(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 082 364 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.11.2022 Bulletin 2022/44

(21) Application number: **21170455.6**

(22) Date of filing: **26.04.2021**

(51) International Patent Classification (IPC):
A24F 42/10 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 42/10; A24F 40/20

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **BIC Violex Single Member S.A.**
14569 Anoixi (GR)

(72) Inventors:
- **Polygerinos, Panagiotis**
  14569 Anixi (GR)
- **Malliaros, Ioannis**
  14569 Anixi (GR)

(74) Representative: **Peterreins Schley**
Patent- und Rechtsanwälte PartG mbB
Hermann-Sack-Straße 3
80331 München (DE)

(54) **A HEAT TRANSFER ASSEMBLY**

(57) A heat transfer assembly for heating an aerosol generating medium, such as a cigarette, without burning. The heat transfer assembly comprises a heat absorber, a heat modulator, and a heat diffuser. The heat absorber is configured to absorb thermal energy from a proximate heat source in a first temperature range. The heat absorber is thermally coupled to the heat modulator, and the heat modulator is thermally coupled to the heat diffuser. The heat modulator is configured to absorb the thermal energy emitted from the heat source, and to provide thermal energy to the heat diffuser in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range. The heat modulator comprises at least one phase change material.

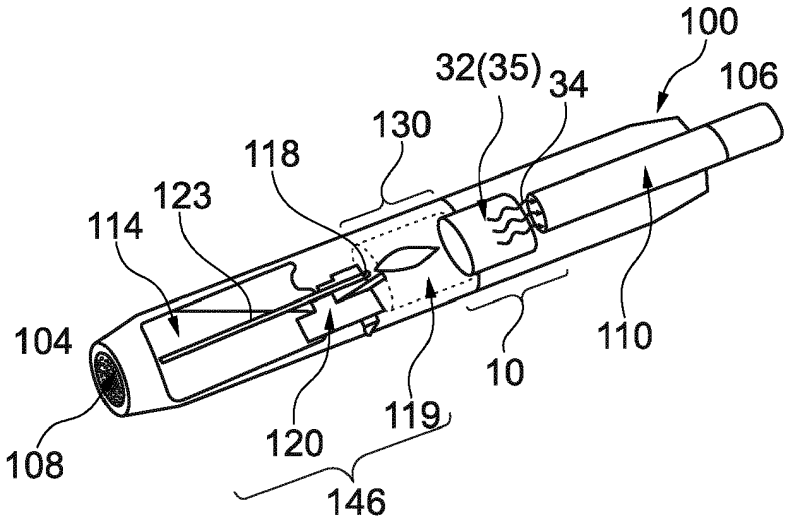


Fig. 3

EP 4 082 364 A1

Description

Technical Field

[0001] The embodiments described in the following disclosure relate to a heat transfer assembly for heating an aerosol generating substrate, such as a heat not burn cigarette. An aerosol generating device for generating an aerosol from an aerosol generating substrate, a lighter assembly, and an associated kit of parts and a method are presented.

Background

[0002] A conventional cigarette comprises a tubular tipping paper containing a processed tobacco rod and a mouthpiece filter. To smoke the cigarette, the end of the cigarette opposite to the mouthpiece filter is ignited using a cigarette lighter. As the tobacco rod burns, vapours are released and inhaled by a user through the mouthpiece filter. Increasingly, conventional cigarettes are being replaced by cigarettes using the "heat not burn" concept in which a cigarette comprising, for example, an aerosol generating substrate and mouthpiece filter is heated by an electrical heater to a temperature high enough to enable active components to vaporise from the aerosol generating substrate for inhalation, and low enough to avoid combustion of the aerosol generating substrate. In this way, a user of a "heat not burn" smoking solution or cigarette may enjoy a comparable smoking experience but without or at least reducing inhalation of unhealthy gas products relating from tobacco combustion.

[0003] The performance of heat not burn smoking solutions may, however, be improved.

Summary

[0004] According to a first aspect, there is provided a heat transfer assembly for heating an aerosol generating medium without burning. The heat transfer assembly comprises a heat absorber, a heat modulator and a heat diffuser. The heat absorber is configured to absorb thermal energy from a proximate heat source in a first temperature range.

[0005] The heat absorber is thermally coupled to the heat modulator, and the heat modulator is thermally coupled to the heat diffuser.

[0006] The heat modulator is configured to absorb the thermal energy emitted from the heat source, and to provide thermal energy to the heat diffuser in a second temperature range different to the first temperature range. The lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range. The heat modulator comprises at least one phase change material.

[0007] An aspect of a device for heating not burning herbal (tobacco) products, such as heated cigarettes, uses thermal energy generated for example by a flame, such as the flame of a cigarette lighter. This means that electronics and bulky batteries hitherto used with heat not burn devices as described herein are not required.

[0008] This removes the inconvenience of carrying around a heat not burn device and waiting for it to be charged. When the time arrives to dispose of the heat not burn device, the absence of electronic components facilitates disposal. Furthermore, a cigarette lighter is capable of providing more heat than a typical electrical battery and thus heat not burn devices according to aspects here in may have a longer lifetime. A heat not burn device according to the aspects discussed herein is lightweight and has a smaller space envelope, compared to a typical heat not burn electronic cigarette comprising a large rechargeable battery assembly. Furthermore, a heat not burn device according to the aspects discussed herein can be shaped into a number of different form factors based around a source of flame, for example a cigarette lighter. Omitting such electrical components also enables a cost-effective heat not burn device to be provided.

[0009] According to a second aspect, there is provided an aerosol generating device for generating an aerosol from an aerosol generating substrate comprised in an aerosol generating article. The aerosol is generated by heating, not burning, the aerosol generating substrate. The aerosol generating device comprises a first receptacle configured to receive a heat source, a heat transfer assembly according to the first aspect, and a second receptacle configured to receive an aerosol generating article. In use, the heat source, such as a flame adjacent to, or comprised in, the first receptacle is configured to be actuatable by a user to generate thermal energy, and to transfer the thermal energy to the heat absorber of the heat transfer assembly. The second receptacle is configured to accept an aerosol generating article, and the heat transfer assembly is configured to transfer thermal energy from the heat source to a portion of the aerosol generating device comprising the aerosol generating substrate, so that the aerosol generating substrate releases vapour to a user without burning.

[0010] An effect is that the benefits of the heat transfer assembly according to the first aspect can be realised within an integrated user-friendly article provided as a cigarette substitute that uses heat not burn cigarettes. In one alternative, the heat source of the aerosol generating device is replaceable, such as being a conventional cigarette lighter. Additionally or alternatively, the heat source of the aerosol generating device may be permanently integrated into the casing of the aerosol generating device, but an example may operate according to principles of a cigarette lighter.

[0011] According to a third aspect, there is provided a heat not burn lighter assembly comprising a first and a second heat source. A distal end of the lighter assembly comprises a first ignition mechanism of the first heat source. A proximal end of the lighter comprises a second heat source and a second ignition mechanism. The proximal end of the lighter assembly may further comprise a first receptacle configured to absorb heat from the second heat source. The lighter further comprises a heat transfer assembly of the first aspect or its embodiments. The lighter further comprises a second receptacle configured to receive an aerosol generating article.

