

AN IMPROVED VAPING DEVICE

TECHNICAL FIELD

[0001] The present disclosure relates to an improved vaping device.

BACKGROUND

[0002] The following discussion of the background is intended to facilitate an understanding of the present disclosure only. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was published, known or is part of the common general knowledge of the person skilled in the art in any jurisdiction as of the priority date of the invention.

[0003] Vaping devices (also commonly referred to as Electronic cigarettes or E-cigarettes) are increasingly popular in the world today. With the rise of the Internet Age, many consumers are able to conveniently purchase vaping devices online. Many users in fact use vaping devices as substitutes to the conventional tobacco cigarettes. It's popularity stems from its aesthetic appearance and that such vaping devices are generally free of harmful components such as tar or aerosol.

[0004] Many people also use vaping devices as it is an efficient and convenient way of delivering the benefits of plant abstracts in vapor form. While there are many vaping devices available, many of such devices often leak, resulting in wastage of liquid and causing the user an unpleasant experience of having to clean up the device.

[0005] Further, many of the available vaping devices are also not sealed completely. This poses a problem as it allows a user to misuse and abuse it by injecting harmful chemicals into the reservoir prior to vaping. The ease of availability of such devices on the internet can potentially lead to young users or even children abusing the use of it as such mixture of liquid in the vaping device can be toxic.

[0006] In many vaping devices, the cartridge is disposable. However, such

disposal can result in wastage of material as such cartridges have complex designs and made from metal.

[0007] There thus exists a need for an improved device to alleviate one or more of the aforementioned problems.

SUMMARY

[0008] The disclosure was conceptualized to reduce leakage of liquid (when present) in a reservoir of the vaping device. This is achieved by the provision of a seal to partially or completely seal up the reservoir. The choice of materials used may also affect the reduction of leakage. The result is that leakage is reduced or prevented even in changing environmental pressure and conditions.

[0009] The disclosure also contemplates the internal structure and selection of materials used in the replaceable cartridge section.

[0010] In an aspect of the disclosure, there is a cartridge for a vaping device. The cartridge comprises a housing having a first end, a second end, a base and an inner wall. A channel extends from the first end to the second end of the housing. The inner wall, channel and base are cooperatively connected to define one or more reservoirs to receive a liquid. The base has means for absorbing the liquid.

[0011] Preferably, the base has one or more holes.

[0012] Preferably, the base has a protrusion extending towards the second end.

[0013] Preferably, the protrusion has a hole covered at one end with a hydrophobic membrane.

[0014] Preferably, the one or more holes at the base is covered at one end with a hydrophobic membrane.

[0015] Preferably, the means for absorbing the liquid at the base is a nib.

[0016] Preferably, the one or more holes at the base is covered at one end with a hygroscopic membrane.

[0017] Preferably, a hollow filter is fitted within the channel.

[0018] Preferably, the second end of the housing has a plurality of projections.

[0019] Preferably, the inner wall of the housing is coated with a hydrophobic coating.

[0020] Preferably, the cartridge is made from a hydrophobic material

[0021] Preferably, the channel is coated with a hydrophobic coating.

[0022] Preferably, the second end of the housing is connectable to a device assembly.

[0023] Preferably, the device assembly has a heating element positioned at a top of the device assembly.

[0024] Preferably, the heating element is in close proximity with the means for absorbing liquid of the base, when the cartridge is connected to the device assembly.

[0025] Preferably, the heating element is in contact with the means for absorbing liquid of the base, when the cartridge is connected to the device assembly.

[0026] Preferably, the top of the device assembly has a plurality of notches to engage the corresponding plurality of projections of the second end.

[0027] Preferably, the device assembly has a USB charging pod.

[0028] A kit comprising the cartridge and a device assembly, the cartridge arranged to be fitted with the device assembly such as to provide heat to the cartridge. The cartridge may preferably be a single-use cartridge.

BRIEF DESCRIPTION OF DRAWINGS

[0029] Fig. 1 is a front side view of the vaping device in a fully assembled kit.

[0030] Fig. 2 is a cross-sectional view of the cartridge and device assembly.

[0031] Fig.3A is a cross-sectional view of the cartridge and device assembly with the directional arrow showing how the cartridge and device assembly connects.

[0032] Fig.3B is a cross-sectional view of the cartridge and device assembly connected together and the heating chamber.

