of the coil **120** and **126**, the length of the wire ends **122**, **124**, **128** and **130**, etc. The specific resistance of the heating elements **110** and **112** are configured to provide a rate of melting of the substance in the solid phase that is sufficient to cause the melted substance in the liquid phase to be retained by the absorbent materials **114** and **116** without saturating the absorbent materials **114** and **116**, to minimize the amount of the low-melting point substance in the liquid phase allowed to drip on the bottom surface **78** of the heating chamber **64**, and to allow enough of the substance in the liquid phase to be released into a vapour phase by air drawn through the heating chamber **64**. In the embodiment shown, the resistance of each of the first and second heating elements **110** and **112** is about **0.8** ohms and the parallel electrical connection of the coils causes the equivalent resistance to be about **0.4** ohms. In some embodiments, the resistance of the first heating element **110** and the second heating element **112** may be different from each other. In some embodiments, the resistance of the first heating element **110** or the second heating element **112** may range from between about **0.6** and about **1.0** ohms. In one embodiment, application of about **3** to about **4.5** volts by the modifier **12** causes the heating elements **110** and **112** to each increase in temperature at a rate such that at least a portion of the substance in the solid phase is melted into the liquid phase without a combustion reaction. For example, the first heating element **110** may increase to a temperature of about **100** to about **300** degrees Celsius within about **2** to about **5** seconds.

Referring now to Figures **6** and **7**, the function of the first heating element **110** and the first absorbent material **114** will be described in detail, with the understanding that the second heating element **112** and the second absorbent material **116** function in substantially the same manner. When a portion of the substance in the low-melting-point solid phase placed of the receiving surface **170** is melted into a liquid phase, the substance in the liquid phase flows from the receiving surface **170** of the first heating element **110** into the coil volume **154** where at least some of the substance in the liquid phase is absorbed into the first absorbent material **114.**

The first absorbent material **114** holds at least some of the substance in the liquid phase at a temperature that enables vapourization the substance in the liquid phase into a vapour phase. Specifically, referring to Figure **6**, the first absorbent material **114** retains at least some of the substance in the liquid phase between a first distance **180** and a second, radial distance **182** from the first heating element **110**. The first distance **180** corresponds to a distance between the first heating element **110** and the first absorbent material **114**, and the second distance **182** corresponds to a radial distance between the first heating element **110** and a center of the first absorbent material **114**. By holding the substance in the liquid phase at least at the first distance **180** from the heating coil, the amount of heat applied to the substance in the liquid phase by the first heating element **110** is reduced, which facilitates vapourization of the substance in the liquid phase into the vapour phase without a combustion reaction. Further, as the first absorbent material **114** has a thermal resistance greater than air, the rate of heat flow from the first heating element **110** is reduced, which reduces the amount of heat applied to the substance in the liquid phase held by the first absorbent material **114** such that vapourization of the substance in the liquid phase into the vapour phase without a combustion reaction is further facilitated.

Referring now to Figure **7**, coupling the cap **40** to the base **42** forms an enclosure **190**, having aligned air inlet openings **58** and **72** and the air outlet opening **54**, enclosing the first heating element **110** (and second element **112**, not shown in Figure **7**). Application of negative pressure to the air outlet opening **54** by a mouth of a human draws air into the air inlet openings **58** and **72** and through the first absorbent material **114** (and the second absorbent material **116**, not shown in Figure **7**) such that at least some of the substance in the vapour phase is carried by the air drawn through the first absorbent material **114** and out of the air outlet opening **54** for inhalation into a respiratory system of the human.

Should a portion of the substance in the liquid phase flow through the first absorbent material **114** past a second surface **192** of the coil **120** and onto the bottom surface **78** of the well **76**, the substance in the liquid phase may collect on the bottom surface **78**. The bottom surface **78** is separated from the first heating element **110** by a distance **194** sufficient to enable the substance in the liquid phase collected on the bottom surface **78** to cool. Further, after the application of the electrical current to the first heating element **110** (and the second heating element **112**, not shown in Figure **7**) is halted, such as by release of the control button **38** of the modifier **12**, the well **76** allows the substance in the liquid phase collected on the bottom surface **78** to cool sufficiently such that it solidifies back into the low-melting-point solid phase. The substance in the solid phase on the bottom surface **78** may then be retrieved for re-use.

Referring to Figures **5** to **7**, a method of producing an inhalable vapour involves placing an amount of the substance in a low-melting point solid phase on at least one of the receiving surface **170** of the first heating element **110** and the receiving surface **172** of the second heating element **112**. In some embodiments, separate amounts of the substance in the low-melting point solid phase can be placed on both the receiving surface **170** of the first heating element **110** and the receiving surface **172** (shown in Figure **5**) of the second heating element **112**.

Then, the cap **40** may be coupled to the base **42** to form the enclosure **190** enclosing the first and the second heating elements **110** and **112**, the enclosure **190** having aligned air inlet openings **58** and **72** and the air outlet opening **54** to allow air to flow through the enclosure **190** and through the first and second heating elements **110** and **112**.