[0012] In use, the second heat source is configured to be actuatable by a user via a second ignition mechanism of the second heat source to thereby generate thermal energy, and to transfer the thermal energy to the heat absorber of the heat transfer assembly. Additionally or alternatively, the second receptacle houses an aerosol generating article, and the heat transfer assembly is configured to transfer thermal energy from the second heat source to a portion of the aerosol generating device comprising the aerosol generating substrate, so that the aerosol generating substrate releases vapour to a user without burning.

[0013] An effect is that the benefits of the heat transfer assembly according to the first aspect can be realised in a unit that resembles a cigarette lighter, giving users the choice between smoking a cigarette according to the traditional burning method, or heating a heat not burn cigarette without burning.

[0014] According to a fourth aspect, there is provided a lighter assembly for heating an aerosol generating medium without burning. The lighter assembly comprises: a flame source, a heat absorber, a heat diffuser, a heatable product receiver, and a heat regulator. The heat absorber is configured to absorb heat emitted by the flame source, in use. The heat diffuser is thermally coupled to the heat absorber and the heatable product receiver to enable a transfer of heat from the flame source to the heatable product receiver, in use.

[0015] The heat regulator is operably coupled to the flame source and/or the heat absorber. The heat regulator is configured to cause the flame source and/or the heat absorber provide thermal energy to the heat diffuser in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range.

[0016] According to a sixth aspect, there is provided a method for heating an aerosol generating medium without burning using an aerosol generating device according to the first aspect. The method comprises:

- inserting a lighter into the first receptacle of the aerosol generating device;
- inserting an aerosol generating article into the second receptacle of the aerosol generating device;
- actuating an ignition mechanism of the lighter so that a heat source emits thermal energy at a first temperature to be absorbed by the heat absorber of the heat transfer assembly of the aerosol generating device, wherein the ignition mechanism of the lighter is actuated for a predetermined time interval;
- modulating the thermal energy from the first temperature down to a second temperature using the heat modulator comprising at least one phase change material, and to conducting thermal energy to the heat diffuser in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range; and
- distributing heat into the aerosol generating article in second receptacle of the aerosol generating device via the heat diffuser.

[0017] According to the present disclosure, the term "proximal" refers to the end of a substantially longitudinal body such as an aerosol generating device that, in use, accommodates a heat not burn cigarette. In other words, the term "proximal" refers to the end of an aerosol generating device that is closest to the face of a user, in use. Therefore, in the following application, the term "distal" refers to the end of a substantially longitudinal body such as an aerosol generating device that, in use, is further from the face of the user than the "proximal" portion.

[0018] According to the present disclosure, the term "thermally coupled" means that heat generated by a heat source proximate to a first element can spread via a thermal coupling to a second element. The thermal coupling has the property that the generated heat can be directed or routed in a controllable way. The term includes thermal conduction, thermal convection, and radiation. For example, a thermal coupling between two elements may in a first example be provided by a metal component having good thermal conductivity that joins the two elements. The shape of the metal component enables the direction of the heat flow to be controlled. In a second example, a tube filled with air may enable convection of heated air from a flame to an absorbing element. The absorbing element may, in a third example, absorb radiated heat from such a flame.

[0019] According to the present disclosure, the term "thermally conductive contact" refers to the property that two members of an assembly are in physical contact, and also enable a relatively efficient degree of heat transfer between them. For example, two abutting copper members would be considered to be in thermally conductive contact because heat flow between the two copper members would be efficient. However, a copper member abutting a glass member would be considered to be in physical contact but not in thermally conductive contact, owing to the poor thermal conductivity of glass (typically 1 W per mK) compared to the thermal conductivity of copper (typically about 400 W per mK).

In other words, term "thermally conductive contact" means that at least two distinguishable members are in physical contact, and are each made from, or comprise, a material having relatively high thermal conductivity.

[0020] Accordingly, the present specification enables the smoking of heated tobacco without the use of an electrically heated source through the design of a heat not burn device in which the heat is provided by a gas lighter. Such a smoking device can use flame produced by the gas lighter as a heating source to store thermal energy into a storing agent (such as a phase change material) that slowly releases the thermal energy when required, or transfer only a portion of the flame generated heat directly to an aerosol generating substrate.

[0021] Further considerations according to the aspects and embodiments described herein are the generation of a lighter like flame that uses compressed gas or the fuel or other fuel (such as isobutane) within the device. An "off-the-shelf lighter" capable of sliding in or being added on to the aerosol generating device can be used as the heat source. Furthermore, the aerosol generating device may comprise an embedded lighter mechanism with a refillable fuel compartment or a pre-filled fuel compartment.

[0022] The flow of air through the aerosol generating device is provided so that the flame is ignited and sustained internally to the body of the aerosol generating device without heating its external structure to protect the user when holding it in their hands, placing the device in their pockets, or placing the device in a bag.

[0023] The aerosol generating device enables a transfer of thermal energy produced by the flame to the tobacco in a controlled manner by a conductive heating element, or a storing element such as phase change material that stores and releases the thermal energy. The thermal energy stored in the conductive heating element or storing element may be applied to heat the tobacco on the periphery of the tobacco or internally to the tobacco using a thermally conductive element. As a result, multiple heating and smoking cycles of an aerosol generating substrate can be achieved using a flame rather than electrical energy stored in batteries that is then converted to thermal energy.

[0024] As a result, the present specification provides an aerosol generating device for heated tobacco that can heat consumable cigarettes without burning using a flame, whilst not requiring electronics or a battery. Arrangements for the flow of air and the control or safe deployment of the flame internal to that heat not burn device are enabled. Arrangements for heat storage and heat transfer from the flame to an aerosol generating substrate, for example a tobacco product, and arrangements for the uniform distribution of heat over the tobacco product for the smoking duration are described.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Other characteristics will be apparent from the accompanying drawings, which form a part of this disclosure. The drawings are intended to further explain the present disclosure and to enable a person skilled in the art to practice it. However, the drawings are intended as nonlimiting examples. Common reference numerals on different figures indicate like or similar features.

Figure 1 schematically illustrates a system diagram of a heat not burn assembly according to a first aspect.
Figure 2a schematically illustrates an aerosol generating device with an aerosol generating article inserted.
Figure 2b schematically illustrates an aerosol generating device without an aerosol generating article.
Figure 3 schematically illustrates the aerosol generating device in a transparent view showing principal components.
Figure 4 schematically illustrates the internal arrangement of the aerosol generating device via a sectional cut along the principal axis.
Figure 5 schematically illustrates a side view of the internal arrangement of the aerosol generating device.
Figure 6 schematically illustrates a side view of the internal arrangement of the aerosol generating device with an alternative heat diffuser and an alternative heat modulator with a partial thermal bypass of the PCM material.
Figure 7 schematically illustrates a side view of the internal arrangement of a portion of the aerosol generating device comprising gas flow channels.
Figure 8a schematically illustrates an isometric view of a first example of a heat not burn lighter assembly without an aerosol generating article inserted.
Figure 8b schematically illustrates a side view of the first example of a heat not burn lighter assembly without an aerosol generating article inserted.
Figure 9a schematically illustrates an isometric view of a second example of a heat not burn lighter assembly, with an aerosol generating article inserted.
Figure 9b schematically illustrates a side view of a second example of a heat not burn lighter assembly, with an aerosol generating article inserted.
Figure 10 schematically illustrates a cut through side view along a longitudinal axis between the distal end and the proximal end of the heat not burn lighter assembly introduced in **Figure 8a** and **Figure 8b.**
Figure 11 schematically illustrates a method according to a sixth aspect.