[0033] Fig.4 is a cross-sectional view of the cartridge and device assembly connected together and with the direction of air flow.

[0034] Fig.5 is a cross-sectional view of the cartridge and device assembly connected together and with the direction of air flow in another embodiment of the invention.

[0035] Fig 6A is a cross-sectional view of the cartridge and device assembly connected together, with a nib, in accordance with the embodiment in Fig 5.

[0036] Fig 6B is a cross-sectional view of the cartridge and device assembly connected together, with a nib, in accordance with the embodiment of Fig 4.

[0037] Fig 6B is a closed up view of the various embodiments of the nibs in Figs 6A and 6B.

[0038] Fig 7A is an elevation view of the heating element.

[0039] Fig 7B is an elevation and plan view of the heating element in various forms.

DESCRIPTION OF EMBODIMENTS

[0040] In order to illustrate the technical solutions to the embodiments of the present disclosure, introduction of the drawings referred to in the description of the embodiment is provided below. The drawings described below are only some examples or embodiments of the present disclosure. A person having ordinary skill in the art, without further creative effort, may apply the present disclosure to other scenarios according to these drawings.

[0041] A cartridge for a vaping device is depicted in Figs 1 – 7. Fig 1 illustrates the front side view of a vaping device 10. The vaping device 10 comprises a cartridge 20 and a device assembly 40. The cartridge 20 is detachable from the device assembly 40. The cartridge 20 may be a single-use cartridge, i.e. it is non-refillable. Once the liquid in the cartridge is consumed or used up, it can be replaced with a new cartridge. The single-use cartridge may be suitably configured or sealed to prevent a user from alteration, e.g. via injecting or topping up the cartridge with substances that can potentially be toxic when mixed.

[0042] The device assembly 40 has an actuator, such as a button 45 on its outer surface. The button 45 can act as a switch to activate an electric circuit which can be housed within the device assembly, to power up the heating element (discussed later). The button 45 can be any types of button, such as a spring loaded button. An indicator 46 is positioned on the device assembly. The indicator 46 can be positioned anywhere on the outer surface of the device assembly. The indicator 46 serves as an indication of the battery strength of the vaping device. For example, the indicator can be a light bulb or an LED indicator. Various colors of light can be used to indicate different things. For example, a red light can indicate that the battery level is low on the device. This will give a user a warning that he should plug in the vaping device to be charged. A non-red light (or any other coloured light) can be used to indicate that the battery power is sufficient. Flashing lights can also be used to indicate that the battery power is running low soon.

[0043] A charging pod 54 is also provided on the device assembly 40. The charging pod allows the device assembly 40 to be connected to an external power source via a cable. The external power source can be a DC or AC voltage power

source, or a computer USB port or in vehicle USB ports. This allows a user the convenience of charging the device assembly easily. In the embodiment shown in Fig 1, the charging pod 54 is a USB charging pod. However, other charging pods such as a Micro USB pod or adaptors can be used as well. The device assembly can also have slots (not shown) to receive alkaline or rechargeable and replaceable batteries to provide power to the device assembly. This allows a user the flexibility to power up his vaping device in the event that he cannot find a power source.

[0044] Fig 2 shows a cross-sectional side view of the cartridge 20. The cartridge 20 comprises a housing 21. The housing 21 has a first end 23 and a second end 24. The housing 21 has an inner wall 22 and a base 35. A channel 32 extends from the first end 23 to the second end 24. A suction hole 19 is formed atop the first end 23. The external walls of the channel 32, the inner wall 22 and the base 35 are connected and define a reservoir 25. The channel 32, inner wall 22 and base 35 can be formed by moulding, or connected to each other via bonding or known adhesives.

[0045] Liquid 26 can be stored in the reservoir 25. The liquid used and its contents can be determined by the manufacturer. For example, the liquid 26 can include tobacco containing material, or a nicotine containing material. The liquid 26 may also include one or more non-tobacco material such as water, solvents, ethanol, plant extracts, natural or artificial flavors. The reservoir 25 is sealed to ensure that no contents can be injected into the reservoir by anyone other than the manufacturer. This will prevent substance abuse by users. Also, the sealed up reservoir 25 aids to prevent any leakage of the liquid 26. This would result in less wastage.