The method then involves causing the first heating element **110** and the second heating element **112** to increase in temperature to melt at least a portion of the substance in the low-melting point solid phase placed on the receiving surface **170** and **172** into a liquid phase. For example, the method may involve application of an electrical current to the first and second heating elements **110** and **112** by a power source, such as by actuation of the control button **38** of the modifier **12** (shown in Figure **1**), which causes the first and second heating elements **110** and **112** to increase in temperature.

Once a portion of the substance in the solid phase is melted into a liquid phase, at least some of the substance in the liquid phase is absorbed in the first absorbent material **114** contained substantially entirely within the first heating element **110** and the second absorbent material **116** contained substantially entirely within the second heating element **112**. The absorbent materials **114** and **116** then hold at least some of the substance in the liquid phase in locations within the heating elements where the temperature is such that the substance in the liquid phase is easily vapourized into a vapour phase.

The method then involves causing at least some of the substance in the vapour phase to be carried by air drawn through the absorbent material **114** and the second absorbent material

116 to enter the respiratory system of the human to produce a physiological effect. For example, application of negative pressure to the air outlet opening **54** by a mouth of the human causes air to be drawn into the air inlet openings **58** and **72**, through the absorbent materials **114** and **116**, out of the air outlet opening **54**, and into the respiratory system of the human.

Any portion of the substance in the liquid phase not vapourized may possibly flow through the first absorbent material **114** past the second surface **192** (shown in Figure **6**) of the first heating element **110** and through the second absorbent material **116** past a second surface of the second heating element **112**, where it may collect and be cooled on the bottom surface **78** of the well **76** such that the substance collected on the bottom surface **78** solidifies back into the low-melting-point solid phase. For example, when the application of electrical current to the first and second heating elements **110** and **112** are stopped, such as by release of the control button **38** of the modifier **12**, the well **76** allows the substance in the liquid phase collected on the bottom surface **78** to cool sufficiently such that it solidifies back into the low-melting-point solid phase.

In some embodiments, the method may further involve causing the first and second heating elements **110** and **112** to increase in temperature before placing the substance in the low-melting point solid phase on the receiving surfaces **170** and **172** in a preparatory heating step. This preparatory heating step may remove substantially all of the oil carried by the absorbent bodies of the first and second absorbent materials **114** and **116**, for example.

Since the first and second heating elements **112** and **110** are configured for direct application of the substance containing active ingredients in the solid phase, the electronic vapourizor system **10** avoids the difficulties associated with applications of substances containing active ingredients in the liquid phase, such as dosage inaccuracies and waste. For example, when substances containing active ingredients in liquid phase are applied to vapourizors, a portion of the substance in the liquid phase may flow rapidly through the heating element and the absorbent material and into the well, which may lead to inconsistencies in the amount of active ingredient vapourized even if a consistent volume of the substance in the liquid phase is applied. Further, it can difficult to retrieve the portion of the substances in the liquid phase which are not vapourized for re-use. Further, marijuana and nicotine derivatives in the solid form typically comprise tertrahydrocannabinol and nicotine content, respectively, at a higher concentration than would be possible for these derivatives in liquid form, which enables the electronic vapourizor system **10** to produce vapours of greater potency from a smaller starting volume of material.

The method allows direct application of a marijuana, nicotine or other active ingredient containing solid phase derivative in a highly concentrated form in the system **10**, and direct vapourization thereof. This avoids the difficulties associated with applications of marijuana derivatives in liquid form, such as dosage inaccuracies and waste. Further, derivatives in the solid form typically have active ingredient content at a higher concentration than would be possible for derivatives in liquid form, which enables the method to produce vapours of greater potency from a smaller starting volume of material.

While specific embodiments of the invention have been described and illustrated, such embodiments should be considered illustrative of the invention only and not as limiting the invention as construed in accordance with the accompanying claims.

EMBODIMENTS IN WHICH AN EXLCUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of producing an inhalable vapour, the method comprising:

placing an amount of a substance in a low-melting point solid phase on at least one heating element suspended to allow for free-flow of air around and through the at least one heating element, the substance containing active ingredients for producing a physiological effect in a human;

causing the at least one heating element to melt at least a portion of the substance in the solid phase into a liquid phase;

absorbing at least some of the substance in the liquid phase in an absorbent material contained substantially entirely within the at least one heating element to hold at least a portion of the at least some of the substance in the liquid phase at a temperature that vapourizes the substance in the liquid phase into a vapour phase; and

causing at least some of the substance in the vapour phase to be carried by air drawn through the absorbent material to enter a respiratory system of the human.

2. The method of claim **1**, wherein placing the amount of the substance in the solid phase on at least one heating element suspended to allow for free-flow of air comprises placing the amount of the substance in the solid phase on the at least one heating element suspended above a well having a bottom surface.

3. The method of claim **2**, further comprising collecting a portion of the substance in the liquid phase not vapourized into the vapour phase on the bottom surface.

4. The method of claim **3**, further comprising causing the portion of the substance in the liquid phase collected on the bottom surface to solidify back into the solid phase.

5. The method of claim **4**, further comprising retrieving the portion of the substance in the solid phase on the well surface for re-use.

6. The method of any one of claims **1** to **5**, wherein causing the at least one heating element to melt at least a portion of the substance in the solid phase into the liquid phase comprises causing a temperature of the at least one heating element to be increased at a rate such that the substance in the solid phase is melted into the liquid phase without a combustion reaction.