DETAILED DESCRIPTION

[0026] Conventional "heat not burn" devices (or heated tobacco devices), as discussed in the background section, heat rather than burn a thermally activated aerosol generating substrate, such as tobacco, in an aerosol generating article. The vapour generated by "heat not burn" devices contains fewer harmful compounds and is appealing to health-conscious consumers. The tobacco in such products is "heated without reaching ignition to produce an emission containing nicotine and other chemicals" according to the definition of the World Health Organisation in the publication "Heated Tobacco Products, a Brief', WHO, 2020.

[0027] Typically, the aerosol generating substrate is provided in the form of a rod resembling conventional cigarette. The rod is inserted into a receptacle on an electrical "heat not burn" handset. When the rod is inserted into the receptacle, an active portion of the rod comprising the aerosol generating substrate is in close contact with a heating coil, and/or a metallic elongated structure such as a blade insertable into the rod. Application of electrical energy to the heating coil causes the aerosol generating substrate to be heated by the heating coil and/or the metallic elongated structure. Vapour is emitted from the aerosol generating substrate and may be drawn through the remainder of the rod by an inhalation action from the user.

[0028] However, conventional heat not burn devices require sophisticated control electronics and a large battery to convert electrical energy to heat energy that may be used to heat the tobacco. Even so, the efficiency of the conversion of electrical energy to heat energy in heat not burn devices is inefficient. The disposal of batteries and electronic devices is complicated, because the substances comprised within such electronic devices require special disposal procedures. Conventional electrical heat not burn devices include bulky and heavy components that users need to carry around. Conventional electrical heat not burn devices require electrical recharging with auxiliary charging cables. This is inconvenient and time consuming.

[0029] Some heat not burn products may heat liquids creating a vapour emission that is drawn, for example by user inhalation, through a tobacco (herbal) plug to absorb flavour and nicotine from the tobacco plug. Some heat not burn products comprise a vented chamber that heat loose tobacco. Yet other heat not burn products have a similar size and shape to regular cigarettes and comprise a carbon tip wrapped in glass fibre that may be electrically heated.

[0030] Typically, heat not burn devices heat an aerosol generating substrate to 350°C (662°F). This temperature is far lower than that required to burn traditional cigarettes. Traditional cigarettes burn tobacco at temperatures of around 900°C (1652°F). However, even to heat tobacco leaves to 350°C can consume large amounts of electrical energy with very low efficiency (owing, for example, to the internal resistance of the batteries used).

[0031] Cigarette lighters, for example butane lighters such as the BIC J26 "Maxi" (TM) comprise pressurised liquid butane. Upon pressing a trigger element, the butane is released from a nozzle in a narrow stream of gas. Substantially simultaneously, an ignition spark can be provided using a striking wheel configured to strike a flint against a steel, or by compression of a piezo-electric crystal. The narrow stream of butane is ignited and burns at around 2000°C (3600°F) as measured in close proximity to the flame tip.

[0032] A butane cigarette lighter has attractive properties, because a butane lighter only uses as much liquid butane as is required to support the flame, and thus fuel consumption is efficient. Furthermore, cigarette lighters are made from simple plastic parts that have been, for example, ultrasonically welded together. The nozzle configured through which the butane is released prior to ignition is typically in the form of a Venturi nozzle enabling a steady flame of predetermined calorific emission. The mechanism for releasing butane from the reservoir and for operating the spark wheel is considerably simpler than control electronics. Accordingly, cigarette lighters offer a simple, controllable, and efficient source of heat that can be utilised in to heat an aerosol generating substrate without burning.

[0033] Accordingly, the present specification proposes to provide a heat transfer assembly 10 that may be incorporated into aerosol generating devices for heating a substrate without burning. A heat transfer assembly 10 is configured to absorb heat from a heat source 12. For example, the heat transfer assembly 10 is configured to absorb heat from a cigarette lighter or cigar lighter. The heat transfer assembly 10 is configured to emit thermal energy absorbed from the source of flame in a temperature range at which an aerosol generating substrate, may be heated without burning.

[0034] Accordingly, an aerosol generating device for "heating not burning" an aerosol generating substrate such as tobacco is significantly simplified, requiring no control electronics or a battery, for example.

[0035] The heat transfer assembly 10 may comprise a phase change material (PCM) 35. PCMs store and release thermal energy during the process of changing from one phase to another (typically melting and freezing). When a PCM freezes, it releases energy in the form of latent heat of fusion, or energy of crystallisation. When a PCM is melted, an equal amount of energy is absorbed from the immediate environment as the PCM changes from solid to liquid. This property of PCMs enables thermal energy storage, thermal barriers, or thermal delay elements to be provided.

[0036] A number of different PCM materials have been identified and developed that freeze and melt at temperatures from the cryogenic range to several hundred degrees centigrade. Accordingly, the present specification proposes to provide a thermal buffer, for example using a PCM, to convert the high temperature of a naked flame (such as a cigarette lighter butane flame) to a lower temperature, and, for example, to store energy emitted by the naked flame and to release

it over a longer period of time than the naked flame is present for.

[0037] The specification furthermore proposes to apply such a heat transfer assembly to aerosol generating devices that function on the heat not burn principle. In particular, an integrated heat not burn device, a heat not burn device that can be refilled using a conventional cigarette lighter, or a device for clipping onto the end of a conventional cigarette lighter are proposed herein. Accordingly, the specification discusses according to the first aspect and its embodiments details of a heat transfer assembly 10 that may be applied to a range of different aerosol generating devices 8 functioning according to the heat not burn principle. The second and third aspects and their embodiments concern specific heat not burn smoking articles that the heat transfer assembly 10 of the first aspect has been incorporated into.

[0038] According to a first aspect, there is provided a heat transfer assembly 10 for heating an aerosol generating medium without burning. The heat transfer assembly comprises a heat absorber 30, a heat modulator 32, and a heat diffuser 34. The heat absorber 30 is configured to absorb thermal energy from a proximate heat source in a first temperature range. The heat absorber 30 is thermally coupled to the heat modulator 32, and the heat modulator 32 is thermally coupled to the heat diffuser 34. The heat modulator 32 is configured to absorb the thermal energy emitted from the heat source, and to provide thermal energy to the heat diffuser 34 in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range, wherein the heat modulator 32 comprises at least one phase change material 35.

[0039] **Figure 1** schematically illustrates a system diagram of a heat not burn assembly according to the first aspect.