[0046] The base 35 has a projection 18 extending towards the second end 24. The projection 18 and the base 35 have holes 27, 33. Holes 27, 33 are small in diameter and can serve as venting holes to allow air to enter the reservoir 25 and channel 32 respectively. To prevent liquid 26 from leaking through holes 27, 33, a hydrophobic membrane 30 can be mounted onto an end of each hole 27, 33. Hydrophobic membrane 30 allows the flow of air into the reservoir 25 and channel 32. However, it prevents liquid 26 from leaking through the holes 27, 33.

[0047] The hydrophobic membrane can be made of or formed from, but are not limited to Heptadecafluorohexyl-trimethoxysilane, Polyhexafluoropropylene,

Polytetrafluoroethylene, Octadecyltrichlorosilane, Nonafluorohexyl-trimethoxysilane, Paraffin wax, Polyvinylidene Flouride, Polyethylene, Polyemethylmethacrylate, Polystyrene, Polyvinylidene Chloride, Polyester, Polyethylene terephthalate, Epoxypolyamide, Polyethersulfone (PES) membrane.

[0048] One or more holes 28 may be formed on the base 35. A hygroscopic membrane 29 is mounted across the one or more holes 28 at the end closer to the second end 24 as means for absorbing the liquid. The membrane 29 can be made of any material that is able to absorb and retain liquid. The one or more holes 28 allow the liquid 26 in the reservoir 25 to flow through them. Liquid 26 can then be absorbed and retained by membrane 29. Again, membrane 29 also prevents liquid 26 from flowing into the channel 32. This prevents leakage of the liquid 26.

[0049] The hygroscopic membrane can be made or formed from any material that has good water absorption properties. Non-limiting examples of the hygroscopic membrane include Nylon, Linen cloth, Paper, Cotton cloth, Wood fibres, Wool, Absorbent cotton and sponge.

[0050] A filter 31 can be placed snugly within the channel 32. Preferably, the filter is hollow and made from a material that can absorb moisture. For example, the filter can be of a hygroscopic material. This enables the channel 32 to be kept relatively dry.

[0051] The filter can be made from any material that has good water absorption properties. For example the filter can be made from Nylon, Linen cloth, Paper, Cotton cloth, Wood fibres, Wool, Absorbent cotton and sponge.

[0052] The cartridge 20 can be made of a hydrophobic material. Alternatively, the inner wall 22 can be coated with either hydrophobic or hydrophilic coating. This will facilitate condensed vapor to fall back into the reservoir 25. The inner walls of the channel 32 can be coated with either hydrophobic or hydrophilic coating. In use, any formation of water droplets on the surface of the inner wall cannot be retained on the surface of the inner wall due to the hydrophobic coating. The water droplets fall back to the reservoir via gravitational pull, for example. Alternatively, a hydrophilic coating can be used. In use, the hydrophilic coating attracts all the water droplets, causing the water droplets to spread across the surface of the inner wall. Similarly, the

gathered water droplets can then fall back into the reservoir via gravitational pull. The hydrophobic or hydrophilic coating can be applied onto the surface of the inner wall. The hydrophobic or hydrophilic coating can be applied by spraying, dip coating or simply wiped upon. This will allow the condensed vapor to be absorbed by the filter 31 or hygroscopic membrane 29. The hydrophilic coating can be Melamine, Silicon Dioxide or its products, Cellulose Acetate, Low-density polyethylene (LDPE).

[0053] Projection 34 extends from the second end 24. Protrusion 18 and projection 34 can suitably fit into the corresponding notches 42 of the device assembly 40, when the cartridge and the device assembly 40 are engaged and shown in Fig 3B. The cartridge 20 and device assembly can also be engaged through other mechanical means, such as magnetic locks, interference fit, snap fits, or mechanical latches. In Fig 3A, the directional arrow indicates how the cartridge 20 can be engaged with the device assembly 40. Fig 3B shows the cartridge 20 and device assembly 40 in an engaged position. In the engaged position shown in Fig 3B, the hygroscopic material 29 can be in contact or in close proximity with the heating element 41.

[0054] The device assembly 40 may be formed of any suitable material or combinations of materials. For example, the device assembly may be formed from metals, alloys, plastics, composite materials, thermoplastics which are suitable for pharmaceutical applications, for instance, polypropylene, PEEK, ceramic or polyethylene.