7. The method of any one of claims **1** to **6**, wherein placing the amount of the substance in the solid phase on the at least one heating element comprises placing the amount of the substance in the solid phase on at least one coil operable to be heated when an electrical current is applied to the at least one coil.

8. The method of claim **7**, wherein placing the amount of the substance in the solid phase on the at least one coil comprises placing the amount of the substance in the solid phase on a coil comprising a wire helically wound about a coil axis and defining a coil volume.

9. The method of claim **8**, wherein absorbing the at least some of the substance in the liquid phase in the absorbent material contained substantially entirely within the at least one heating element comprises absorbing the at least some of the substance in the liquid phase in an absorbent material contained substantially entirely within the coil volume.

10. The method of any one of claims **1** to **9**, wherein placing the amount of the substance in the solid phase on the at least one heating element comprises placing an amount of the substance in the solid phase on each one of a plurality of heating elements.

11. The method of any one of claims **1** to **10**, wherein absorbing at least some of the substance in the liquid phase in the absorbent material comprises causing at least some of the substance in the liquid phase to be retained a distance from the at least one heating element such that the substance in the liquid phase is vapourized into the vapour phase without a combustion reaction.

12. The method of claim **1** or **11**, wherein absorbing at least some of the substance in the liquid phase in the absorbent material comprises absorbing at least some of the substance in the liquid phase in at least one absorbent body.

13. The method of claim **12**, wherein absorbing at least some of the substance in the liquid phase in the at least one absorbent body comprises absorbing at least some of the substance in the liquid phase in at least one absorbent body comprising a plurality of fiberglass threads carrying an oil.

14. The method of claim **13**, wherein absorbing at least some of the substance in the liquid phase in the absorbent material contained substantially entirely within the at least one heating element comprises absorbing the at least some of the substance in the liquid phase in the plurality of fiberglass threads, wherein each of the plurality of fiberglass threads is contained substantially entirely within the at least one heating element.

15. The method of any one of claims **1** to **14**, wherein placing the amount of the substance in the low-melting point solid phase on the at least one heating element comprises placing an amount of a low-melting-point marijuana derivative in a solid phase on the at least one heating element.

16. The method claim **15**, wherein placing the amount of the low-melting-point marijuana derivative in the solid phase on the at least one heating element comprises placing a low-melting-point solid marijuana derivative having a tetrahydrocannabinol content of between about **70** to **99** percent by weight in a solid phase on the at least one heating element.

17. An apparatus for producing an inhalable vapour, the apparatus comprising:

at least one heating element suspended to allow for free-flow of air thereabout and through the at least one heating element, the at least one heating element configured to facilitate placement thereon, of an amount of a substance in a low-melting point solid phase, the substance containing active ingredients for producing a physiological effect in a human, the at least one heating element being operable to melt at least a portion of the substance in the solid phase into a liquid phase;

an absorbent material for absorbing at least some of the substance in the liquid phase, the absorbent material being contained substantially entirely within the at least one heating element to hold at least a portion of the at least some of the substance in the liquid phase at a temperature that vapourizes the substance in the liquid phase into a vapour phase; and

an enclosure enclosing the at least one heating element and having an air inlet and an air outlet for enabling air to be drawn through the air inlet and through the absorbent material such that at least some of the substance in the vapour phase is carried by the air drawn through the absorbent material and out of the air outlet for inhalation into a respiratory system of the human.

18. The apparatus of claim **17**, further comprising a well having a bottom surface, wherein the at least one heating element is suspended above the well such that the bottom surface is configured to collect a portion of the substance in the liquid phase not vapourized into the vapour phase.

19. The apparatus of claim **18**, wherein the bottom surface is spaced from the at least one heating element by a distance such that the bottom surface is operable to cool the portion of the substance in the liquid phase collected on the bottom surface.

20. The apparatus of claim **19**, wherein the bottom surface is further operable to solidify the portion of the substance in the liquid phase back into the solid phase for retrieval.

21. The method of claim any one of claims **17** to **20**, wherein the at least one heating element being operable to melt the substance in the solid phase into the liquid phase comprises the at least one heating element being operable to increase temperature at a rate such that the substance in the solid phase is melted into the liquid phase without a combustion reaction.

22. The apparatus of any one of claims **17** to **21**, wherein each of the at least one heating element comprises a respective coil operable to be heated when an electrical current is applied to the coil.

23. The apparatus of claim **22**, wherein the coil comprises a wire helically wound about a coil axis and defining a coil volume.

24. The apparatus of claim **22** or **23**, wherein the coil has a coil diameter of about **2**mm to about **6**mm.

25. The apparatus of any one of claims **22** to **24**, wherein the coil has a coil length of about **6**mm to about **10**mm.

26. The apparatus of claim **22** to **25**, wherein the absorbent material being contained substantially entirely within the at least one heating element comprises the absorbent material being contained substantially entirely within the coil volume.

27. The apparatus of any one of claims **22** to **26**, wherein the coil further comprises a first wire end operably configured to be electrically connected to a negative contact and a second wire end operably configured to be electrically connected to a positive contact to receive the electrical current.