[0040] The direction of heat flow through the heat absorber 30, the heat modulator 32, and the heat diffuser 34 is schematically shown using arrows. In an embodiment, the heat transfer assembly 10 may be incorporated into an aerosol generating device 8 comprising, for example, a heat source 12. In an example, the heat source 12 is a flame source. In an example, the flame source generates a flame via catalytic combustion of a fuel precursor.

[0041] The heat source 12 may comprise, for example, a fuel reservoir 14, a fuel valve 16, a fuel nozzle 18, and an igniter 20. In an embodiment, the heat source 12 is a butane cigarette lighter. In other embodiments, the heat absorber 30 of the heat transfer assembly 10 is configured to absorb thermal energy from another source of flame such as a lit match. In an example, the heat source 12 is capable of generating a lighter-like flame able to burn above 350°C. In an example, the flame is laminar (as produced by gas cigarette lighters). In another example, the flame resembles a jet or turbo flame that premixes compressed gas fuel before ignition (similar to turbo gas lighters). The thermal path between the heat absorber 30, heat modulator 32, and heat diffuser 34 may be exclusively by thermal conduction. Alternatively, the thermal path between the heat absorber 30, heat modulator 32, and heat diffuser 34 may also comprise a component of thermal convection and/or radiation.

[0042] In an embodiment, a second portion of an internal periphery the heat absorber forming the cavity is a thermally conductive portion capable of conducting heat to a second portion of an external periphery of the heat absorber that is thermally coupled to the heat diffuser.

[0043] In an embodiment, the heat absorber 30 comprises heat insulation 31. The heat insulation 31 prevents thermal energy from the heat source 12 conducting, convecting, or radiating away from the heat absorber 30 to parts of a heat not burn assembly 8 that the user is holding. In an example, the heat absorber 30 comprises a cavity or chamber capable of substantially encircling flame created by the heat source 12. In an example, the cavity or chamber comprises at least one inlet enabling the supply of ambient gas flow to nourish the flame in the heat absorber. In an example, the cavity or chamber comprises at least one outlet enabling the venting of exhaust fumes and/or excessive heat from the cavity into the environment.

[0044] In an embodiment, the heat source is not an electrical heat source.

[0045] In an embodiment, the heat absorber 30 comprises a cavity configured to substantially surround a flame produced by the heat source 12, and to conduct thermal energy from the heat source, in use.

[0046] In an embodiment, the heat absorber 30 further comprises a thermally conductive portion 136a capable of transferring heat from inside the cavity to a surface of the heat modulator 32.

[0047] In an embodiment, the heat absorber 30 forming the cavity comprises an internal periphery with an insulating portion 162 configured to insulate against thermal conduction to a corresponding external periphery of the heat absorber 30 in use.

[0048] In an embodiment, the outer periphery of the heat absorber 30 may be substantially surrounded by a portion of heat insulation to ensure that the outer body of the cavity or chamber remains at a range of temperatures that a user's skin can withstand.

[0049] In an example, the temperature of the outer periphery of the casing member 102a-d the heat absorber 30, the heat modulator 32, and the heat diffuser 34 does not exceed a safe temperature for direct contact to human skin, for example 40°C. In an example, the outer periphery of the casing member 102a-d comprises a warning marker or label (not illustrated) alerting a user to a region on the outer surface of the casing member 102a-d that a user should avoid touching, in use.

[0050] In an embodiment, the heat absorber 30 comprises a flameproof material that does not deform or melt at high

temperatures. In an embodiment, the first portion of the internal periphery comprises alumina, solid glass, glass fibre, silica, Kapton (TM), cellulose, mineral wool, polystyrene, mica-based insulator, and/or carbon.

[0051] In an embodiment, the heat modulator 32 comprises a phase change material 35 capable of absorbing energy from the heat source 12 via the heat absorber 30, and releasing the energy via the heat diffuser 34 at a different temperature. In an example, the heat modulator releases the heat at a different time.

[0052] In an embodiment, the heat modulator 32 comprises a receptacle, such as a sealed rigid or semi-rigid container, that sealably encloses the phase change material 35. The receptacle isolates the phase change material 35 from the remainder of the interior of the casing member 102a-d. When the phase change material 35 enters its liquid phase upon being heated, it is isolated in a desired portion of the casing member 102a-d. In an embodiment, the receptacle for accommodating the phase change material 35 is, at least partially, formed integrally with the casing member 102a-d.

[0053] Therefore the heat modulator 32 can, in an example, function as a thermal delay element and/or a thermal modulation element. Other materials and structures can function as a thermal delay element and/or a thermal modulation element without comprising a phase change material 35, and/or in addition to the phase change material 35.

[0054] For example, a heat modulator may be comprised of a longitudinally shaped metallic element comprising a plurality of dissipative vanes that thermally couple the heat absorber 30 to the heat diffuser 34. In this example, as heat is applied to the heat absorber 30 heat dissipation from the plurality of dissipative vanes reduces the rate of heat increase at the heat diffuser 34.

[0055] The heat absorber 30 and heat modulator 32 are connected so that heat absorbed by the heat absorber 30 can flow into the heat modulator 32. In an embodiment, the heat absorber 30 is in physical contact with, or abuts, the heat modulator 32. In an embodiment, the heat absorber 30 and at least a portion of the heat modulator 32 may be integrally formed from the same material. For example, the heat modulator 32 may comprise a sealed body that contains a phase change material 35. In an embodiment, the sealed body configured to contain the phase change material 35 may be integrally formed with the heat absorber 30, and/or the heat diffuser 34.

[0056] The heat diffuser 34 may comprise a heat transfer material 37 to enable the heat stored in the heat modulator 32 to be transferred to a receptacle in which a heat not burn consumable product may be accommodated.

[0057] In an embodiment, the second portion of the internal periphery and the external periphery comprises a thermally conductive element in conductive contact to the heat modulator, a portion of the heat modulator, or a sealed body comprising the heat modulator.

[0058] In an embodiment, the heat absorber 30 comprises at least one thermally conductive protrusion or vane configured to extend into the cavity provided by the heat absorber, to improve the efficiency of thermal energy transfer between the flame and the internal periphery of the heat absorber, in use.

[0059] In an embodiment, the cavity defined by the heat absorber has a substantially cylindrical or ovoid cross-section in a plane perpendicular to a longitudinal direction of the heat transfer assembly, with the diameter or major axis of the cylindrical or oval cross-section comprised in the range 5mm to 30mm.

[0060] In an embodiment, the heat absorber has a length in the range 5mm to 50mm along a longitudinal direction of the heat transfer assembly.

[0061] In an embodiment the heat modulator comprises a sealed body containing the at least one phase change material, wherein a first portion of the sealed body is in thermally conductive contact with the heat absorber, and a second portion of the sealed body is in thermally conductive contact with the heat diffuser.

[0062] In an embodiment, the heat modulator comprises at least first and second phase change materials, or at least first and second sealed bodies comprising at least first and second phase change materials, respectively, wherein the first phase change material has a different temperature of phase transition to the second phase change material.