[0055] In use, a user may actuate button 45 to activate the power to turn on the heating element 41. The heater element 41 can then heat up to a pre set timing. Alternatively, the user can release the button 45 to stop the heating, according to his desire. When the wet hygroscopic membrane 29 is in contact or close proximity with the heating element 41, the heating element generates sufficient heat to vaporize the liquid 26.

[0056] The user may then inhale the vapor formed from vaporizing the liquid 26 through suction hole 19. The vapor may flow through the channel 32 and filter 31. Excess moisture will be absorbed by filter 31. Fig 4 illustrates the air flow through the

cartridge 20 when in use. The directional arrows indicate how the air will flow through the channel 32. Inner wall 22 has one or more holes 27 to allow air to enter the cartridge 20. The device assembly 40 may have a hollow channel 39 to allow air to flow from outside into the cartridge 20. Air may also flow into the cartridge through gaps formed between the cartridge 20 and device assembly 40.

[0057] To replace the liquid 26 that is flowing through holes 28 and the hygroscopic membrane 29 into the heating chamber 36 (dotted lines in Fig 3B), air may flow into the reservoir 25 via venting hole 27. The hydrophobic membrane 30 prevents liquid from flowing into the channel 32. Air can also flow through hole 33 into heating chamber 36. This air flow replaces the vapor inhaled through the suction hole 19.

[0058] Once the liquid within the reservoir 25 is consumed, for example when the reservoir is substantially dry and no more liquid 26 can be inhaled by the user, the cartridge can be disposed and replaced. As the heating element is constructed on the device assembly, this will save costs and material as only the cartridge is replaced.

[0059] It would be appreciated that the simplicity of the design with few components in the cartridge ensures that the reservoir 25 has more room to store liquid 26, thereby allowing more smoke cycles.

[0060] Fig 5 shows the cross-sectional view of the cartridge and device assembly connected together and with the direction of air flow in another embodiment of the invention. The cartridge has a housing 51. The housing has an inner wall 52, a first end 53, second end (not shown), and a base 60. A channel 70 extends from the first end 53 to the second end. In this embodiment, the channel is at the middle of the cartridge. The inner wall 52, base 60 and outer walls of the channel 70 define a reservoir 55. The reservoir 55 receives a liquid 56.

[0061] Liquid 56 can be stored in the reservoir 55. The liquid used and its contents can be determined by the manufacturer. For example, the liquid 56 can include tobacco containing material, or a nicotine containing material. The liquid 56 may include a non-tobacco material such as water, solvents, ethanol, plant extracts, natural or artificial flavors. The sealed up reservoir 55 ensures that no contents can

be injected into the reservoir by anyone other than the manufacturer. This will prevent substance abuse by users. Also, the sealed up reservoir 55 aids to prevent any leakage of the liquid 56. This would result in less wastage.

[0062] The base 60 has a venting hole 57. Venting hole 57 allows air to flow into the reservoir 55. One end of the venting hole 57 is covered with a hydrophobic membrane 67. This prevents liquid 56 from flowing out of the venting hole 57. On the other side of the channel 70, the base has one or more holes 58. Holes 58 are small in diameter and allow liquid 56 to flow through them. A hygroscopic membrane 59 sits across the holes 58 at the end closer to the second end of the housing. The hygroscopic membrane 59 absorbs liquid 56 and retains it.

[0063] The hydrophobic membrane can be made of but are not limited to Heptadecafluorohexyl-trimethoxysilane, Polyhexafluoropropylene, Polytetrafluoroethylene, Octadecyltrichlorosilane, Nonafluorohexyl-trimethoxysilane, Paraffin wax, Polyvinylidene Fluoride, Polyethylene, Polyemethylmethacrylate, Polystyrene, Polyvinylidene Chloride, Polyester, Polyethylene terephthalate, Epoxypolyamide, Polyethersulfone (PES) membrane.