28. The apparatus of any one of claims **22** to **27**, wherein the wire is helically wound for at least about **3** coil wraps to at least about **20** coil wraps.

29. The apparatus of any one of claims **22** to **28**, wherein the wire is helically wound for **10** coil wraps.

30. The apparatus of any one of claims **22** to **29**, wherein the wire is formed from an alloy of at least iron, chromium and aluminium.

31. The apparatus of any one of claims **22** to **30**, wherein the wire is formed from KathanI™.

32. The apparatus of any one of claims **22** to **29**, wherein the wire is formed from an alloy of at least nickel and chromium.

33. The apparatus of any one of claims **22** to **29**, wherein the wire is formed from titanium.

34. The apparatus of any one of claims **22** to **33**, wherein the wire has a diameter of about **20** AWG to about **38** AWG.

35. The apparatus of any one of claims **22** to **34**, wherein the wire has a diameter of about **22** AWG.

36. The apparatus of any one of claims **17** to **35**, wherein the at least one heating element comprises a plurality of heating elements.

37. The apparatus of anyone of claims **17** to **36**, wherein the at least one heating element comprises two heating elements.

38. The apparatus of any one of claims **17** to **37**, wherein the absorbent material holds the at least some of the substance in the liquid phase by retaining a portion of the at least some of the substance in the liquid phase a distance from the at least one heating element such that the substance in the liquid phase is vapourized into the gas phase without a combustion reaction.

39. The apparatus of any one of claims **17** to **38**, wherein the absorbent material comprises at least one absorbent body.

40. The apparatus of claim **39**, wherein the at least one absorbent body comprises plurality of fiberglass threads carrying an oil.

41. The apparatus of claim **40**, wherein the absorbent material being contained substantially entirely within the at least one heating element comprises each of the plurality of fiberglass threads of the at least one absorbent body being contained substantially entirely within the at least one heating element.

42. The apparatus of any one of claims **39** to **41**, wherein the at least one absorbent body is shaped into generally an elongate pellet shape.

43. The apparatus of claim any one of claims **39** to **42**, wherein the at least at least one absorbent bodies has a body density of about **0.5** grams per cm^3 to about **0.7** grams per cm^3.

44. The apparatus of any one of claims **39** to **43**, wherein the at least one absorbent body comprises a plurality of absorbent bodies, and wherein each of the plurality of absorbent bodies are contained substantially entirely within the at least one heating element.

45. The apparatus of any one of claims **17** to **44**, wherein the substance comprises a low-melting-point marijuana derivative.

46. The apparatus of claim **45**, wherein the low-melting-point solid marijuana derivative has a tetrahydrocannabinol content of between about **70** to about **99** percent by weight.