[0063] In an embodiment, the at least one phase change material is selected from: a salt hydrate, a barocaloric, mechanocaloric, magnetocaloric material, paraffin, sodium acetate, naphthalene, wax, polyethylene oxide, a metal, metal salt, a mixture of eutectic salts, Glauber salts, or an alloy.

[0064] Other phase change materials that may be used are, for example, sodium and potassium nitrates, hydroxides, carbonates, vanadates, molybdates, and/or metal alloys.

[0065] In an example, a phase change material may be a molten salt binary system such as KNO_3 and KCl (melting point 307°C), KNO_3 and K_2CO_3 (melting point 325°C), KNO_3 and LiOH (melting point 330°C), KCl and $MnCl_2$ (melting point 417°C), $CaCl_2$ and LiCl (melting point 475°C). An example, a phase change material may be a molten salt ternary system.

[0066] In an embodiment, the heat modulator 34 is a heat sink or heat exchanger with high thermal conductivity such that it can accept temperatures up to a certain threshold (for example 350°C) and discard the remaining heat to the environment. In an example, the heat modulator is aluminium, copper, or an encased liquid.

[0067] In an embodiment, the first temperature range includes a temperature range of a source of flame, such as a lighter, and wherein the second temperature range includes an aerosolization temperature of an aerosol source of a heat not burn cigarette.

[0068] In an embodiment, the first temperature range is greater than 1000 degrees Celsius, and the second temperature

range is less than 120 degrees Celsius.

[0069] In an embodiment, the first temperature range is greater than 900 degrees Celsius, and the second temperature range is less than 400 degrees Celsius.

[0070] In an embodiment, the first temperature range is greater than one of 500°C, 550°C, 600°C, 650°C, 700°C, 750°C, 800°C, 850°C, 900°C, 950°C, 1000°C, 1050°C, or 1100°C.

[0071] In an embodiment, the second temperature range is less than one of 1000°C, 950°C, 900°C, 850°C, 800°C, 750°C, 700°C, 650°C, 600°C, 550°C, 500°C, 450°C, 425°C, 400°C, 375°C, 350°C, 325°C, 300°C, 275°C, or 250°C.

[0072] In an embodiment, the heat modulator is further configured to thermally conduct a proportion of the heat from the heat absorber 30, 130, 230 to the heat diffuser 34, 134, 234 via a bypass 137 (thermal bypass) of the at least one phase change material 35 comprised in the heat modulator.

[0073] In an embodiment, the heat diffuser 34 comprises a thermally conductive rod, spike, or blade.

[0074] In an embodiment, the thermally conductive rod, spike, or blade is configured, in use, to protrude into a heat not burn cigarette inserted into the heat diffuser by between 2mm and 50mm along a longitudinal axis of the heat not burn cigarette.

[0075] In an embodiment, the heat diffuser 34 is configured to transfer heat to a heat not burn cigarette to enable aerosolization of one or more volatile compounds therein.

[0076] In an embodiment, the heat diffuser 34 comprises at least one elongate thermally conductive member in thermal contact with the heat modulator 32. The elongate thermally conductive member is configured to lodge within the heat not burn cigarette upon insertion of the heat not burn cigarette into the heat diffuser 34. An effect of such configuration is that heat may be delivered directly to aerosol generating substrate material, or another gas emitting and heat activated substrate, contained in the internal portion of an aerosol generating article 110, without needing to radiate or conduct through a tipping paper, for example.

[0077] In an embodiment, the heat diffuser 34 may comprise a thermally conductive receptacle, for example a tube, configured, in use to accept and/or to physically support the heat not burn cigarette, wherein the thermally conductive receptacle is in thermal contact with the heat modulator 32.

[0078] In an embodiment, the thermally conductive receptacle and/or thermally conductive member comprises stainless steel, copper, thermally conductive paste, metal alloys comprising nickel, aluminium, chromium, tin, iron, and the like.

[0079] Specific implementations of aerosol generating devices 100 comprising the heat transfer element 10 will now be discussed.

[0080] According to a second aspect, there is provided an aerosol generating device 100 for generating an aerosol from an aerosol generating substrate comprised in an aerosol generating article 110. The aerosol is generated by heating, not burning, the aerosol generating substrate. The aerosol generating device comprises a first receptacle 146a configured to receive a heat source.

[0081] In the second aspect, a heat transfer assembly 10 is provided, according to the first aspect or its embodiments. and a second receptacle 140a configured to receive an aerosol generating article 110.

[0082] In use, a heat source 12 adjacent to, or comprised in, the first receptacle 146a is configured to be actuatable by a user to generate thermal energy, and to transfer the thermal energy to the heat absorber of the heat transfer assembly 10. The second receptacle 140a is configured to accept an aerosol generating article, and the heat transfer assembly 10 is configured to transfer thermal energy from the heat source to a portion of the aerosol generating device comprising the aerosol generating substrate, so that the aerosol generating substrate releases vapour to a user without burning.

[0083] **Figure 2a** schematically illustrates an aerosol generating device 100 with an aerosol generating article 110 inserted. The aerosol generating device 100 comprises a casing member 102a-d distributed between a distal end 104 and a proximal end 106 of the aerosol generating device 100. In this specification, the proximal end 106 is the end of the aerosol generating device 100 that the user inserts the aerosol generating article 110 into. The distal end 104 is the end of the aerosol generating device 100 furthest away from the proximal end 106 along a major longitudinal axis of the aerosol generating device 100. In other words, the distal end 104 is the end of the aerosol generating device 100 furthest away from the face of the user of the aerosol generating device 100, in use.

[0084] The aerosol generating device 100 illustrated in **Figure 2a** comprises a casing member 102a-d configured to accommodate (enclose) the heat transfer assembly 10 in accordance the first aspect. In an example, the heat diffuser 34 (not shown) is closer to the proximal end 106 of the casing, and the heat absorber 30 (not shown) is closer to the distal end 104 of the casing. Accordingly, the distal end 104 of the casing comprises an air aperture portion 10 to enable inlet air to be supplied to the heat absorber 30, for example. As illustrated, the casing member 102a-d is divided into a distal casing portion 102a, an actuator casing portion 102b, a central casing portion 102c, and a proximal casing portion 102d.

[0085] In this example, the distal casing portion 102a and the proximal casing portion 102d comprises tapers for aesthetic and/or ergonomic effect. In an example, the actuating casing portion 102b comprises an actuator enabling a user to switch the heat source on and off.

[0086] Also illustrated in Figure 2a is a partial view of an aerosol generating article 100 inserted into a longitudinal receptacle provided in the proximal casing portion 102d. In an example, one or more portions of the casing 102 are integrally formed. In an example, the entire casing 102 is integrally formed. In an example, distal casing portion 102a and actuator casing portion 102b comprise mating surfaces enabling the connection and disconnection of the respective portions, so that a heat source 12 such as a cigarette lighter can be placed inside the casing 102. In the example, the mating surfaces are complementary screw threads or detents. In an example, the distal casing portion 102a and the actuator casing portion 102b have "snap fit" or single use connections, so that a heat source 12 such as a cigarette lighter can be permanently mounted inside the aerosol generating device 100.