[0064] The cartridge can be made of a hydrophobic material. Alternatively, the inner wall 52 can be coated with either hydrophobic or hydrophilic coating. This will allow the condensed vapor to fall back into the reservoir 55. The walls of the channel 70 can be coated with either hydrophobic or hydrophilic coating. In use, any formation of water droplets on the surface of the inner wall cannot be retained on the surface of the inner wall due to the hydrophobic coating. The water droplets fall back to the reservoir via gravitational pull, for example. Alternatively, a hydrophilic coating can be used. In use, the hydrophilic coating attracts all the water droplets, causing the water droplets to spread across the surface of the inner wall. Similarly, the gathered water droplets can then fall back into the reservoir via gravitational pull. The hydrophobic or hydrophilic coating can be applied onto the surface of the inner wall. The hydrophobic or hydrophilic coating can be applied by spraying, dip coating or simply wiped upon. This will allow the condensed vapor to be absorbed by the filter 71 or hygroscopic membrane 59. The hydrophilic coating can be Melamine, Silicon Dioxide or its products, Cellulose Acetate, Low-density polyethylene (LDPE).

[0065] Inner wall 52 has a venting hole 61 to allow atmospheric air to enter the heating chamber. A hydrophobic membrane 67 is fitted across one end of the hole 61 to allow air to flow through and prevent liquid from leaking through the hole 61. In Fig 5, the cartridge engages the device assembly in an interference fit. Hygroscopic membrane 59 is in close proximity or in contact with the heating element 41 when the cartridge and the device assembly are engaged.

[0066] The hygroscopic membrane can be made from any material that has good water absorption properties. For example the hygroscopic membrane can be made from Nylon, Linen cloth, Paper, Cotton cloth, Wood fibres, Wool, Absorbent cotton and sponge.

[0067] The device assembly 40 may be formed of any suitable material or combinations of materials. For example, the device assembly may be formed of metals, alloys, plastics, composite materials, thermoplastics which are suitable for pharmaceutical applications, for instance, polypropylene, PEEK, ceramic or polyethylene.

[0068] In use, button 45 is activated. This causes the heating element 41 to heat to the desired temperature and vaporize liquid 56 retained in hygroscopic membrane 59. The user places his mouth close to suction hole 72 and sucks or inhales the vapor through the suction hole 72. The vapor will flow through channel 70 and filter 71 before entering the mouth of a user. Filter 71 absorbs excessive moisture.

[0069] Air will flow through hydrophobic membrane 67 and hole 57 to replace the liquid 56 that is entering the heating chamber. Air enters the heating chamber through hole 61 and through gaps formed between the cartridge and device assembly. The dotted arrow in Fig 5 shows the direction of vapor flow when a user inhales vapor via the suction hole 72.

[0070] The cartridge 20 can be disposed and replaced once the liquid 56 is suitably consumed. As the heating element is constructed on the device assembly, this will save costs and material as only the cartridge is replaced.

[0071] It would be appreciated that the simplicity of the design with few components in the cartridge ensures that the reservoir 55 has more room to store

liquid 56, thereby allowing more smoke cycles.

[0072] Figs 6A-6C illustrate another form of liquid transfer from the reservoir to the heating element. The cartridge has a housing 51. The housing has an inner wall 52, a first end 53, second end (not shown), and a base 60. A channel 70 extends from the first end 53 to the second end. In the embodiment shown in Fig. 6A, the channel is at the middle of the cartridge. The inner wall 52, base 60 and outer walls of the channel 70 define reservoir 55. The reservoir 55 receives a liquid 56.

[0073] Liquid 56 can be stored in the reservoir 55. The liquid used and its contents can be determined by the manufacturer. For example, the liquid 56 can include tobacco containing material, or a nicotine containing material. The liquid 56 may include a non-tobacco material such as water, solvents, ethanol, plant extracts, natural or artificial flavors. The sealed up reservoir 55 ensures that no contents can be injected into the reservoir by anyone other than the manufacturer. This will prevent substance abuse by users. Also, the sealed up reservoir 55 aids to prevent any leakage of the liquid 56. This would result in less wastage.

[0074] The base 60 has a venting hole 57. Venting hole 57 allows air to flow into the reservoir 55. One end of the venting hole 57 is covered with a hydrophobic membrane 67. This prevents liquid 56 from flowing out of the venting hole 57. On the other side of the channel 70, the base has a nib 62 mounted on it. The nib has a top 80 and a bottom 81. Nib 62 allows liquid 56 to be absorbed at the top 80 and retained at the bottom 81.

[0075] Inner wall 52 has a venting hole 61 to allow atmospheric air to enter the heating chamber. A hydrophobic membrane 67 is fitted across one end of the hole 61 to allow air to flow through and prevent liquid from leaking through the hole 61. In Fig 6A, the cartridge engages the device assembly in an interference fit. The bottom 81 is in close proximity or in contact with the heating element 41 when the cartridge and device assembly is engaged.