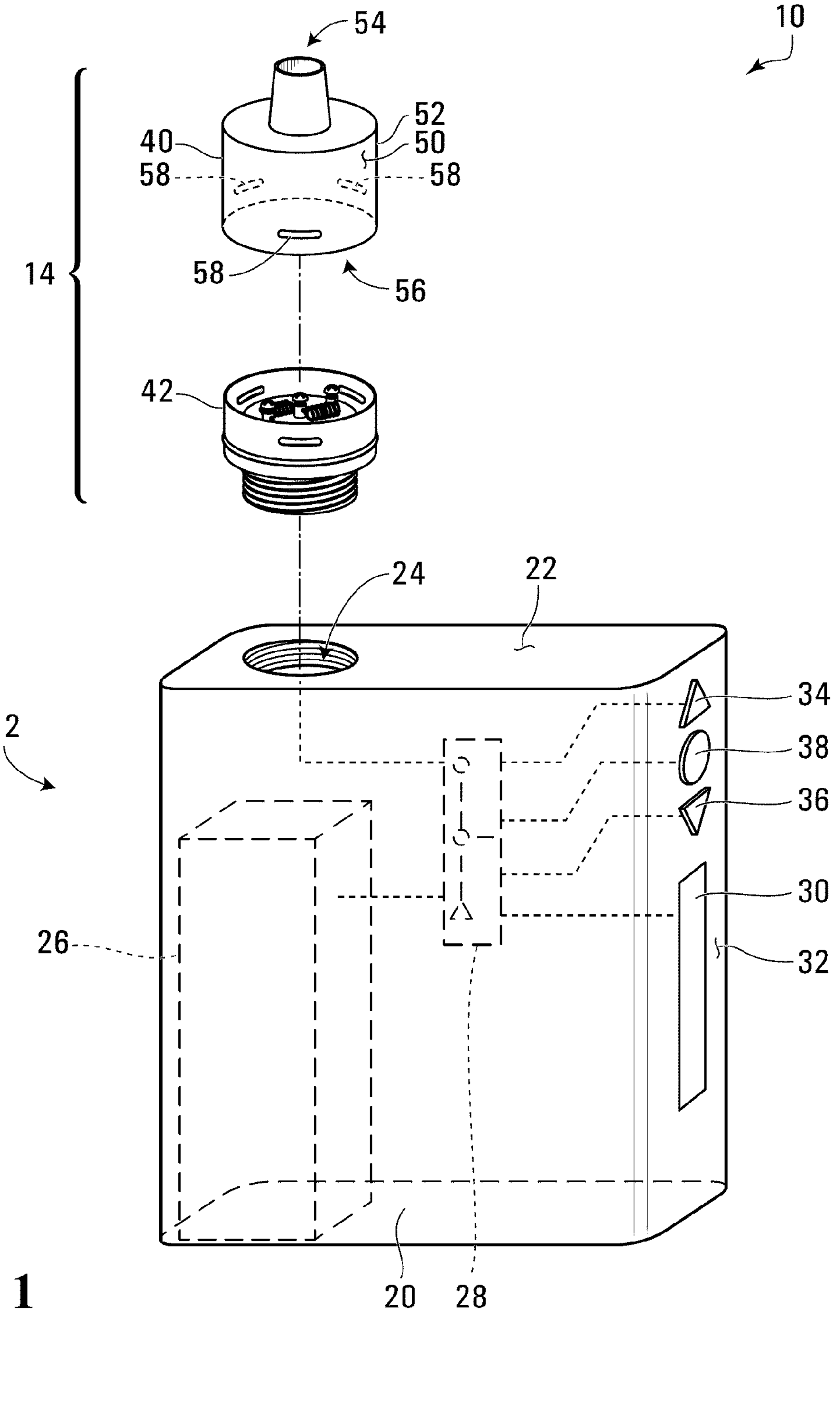

FIG. 1

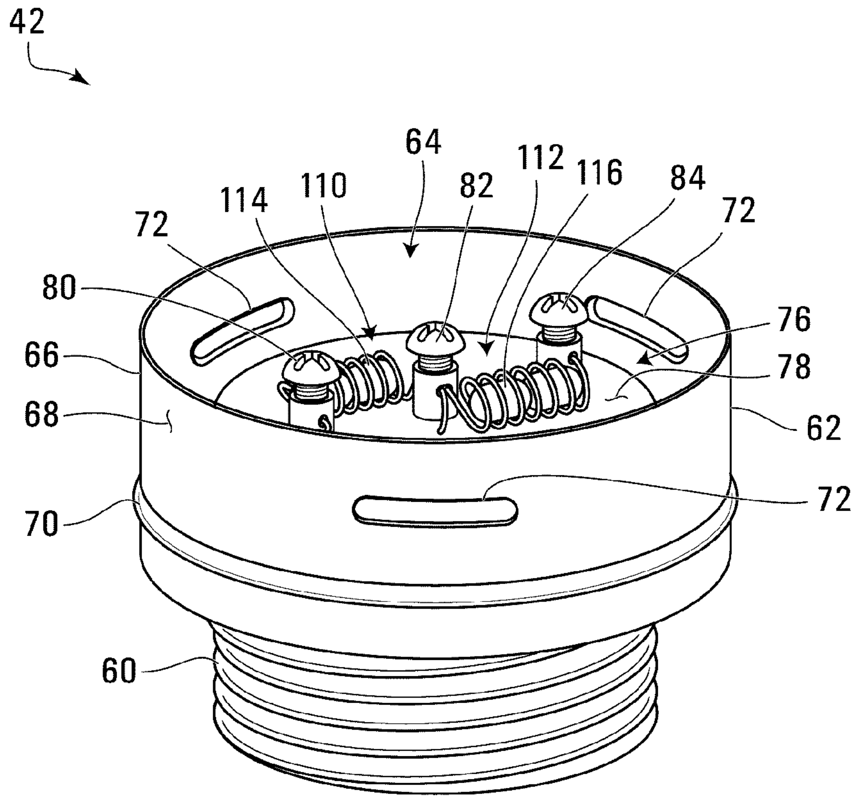

FIG. 2

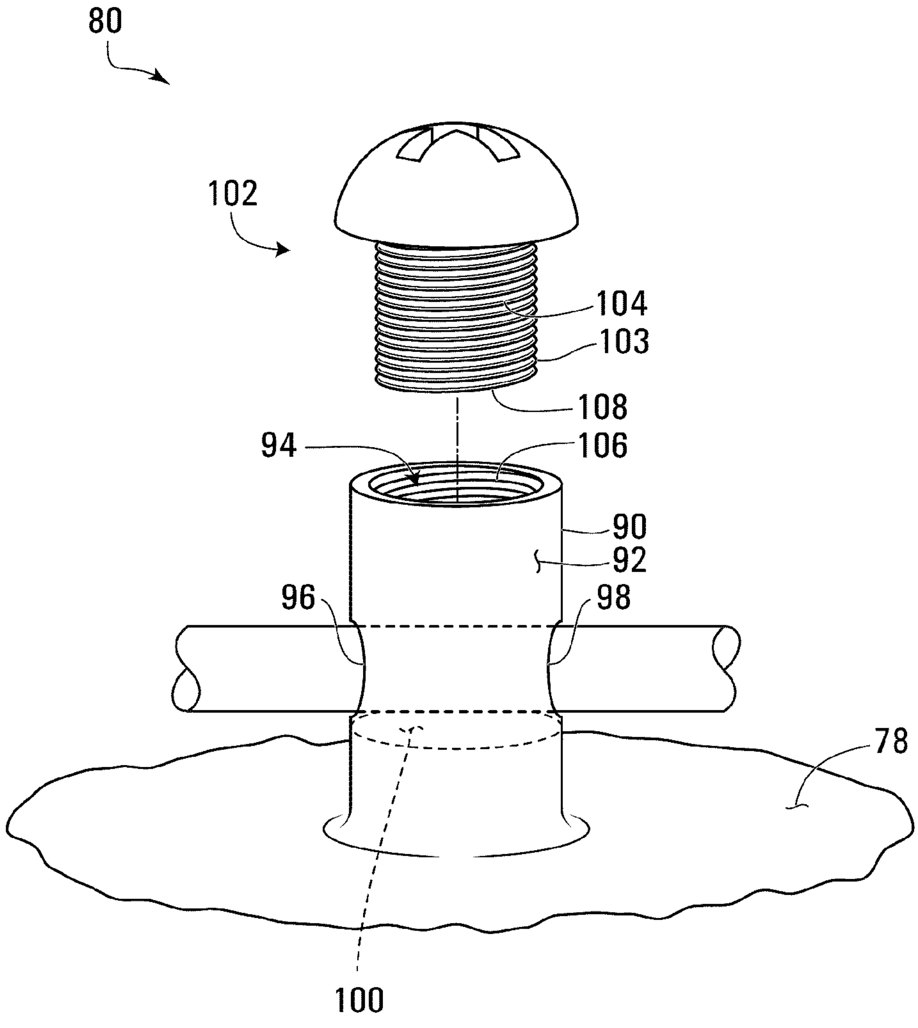