[0087] **Figure 2b** schematically illustrates an aerosol generating device 100 without an aerosol generating article 110.

[0088] **Figure 3** schematically illustrates the aerosol generating device 100 in a transparent view showing the arrangement of principal components.

[0089] A fuel reservoir 114 comprised in a flame source portion 146 of the aerosol generating device 100 is configured to transfer liquid butane to a fuel nozzle 118 via a lumen 123. The nozzle 118 is positioned proximate to the combustion chamber 130 functioning as a heat absorber 30 of a heat transfer assembly 10. A fuel actuator 120 controls the release of fuel from the fuel reservoir 114 and the actuation of a flame igniter proximate to the nozzle 118.

[0090] Longitudinally opposite the nozzle 118, the combustion chamber 130 abuts a heat modulator 32 comprising a phase change material 35. In another embodiment, the heat modulator 32 does not need to comprise a phase change material 35. In this example, a cavity forming the heat absorber 30 is illustrated in **Figure 3** using a dotted line to transparently delineate an example of the boundary of the cavity encompassing the flame 119a within the casing 102. The heat diffuser 34 is present but not visible in **Figure 3,** because it is obscured by aerosol generating article 110 inserted into a receptacle at the proximal end of the casing 102.

[0091] In use, a user inserts the aerosol generating article 110 into the receptacle at the proximal end 106 of the casing 102 such that the aerosol generating article 110 abuts, is surrounded by, or makes thermal contact with, the heat diffuser 34 of the heat transfer assembly 10. The heat diffuser may be provided in many different physical forms capable of heating an aerosol generating article containing an aerosolizeable substrate, some of which are discussed subsequently.

[0092] **Figure 4** schematically illustrates the internal arrangement of another embodiment of the aerosol generating device 100 via a sectional cut along the principal axis. This embodiment different from that of **Figure 3** because it comprises a tubular heat diffuser 133 in the proximal end 106. The tubular heat diffuser 133 may function as a heat diffuser. The tubular heat diffuser 133 is thermally coupled to heat modulator 132. Thus, the tubular heat diffuser 133 may be an alternative or an addition to an integrated heat diffuser 134. Rather than one or more elongate elements, such as blades destructively or comparatively interacting with an aerosol generating article 110, the tubular heat diffuser 133 forms a combustion chamber 130 into which an aerosol generating article 110 is inserted.

[0093] In other words, the tubular heat diffuser 133 is an encompassing component that heats the aerosol generating article 110 from the external surface of the aerosol generating article. An effect of this is that because a greater surface area of the aerosol generating article 110 is exposed to heat from a tubular heat diffuser 133, heat is more evenly distributed around and inside the aerosol generating article 110.

[0094] The remaining elements of the further embodiment of the aerosol generating device 100 illustrated in **Figure 4** are substantially similar to those described in relation to the embodiment of **Figure 3.**

[0095] **Figure 5** schematically illustrates a side view of the internal arrangement of an aerosol generating device 100.

[0096] The principal elements of the aerosol generating device 100 identified from the proximal end 106 along a longitudinal axis of the aerosol generating device 100 to the distal end 104 of the aerosol generating device 100 are now introduced.

[0097] The aerosol generating device 100 may, overall, have the cross-section of a cylinder. In an embodiment, the proximal end 106 and/or the distal end 104 of the cylinder may be partially tapered towards the longitudinal axis of the aerosol generating device 100, for example for ergonomic convenience. In another example, the aerosol generating device 100 may have the cross-section of a triangle, square, pentagon, hexagon, and the like. The aerosol generating device 100 may have a rectangular or trapezoidal cross-section. The aerosol generating device 100 may comprise a variable cross-section that changes as the longitudinal axis of the aerosol generating device 100 is traversed from the distal end 104 to the proximal end 106. For example, an undulating pattern may be provided over some or all of the external cross-section of the aerosol generating device 100 to improve the finger grip of a user.

[0098] The dimensions of the aerosol generating device are at the upper bound, for example, constrained by the maximum dimension that an average human hand is capable of comfortably holding. The dimensions of the aerosol generating device 100 are at the lower bound, for example, constrained by the dimensions of a typical aerosol generating article 110 and/or a typical flame source, such as a lighter.

[0099] In an example, the dimension of an example aerosol generating device 110 is a cylinder having a substantially constant diameter along a longitudinal axis. The diameter of the example aerosol generating device 110 is, comparable to conventional cigarettes, between around 7 mm to 9 mm. The length of an example aerosol generating device 110 is, comparable to conventional cigarettes, between 70 and 110 mm long.

[0100] Of course, the dimensions and shape of an example aerosol generating device 110 may take many forms and the previously cited numbers are examples.

[0101] Beginning at the distal end 104 of the aerosol generating device 100, the flame source portion 146 comprises a first receptacle 146a capable of accommodating a flame source. The flame source may be retained in the distal casing portion 102a and/or the actuator casing portion 102b dependent on specific size and design considerations of the casing 102 and the nature of the flame source.

[0102] In an example, the flame source may be a commodity lighter such as the BIC J26 "Maxi" (TM), although a generic lighter is illustrated. The outer dimensional envelope of the BIC J26 "Maxi" (TM) are 80 mm x 25 mm x 15 mm with a weight of 20-30 grams. Of course, the flame source may be any other type of lighter or flame source. In an example, the flame source comprises a fuel reservoir 114 accommodated inside the first receptacle 146a of the casing 102. In an example, the flame source resembles a generic lighter, but is integrally formed with the casing 102.

[0103] In an example (not illustrated), the casing 102 may comprise a user actuatable joint enabling the separation of the casing 102 into a plurality of separate parts. For example, the casing 102 may be divided into a first separable portion comprising the distal casing portion 102a and the actuator casing portion 102b. A second separable portion may comprise the central casing portion 102c and a proximal casing portion 102d. The first and second separable portions may unscrew in the manner of a pen, for example. Once separated, a removable lighter may be replaced in the first separable portion.

[0104] In the illustrated example, the flame source portion 146 comprises an integral flame source composed of a fuel reservoir 114 surrounded by a pressurized lining. A lumen 123 extends from the inside of the fuel reservoir 114, substantially along the longitudinal direction of the axis running from the distal end 104 to the proximal end 106, terminating at a nozzle 118.

[0105] In an example, the fuel nozzle 118 ?is specially shaped to improve the properties of a flame in use. For example, the nozzle may be a Venturi nozzle. A fuel actuator 120 is disposed in the wall of the actuator casing portion 102b and is operably coupled to a valve (not shown) capable of controlling fuel flow from the fuel reservoir 114 to the nozzle 118. An ignition means 150 is also operably coupled to the fuel actuator 120. This enables an ignition impulse to be emitted in the vicinity of the nozzle 118. For example, the ignition means 150 may be a sparking wheel, so that when the fuel actuator 120 is pressed down by a user, spark is omitted in the vicinity of the nozzle 118 igniting fuel passing from the fuel reservoir 114 to the nozzle 118. A piezoelectric element may also be used to provide the ignition spark.