[0076] The cartridge can be made of a hydrophobic material. Alternatively, the inner wall 52 can be coated with either hydrophobic or hydrophilic coating. This will allow the condensed vapor to fall back into the reservoir 55. The walls of the channel 70 can be coated with either hydrophobic or hydrophilic coating. In use, any

formation of water droplets on the surface of the inner wall cannot be retained on the surface of the inner wall due to the hydrophobic coating. The water droplets fall back to the reservoir via gravitational pull, for example. Alternatively, a hydrophilic coating can be used. In use, the hydrophilic coating attracts all the water droplets, causing the water droplets to spread across the surface of the inner wall. Similarly, the gathered water droplets can then fall back into the reservoir via gravitational pull. The hydrophobic or hydrophilic coating can be applied onto the surface of the inner wall. The hydrophobic or hydrophilic coating can be applied by spraying, dip coating or simply wiped upon. This will allow the condensed vapor to be absorbed by the filter 71 or bottom 81 of nib 62. The hydrophilic coating may include one or more of the following:- Melamine, Silicon Dioxide or its derived products, cellulose acetate, low-density polyethylene (LDPE) etc.

[0077] The device assembly 40 may be formed of any suitable material or combinations of materials. For example, the device assembly may be formed of metals, alloys, plastics, composite materials, thermoplastics which are suitable for pharmaceutical applications, for instance, polypropylene, PEEK, ceramic or polyethylene.

[0078] In use, button 45 is activated. This causes the heating element 41 to heat to the desired temperature and vaporize liquid 56 retained in bottom 81 of nib 62. The user places his mouth close to suction hole 72 and sucks or inhales the vapor through the suction hole 72. The vapor will flow through channel 70 and filter 71 before entering the mouth of a user. Filter 71 absorbs excessive moisture.

[0079] Air will flow through hydrophobic membrane 67 and hole 57 to replace the liquid 56 that is entering the heating chamber. Air enters the heating chamber through hole 61 and through gaps formed between the cartridge and device assembly.

[0080] Once the reservoir 55 is dry and there is no more liquid 56, the cartridge can be disposed and replaced. As the heating element is constructed on the device assembly, this will save costs and material as only the cartridge is replaced.

[0081] It would be appreciated that the simplicity of the design with few components in the cartridge ensures that the reservoir 55 has more room to store

liquid 56, thereby allowing more smoke cycles.

[0082] In the embodiment shown in Fig 6B, the cartridge comprises a housing 21. The housing 21 has a first end 23 and a second end 24. The housing 21 has an inner wall 22 and a base 35. A channel 32 extends from the first end 23 to the second end 24. A suction hole 19, sits atop the first end 23. The external walls of the channel 32, the inner wall 22 and the base 35 are connected and define a reservoir 25. The channel 32, inner wall 22 and base 35 can be formed by moulding, or connected to each other via bonding or known adhesives.

[0083] Liquid 26 can be stored in the reservoir 25. The liquid used and its contents can be determined by the manufacturer. For example, the liquid 26 can include tobacco containing material, or a nicotine containing material. The liquid 26 may include a non-tobacco material such as water, solvents, ethanol, plant extracts, natural or artificial flavors. The sealed up reservoir 25 ensures that no contents can be injected into the reservoir by anyone other than the manufacturer. This will prevent substance abuse by users. Also, the sealed up reservoir 25 aids to prevent any leakage of the liquid 26. This would result in less wastage.

[0084] The base 35 has a projection 18 extending towards the second end 24. The projection 18 and the base 35 have holes 27, 33. Holes 27, 33 are small in diameter and can serve as venting holes to allow air to enter the reservoir 25 and channel 32 respectively. To prevent liquid 26 from leaking through holes 27,33, a hydrophobic membrane 30 can be mounted onto an end of each hole 27, 33. Hydrophobic membrane 30 allows the flow of air into the reservoir 25 and channel 32. However, it prevents liquid 26 from leaking through the holes 27, 33.