FIG. 3

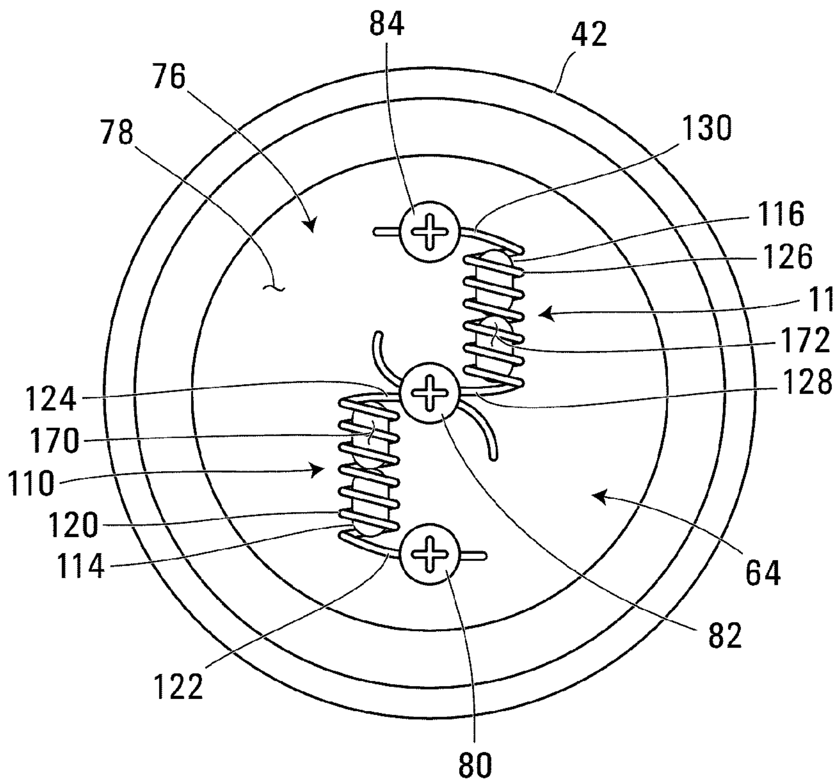
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FIG. 4