[0106] A combustion chamber portion 144 of the aerosol generating device 100 comprises, at its distally oriented end, the nozzle 118. The proximally oriented end of the combustion chamber portion 144 abuts the heat management portion 142 of the aerosol generating device 100.

[0107] A substantial proportion of the combustion chamber portion 144 comprises the combustion chamber 130 (cavity). The combustion chamber functions as a heat absorber 30 by providing an environment for a naked flame to burn in. The combustion chamber 130 directs thermal energy to a heat modulator 132. The combustion chamber prevents heat from conducting or radiating to the casing member 102a-d (where heating the casing may injure a user). The combustion chamber 130 is defined by a distal wall of the combustion chamber portion 144.

[0108] In the example of **Figure 5**, the distal wall of the combustion chamber portion 144 comprises the nozzle 118, however it should be understood that the nozzle 118 may exhaust into the combustion chamber 130 from other locations in the combustion chamber portion 144. The combustion chamber 130 may be further defined by a proximal wall of the combustion chamber portion 144. At least a portion of the proximal wall of the combustion chamber portion 144 comprises a first portion 136a of the heat absorber 136. In other words, the first portion 136a of the heat absorber 136 is disposed to absorb the thermal energy emitted inside the combustion chamber 130 by ignition of a flame supplied by fuel emitted from the nozzle 118.

[0109] A skilled person will appreciate that the custom flame source portion 146 design discussed in the foregoing paragraph may be replaced by a commodity cigarette lighter held in a suitable moulding or cut out of the casing 102. Furthermore, a skilled person will appreciate that the use of the nozzle 118 to discharge fuel into the combustion chamber 130 is exemplary, and fuel distribution means such as a wick can also sustain a flame in the combustion chamber 130.

[0110] Although not illustrated in **Figure 5** for clarity, the combustion chamber 130 comprises an air supply and/or an exhaust route. In an embodiment, the air supply and/or exhaust route may be a first gas channel 129a and a second gas channel 129b is illustrated at least in **Figure 7.**

[0111] In examples, the distal end 104 of the aerosol generating device 100 comprises an air aperture portion 108. The air aperture portion 108 is substantially permeable to external gas. The air aperture portion 108 may supply external air to one or more of the first gas channel 129a and second gas channels 129b. In turn, the first gas channel 129a and second gas channels 129b may supply external gas to the combustion chamber 130 at a rate to enable a sufficiently sized flame to be ignited, and to burn, inside the combustion chamber 130 in the vicinity of the nozzle 118. Exhaust gases may be removed through one of the gas channels 129a, 129b or via other apertures from the combustion chamber 130 (not shown).

[0112] The combustion chamber 130 may comprise an encompassing wall configured to form a combustion chamber that is substantially resistant to the high temperature emitted by a lighter flame. For example, the shell 119 may be

comprised of alumina (ceramics), Pyrex glass, steel, and the like. The shell 119 may be tubular, for example. The function of the shell 119 is to prevent heat from being conducted laterally into the casing member 102a-d of the aerosol generating device, or at least to significantly reduce the degree of conduction away from the combustion chamber 130.

[0113] As noted above, the end of the combustion chamber 130 (flame chamber) nearest to the proximal end 106 of the aerosol generating device 100 is formed from a first portion 136a of the heat absorber 136. For example, the first portion 136a of the heat absorber may comprise a material having good thermal conduction properties such as a metal abutting the tubular shell 119.

[0114] In an example (not shown), the first portion 136a of the heat absorber may comprise one or more protrusions or vanes into the combustion chamber 130 to improve the rate of thermal conduction into the heat absorber 136 from a flame in the combustion chamber 130. For example, an example of a protrusion is a plurality of tubes inside the combustion chamber 130 of decreasing diameter, arranged concentrically around the longitudinal axis of the casing member 102a-d. The plurality of tubes may be thermally connected to the heat absorber 136. The plurality of tubes may increase the surface area of the first portion of the heat absorber 136a capable of absorbing heat from a flame in the combustion chamber 130.

[0115] In other words, the combustion chamber 130 comprises at its proximal end a heatsink configured to absorb heat from a flame, in use.

[0116] A heat modulator 132 is provided in a heat management portion 142 of the aerosol generating device 100. The heat modulator 132 is in thermal contact with the combustion chamber 130 and the heat diffuser 134 via a thermally conductive path. A portion 163 of the heat modulator 132 is in thermal contact with the first portion 136a of the heat absorber.

[0117] The heat modulator 132 is configured to absorb the thermal energy emitted from a flame in the combustion chamber 130, and to provide thermal energy (for example, by thermal conduction) to the integrated heat diffuser 134 in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range, wherein the heat modulator comprises at least one phase change material 35.

[0118] In embodiments, the heat modulator 132 may comprise a phase change material 35.

[0119] Accordingly, the heat modulator 132 changes (shifts) the temperature range and/or time of thermal emission from the integrated heat diffuser 134, as compared to the temperature range and/or time of thermal absorption in the combustion chamber 130.

[0120] In an embodiment, the heat modulator 132 is a sealed container, for example formed from metal (such as a cylindrical canister) aligned with the longitudinal axis of the casing member 102a-d. The sealed container sealably encloses at least one phase change material 35, so that when the phase change material 35 is in its liquid phase, it does not leak from the container. In an example, a proximately oriented outer face of the sealed canister is the first portion 136a providing a wall of the combustion chamber 130. In an example, the proximately oriented outer face of the sealed container is thermally connected to another member that forms a distantly oriented wall of the combustion chamber (not illustrated).

[0121] In examples, a distally oriented outer face of the heat modulator 132 abuts, adjoins, or is integrally formed with a proximately oriented portion of the integrated heat diffuser 134. In an example, the distally oriented outer face of the heat modulator 132 provides a thermal path to the integrated heat diffuser 134.

[0122] In other embodiments (not illustrated) the heat modulator 132 may comprise a thermally conductive portion (such as a metal rod) integrally formed with, or directly connecting the first portion 136a of the heat absorber with the integrated heat diffuser. In this case, heat modulation is provided by a heat modulation element (for example, a sealed container) comprising the phase change material 35.

[0123] The heat modulation element may entirely enclose a portion of the thermally conductive portion connecting the first portion 136a of the heat absorber with the integrated heat diffuser, in the manner of a toroid. Additionally or alternatively, the heat modulation element may run in parallel to the thermally conductive portion connecting first portion 136a of the heat absorber with the integrated heat diffuser. Such configuration provides the effect that heat from the flame in the combustion chamber 130 is more directly conducted to the integrated heat diffuser 134. In other words, this enables the integrated heat diffuser 134 to heat up more quickly, and to a higher temperature (but without burning the aerosol generating substrate comprised in the aerosol generating article), which may be effective in certain applications. Thermal regulation function is provided by the phase change material comprised in the integrated heat diffuser.