[0085] The hydrophobic membrane can be made of but are not limited to Heptadecafluorohexyl-trimethoxysilane, Polyhexafluoropropylene, Polytetrafluoroethylene, Octadecyltrichlorosilane, Nonafluorohexyl-trimethoxysilane, Paraffin wax, Polyvinylidene Fluoride, Polyethylene, Polyemethylmethacrylate, Polystyrene, Polyvinylidene Chloride, Polyester, Polyethylene terephthalate, Epoxypolyamide, Polyethersulfone (PES) membrane.

[0086] The base 35 has a nib 62 mounted on it. The nib has a top 80 and a bottom 81. Nib 62 allows liquid 56 to be absorbed at the top 80 and retained at the

bottom 81. This prevents leakage of the liquid 26. A filter 31 can be placed snugly within the channel 32. Preferably, the filter is hollow and made from a material that can absorb moisture. For example the filter can be made from Nylon, Linen cloth, Paper, Cotton cloth, Wood fibres, Wool, Absorbent cotton and sponge. This enables the channel 32 to be kept relatively dry.

[0087] The cartridge can be made of a hydrophobic material. Alternatively, the inner wall 22 can be coated with either hydrophobic or hydrophilic coating. This will allow the condensed vapor to fall back into the reservoir 25. The walls of the channel can be coated with either hydrophobic or hydrophilic coating. In use, the hydrophobic coating any formation of water droplets on the surface of the inner wall cannot be retained on the surface of the inner wall due to the hydrophobic coating. The water droplets fall back to the reservoir via gravitational pull, for example. Alternatively, a hydrophilic coating can be used. In use, the hydrophilic coating attracts all the water droplets, causing the water droplets to spread across the surface of the inner wall. Similarly, the gathered water droplets can then fall back into the reservoir via gravitational pull. The hydrophobic or hydrophilic coating can be applied onto the surface of the inner wall. The hydrophobic or hydrophilic coating can be applied by spraying, dip coating or simply wiped upon. This will allow the condensed vapor to be absorbed by the filter 31 or bottom 81 of nib 62.

[0088] Projection 34 extends from the second end 24. Protrusion 18 and projection 34 can fit into the corresponding notches 42 of the device assembly 40, when the cartridge and the device assembly 40 are engaged and shown in Fig 6B. The cartridge 20 and device assembly can also be engaged through other mechanical means, such as magnetic locks, interference fit, snap fits, or mechanical latches. In the engaged position shown in Fig 6B, the bottom 81 of nib 62 can be in contact or in close proximity with the heating element 41.

[0089] In use, a user presses button 45 to activate the power to turn on the heating element 41. The heater element 41 can then heat up to a pre set timing. Alternatively, the user can release the button 45 to stop the heating, according to his desire. When the bottom 81 of nib 62 is in contact or close proximity with the heating element 41, the heating element generates sufficient heat to vaporize the liquid 26.

[0090] The user will then suck the vapor formed from vaporizing the liquid 26 through suction hole 19. The vapor may flow through the channel 32 and filter 31. Excess moisture will be absorbed by filter 31. Inner wall 22 has one or more holes 27 to allow air to enter the cartridge 20. The device assembly 40 may have a hollow channel 39 to allow air to flow from outside into the cartridge 20. Air may also flow into the cartridge through gaps formed between the cartridge 20 and device assembly 40.

[0091] To replace the liquid 26 that is flowing through holes 28 and the hygroscopic membrane 29 into the heating chamber 36, air may flow into the reservoir 25 via venting hole 27. The hydrophobic membrane 30 prevents liquid from flowing into the channel 32. Air can also flow through hole 33 into heating chamber 36. This air flow replaces the vapor sucked out through the suction hole 19.

[0092] Once the reservoir 25 is dry and there is no more liquid 26, the cartridge can be disposed and replaced. As the heating element is constructed on the device assembly, this will save costs and material as only the cartridge is replaced.

[0093] It would be appreciated that the simplicity of the design with few components in the cartridge ensures that the reservoir 25 has more room to store liquid 26, thereby allowing more smoke cycles.

[0094] Fig 6C shows various shapes and designs of nib 62. As illustrated in Fig 6C, the nib can take various forms of shape. The bottom 81 of nib 62 may be one of a rounded tip, flat tip, tapered tip, pointed tip.

[0095] Figs 7A-7B illustrates the heating element 41 described in the above various embodiments. Heating element 41 can be housed in a heater holder 42. Heater holder 42 can be made from Polyether ether ketone (PEEK), silicon, ceramic or any material with good thermal properties that can withstand the heat of the heating element 41, without causing damage, deformation, degrading, bending or burnt to the heater holder 42. A pair of electrical contacts 44 is mounted at the base of the heater holder 42 to allow electricity to flow.