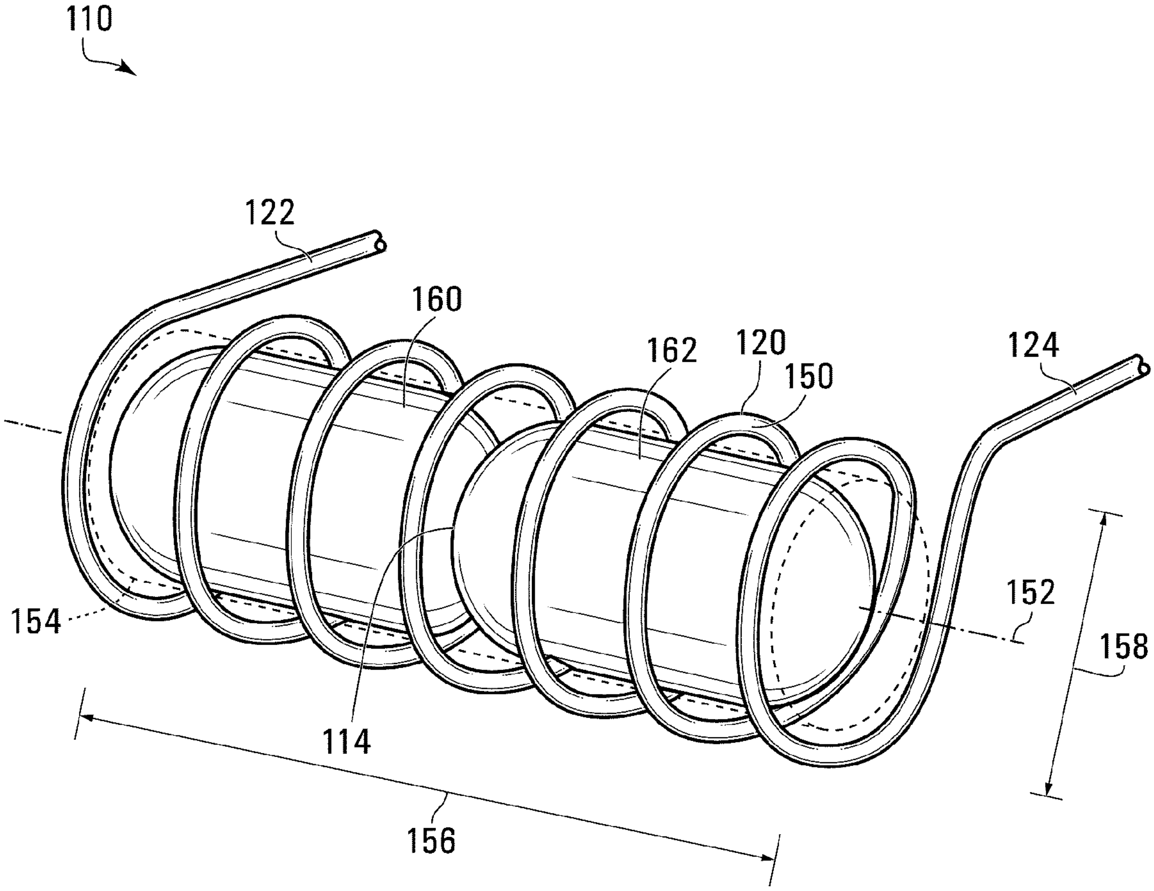

FIG. 5

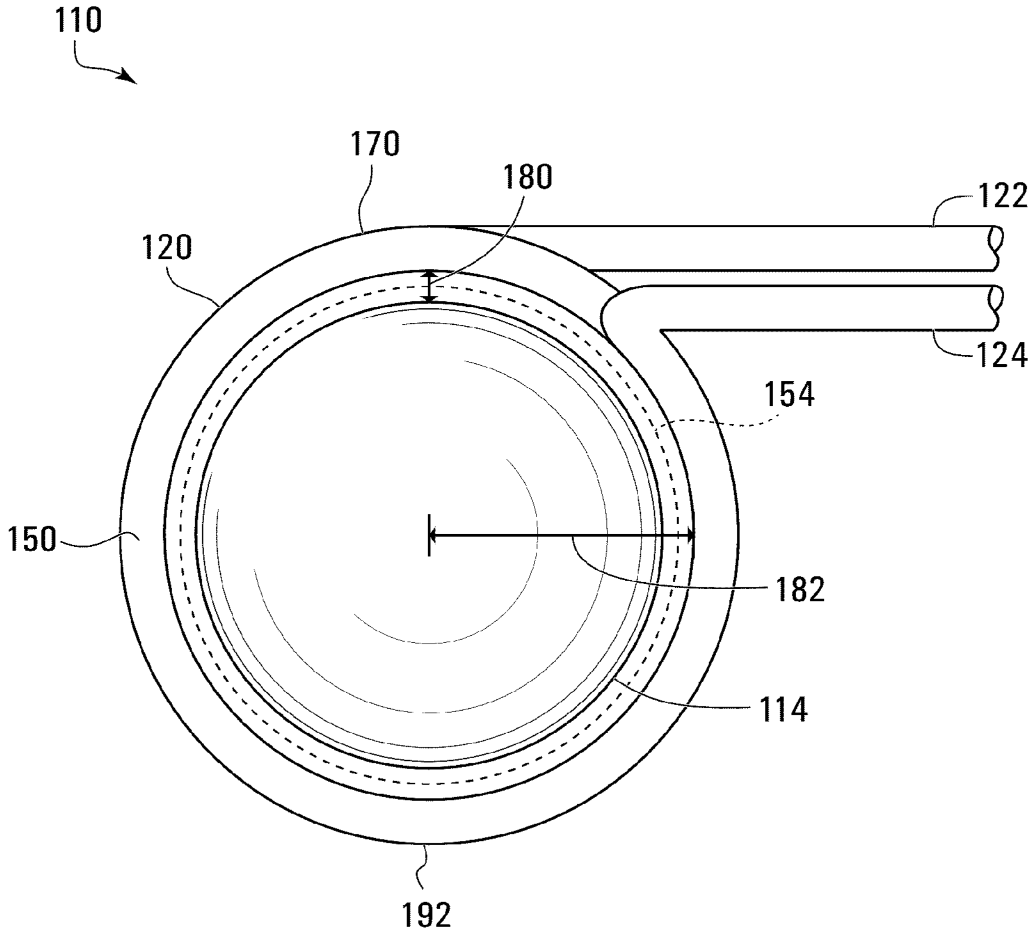

FIG. 6

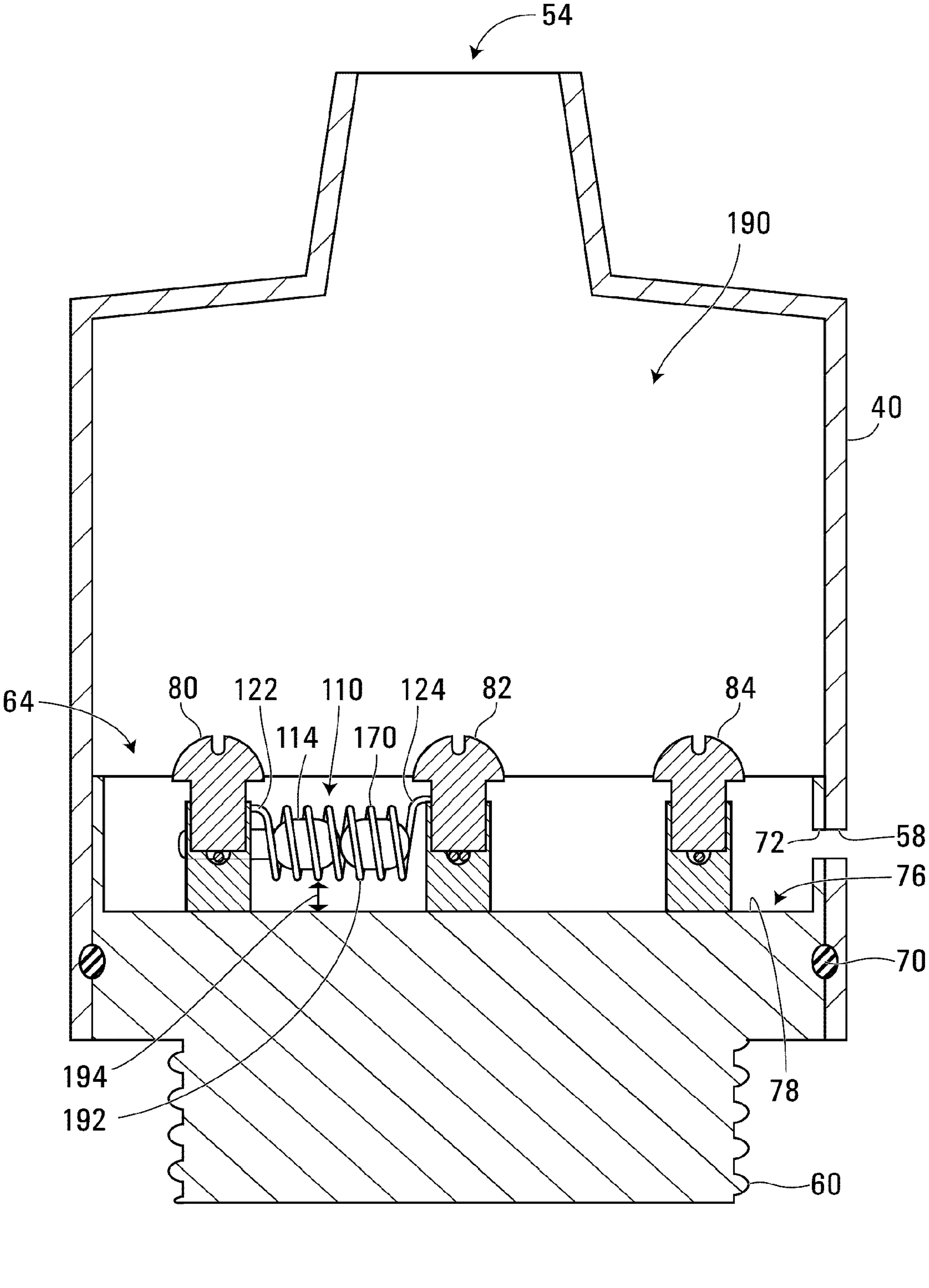

FIG. 7

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***A24F 47/00*** (2006.01) , ***A24B 15/16*** (2006.01) , ***A61M 11/00*** (2006.01) , ***A61M 15/00*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: A24F 47/00 (2006.01) , A24B 15/16 (2006.01) , A61M 11/00 (2006.01) , A61M 15/00 (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patents Database, Questel-Orbit (FamPat)
Keywords : inhal+, vap+, liquid, solid, heat+, melt+ absorbent, coil, container, well, suspend+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US2016213866A1 (TAN, W.) 28 July 2016 (28-07-2016) *Abstract; Para[0072-0078]; Figs. 1-3*	1, 6-17, 21-46
Y	US2015245659A1 (DEPIANO, J. et al.) 03 September 2015 (03-09-2015) *Abstract; Para[0113]; Fig. 8*	1, 6-17, 21-46
Y	US2015157055A1 (LORD, C.) 11 June 2015 (11-06-2015) *Abstract; Para[0061-0062] ; Fig. 2*	11, 38
A	US2016021932A1 (SILVESTRINI, P.C., et al) 28 January 2016 (28-01-2016) *Abstract*	1, 17

☐ Further documents are listed in the continuation of Box C.

☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
24 August 2016 (24-08-2016)

Date of mailing of the international search report
14 September 2016 (14-09-2016)

Name and mailing address of the ISA/CA
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