[0096] Heating element 43 can be made from Nichrome plates or any material which can generate heat when an electrical current is passed through. Heating

element 43 is thinned down its depth in the middle. This creates a resistance for the current flow, thereby generating heat in the thinned region.

[0097] Fig 7B illustrates other methods to create a resistance in current flow by narrowing the heating element or creating a longer path for resistance by using a longer heating element. Some non-exhaustive examples are using: a heating element with a thin down depth, a narrower width, 2 or more narrow heating elements, long heating elements that are slanted with smooth corners and multiple loops, long horizontal heating elements with sharp corners and multiple loops, long horizontal heating elements with smooth corners and multiple loops, long vertical heating element with sharp corners and multiple loops and long vertical heating element with smooth corners and multiple loops.

[0098] It will now be apparent that a new, improved vaping device has been described in the specification with sufficient particularity as to be understood by one of ordinary skill in the art. Moreover, it will be apparent to those skilled in the art that various modifications, variations, substitutions and equivalents exist for features of the vaping device which do not materially depart from the scope of the invention.

[0099] It should be further appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments falling within the intended scope of the invention.

CLAIMS

1. A cartridge for a vaping device, comprising:
 - a housing having a first end, a second end, a base and an inner wall;
 - a channel extending from the first end to the second end, the inner wall, the channel and the base cooperatively connected to define one or more reservoirs to receive a liquid,
 - wherein the base has means for absorbing the liquid and comprises at least one venting hole, the at least one venting hole covered at one end with a hydrophobic membrane arranged to allow air to enter the one or more reservoirs and prevent leakage of the liquid out of the venting hole.
2. The cartridge of claim 1, wherein the hydrophobic membrane is formed from at least one of the following: Heptadecafluorohexyl-trimethoxysilane, Polyhexafluoropropylene, Polytetrafluoroethylene, Octadecyltrichlorosilane, Nonafluorohexyl-trimethoxysilane, Paraffin wax, Polyvinylidene Fluoride, Polyethylene, Polyemethylmethacrylate, Polystyrene, Polyvinylidene Chloride, Polyester, Polyethylene terephthalate, Epoxypolyamide, Polyethersulfone (PES) membrane.
3. The cartridge of claim 1 or 2, further comprises a protrusion extending from the base towards the second end.
4. The cartridge of claim 3, wherein the protrusion has a hole covered at one end with a hydrophobic membrane.
5. The cartridge of claim 1, wherein the means for absorbing the liquid is a nib.
6. The cartridge of claim 1, wherein at least one of the one or more venting holes is covered at one end with a hygroscopic membrane.

7. The cartridge of any of the preceding claims, wherein a hollow filter is fitted within the channel.
8. The cartridge of claim 7, wherein the hollow filter comprises a hygroscopic material.
9. The cartridge of any of the preceding claims, wherein the second end has a plurality of projections.
10. The cartridge of any preceding claims, wherein the inner wall is coated with a hydrophobic coating.
11. The cartridge of any preceding claims, wherein the cartridge is made from a hydrophobic material.
12. The cartridge of any preceding claims, wherein the channel is coated with either a hydrophobic coating or a hydrophilic coating.
13. The cartridge of any preceding claims, wherein the second end is connectable to a device assembly.
14. The cartridge of claim 13, wherein the device assembly has a heating element positioned at a top of the device assembly.
15. The cartridge of claim 14, wherein the heating element is in close proximity with the means for absorbing liquid of the base, when the cartridge is connected to the device assembly.
16. The cartridge of claim 14 or 15, wherein the heating element is in contact with the means for absorbing liquid of the base, when the cartridge is connected to the device assembly.

17. The cartridge of claim 9 and claim 13, wherein the top of the device assembly has a plurality of notches to engage the corresponding plurality of projections of the second end.
18. The cartridge of any one of claims 13 to 17, wherein the device assembly has a USB charging pod.
19. The cartridge of any one of claims 14 to 16, wherein the device assembly houses an electric circuit within the device assembly to power the heating element.
20. A kit comprising the cartridge of any of the preceding claims and a device assembly according to any one of claim 13 to 18.