[0124] **Figure 5** further illustrates a heatable product receptacle 140 of the aerosol generating device 100 is configured to form a heatable product receiver 141 in the form of combustion chamber 130 capable of accepting an aerosol generating device 100. In an example, the aerosol generating device 100 is a narrow tubular element resembling a conventional cigarette, albeit adapted for heat not burn functionality. An integrated heat diffuser 134 extends along the longitudinal axis of the aerosol generating device 100. The integrated heat diffuser 134 may be configured to extend 100%, 50%, 25%, 10%, or 5% of the internal length of the heatable product receptacle.

[0125] As illustrated in **Figure 5**, the integrated heat diffuser 134 is, in this example, an elongate blade element. In

other words, the integrated heat diffuser can be a flattened and substantially rectangular element with a height (the dimension normal to the longitudinal axis of the aerosol generating device 100) much smaller than the length of the elongate heat diffuser in the longitudinal dimension of the aerosol generating device 100.

[0126] As an example, the integrated heat diffuser 134 may be a steel leaf having a height of 4 mm normal to the longitudinal axis of the aerosol generating device 100, a length of 30 mm along the longitudinal axis of the aerosol generating device 100, and the thickness of 4.75 mm. In an embodiment, the integrated heat diffuser 134 comprises a sharpened end towards its proximal point. In embodiment, the integrated heat diffuser 134 reduces in height as it approaches the proximal end of the heatable product receiver 141. In an embodiment, the integrated heat diffuser 134 is a substantially cylindrical sectioned component such as a pin. In an embodiment, the heatable product receiver 141 comprises a plurality of elongate heat diffusers. In an embodiment, the integrated heat diffuser 134 resembles a knife blade. In an embodiment, the integrated heat diffuser 134 is substantially flat. In an embodiment, the integrated heat diffuser 134 comprises one or more crimped portions. Such crimped portions enable better contact between an aerosol generating article 110, when it is inserted into the heatable product receiver 141.

[0127] In an embodiment, the integrated heat diffuser 134 comprises a plug portion 134a. The plug portion 134a may, in an embodiment, be integrally formed with the integrated heat diffuser 134 and formed of the same material. In this case, the plug portion 134a serves to radiate heat more uniformly towards the end of an aerosol generating article 110 when placed in the heatable product receiver 141.

[0128] In an embodiment, the plug portion 134a may be a different material to the integrated heat diffuser 134. For example, the plug portion 134a may comprise an insulating portion, or ring. The insulating portion, or ring, may be formed from Kapton (TM), Delrin (TM), ceramic, or heat-resistant plastic to prevent the conduction of thermal energy away from the integrated heat diffuser 134 and into the casing member 102d.

[0129] The portion of the integrated heat diffuser 134 closest to the distal end 104 of the aerosol generating device 100 is in thermal contact with a second portion 136b of a heat modulator 132. For example, the heat modulator 132 is a sealed portion of phase change material 35.

[0130] In use, a user positions an aerosol generating article 110 inside the heatable product receiver 141 by aligning the longitudinal axis of the aerosol generating article 110 with the longitudinal axis of the casing member 102a-d the aerosol generating device 100, and pressing the aerosol generating article 110 so that it enters the heatable product receiver 141.

[0131] The heatable product receiver 141 may be dimensioned, for example, to provide a friction fit when an aerosol generating article is inserted, so that the aerosol generating article does not accidentally become detached from the heatable product receiver 141 as the aerosol generating device is moved around. In the illustrated example of **Figure 5** of the aerosol generating device 100, the user may encounter resistance as the aerosol generating article comes into contact with the integrated heat diffuser, as the illustrated elongated blade destructively or compressively contacts the vapour generating material inside the aerosol generating article 110.

[0132] Once the aforementioned operations have been performed, the aerosol generating article 110 is ready for smoking. The user then actuates the fuel actuator 120. In an example, the fuel actuator 120 opens a valve (not shown) enabling fuel in the fuel reservoir 114 to flow towards the nozzle 118 along the lumen 123. Actuation of the fuel actuator 120 simultaneously actuates an ignition means (such as a spark generator or sparking wheel) to ignite the fuel in the proximity of the nozzle 118. At this point, a flame is ignited and confined within the combustion chamber 130. The temperature of the flame above the flame tip is, for example, in a range of 2000°C to 4000°C.

[0133] Thermal energy from the flame is conducted, radiated, or convected to the first portion 136a of the heat absorber 136 and is conducted to heat modulator 132. The heat modulator 132 comprises a phase change material 35, initially in a solid phase. As the integrated amount of thermal energy absorbed from the flame in the combustion chamber 130 increases, the temperature of the phase change material 35 increases to the point where it changes phase to a liquid phase, for example. This process or transforms the temperature and/or time of emission of thermal energy from the second portion 136b of the heat absorber 136 compared to the temperature and/or time of absorption of thermal energy at the first portion 136a of the heat absorber.

[0134] Thermal energy then conducts along the thermal heat diffuser 134 and is emitted into the portion of the aerosol generating article containing vapour generating material (not shown in **Figure 5**). The heat of the vapour generating material is, therefore, elevated to a range of temperatures enabling vaporisation by heating, but not burning. In an example, the heat of the vapour generating material is elevated to between 350°C and 450°C.

[0135] At this point, a user may draw on the aerosol generating article with one or more puffs to draw vapour out of the aerosol generating article into their mouth. Once the user has finished smoking, the aerosol generating article is withdrawn from the heatable product receiver 141.

[0136] Further variations are now discussed.

[0137] **Figure 6** schematically illustrates a side view of the internal arrangement of the aerosol generating device with an alternative heat diffuser and an alternative heat modulator with a partial thermal bypass of the PCM material. Like reference numerals in **Figure 6** to those of **Figure 5** are as described as above, and are not further described. The

aerosol generating device of **Figure 6** comprises an alternative integrated heat diffuser in the form of a tubular heat diffuser 133. This enables an aerosol generating article (not shown) to be heated from its outside surface, and requires no destructive alteration of the aerosol generating article upon insertion. In an embodiment, the tubular heat diffuser 133 may be combined with an integrated heat diffuser 134 (for example an elongated blade) as discussed above to enable heating of an aerosol generating article from the outside and the inside simultaneously.

[0138] The aerosol generating device of **Figure 6** comprises a heat modulator 32 formed from a sealed body 136 comprising a collar or toroid-shaped capsule of phase change material 132(35) with a central thermal bypass member 137. In an example, the thermal bypass member 137 enables a direct thermal conduction path along the longitudinal axis of the aerosol generating device 100 between the heat absorber 30 and the heat diffuser 34 that does not pass through a portion of phase change material 35. In this case, the thermal transfer characteristic of the central thermal bypass member 137 is regulated by the adjoining phase change material, but not entirely controlled by the phase change material 35. The phase change material 35 according to this embodiment need not be a collar that fully surrounds the thermal bypass member 137, but could be a sealed body containing phase change material that partially surrounds, or lies alongside, and in thermal contact with the thermal bypass member 137.

[0139] In an embodiment, the aerosol generating device is arranged longitudinally between a proximal end comprising the second receptacle and a distal end comprising the first receptacle, and within a casing member 102a-d.

[0140] In an embodiment, the casing member 102a-d is configured to house a replaceable flame source as the flame source at the distal end of the aerosol generating device.

[0141] According to this embodiment, the aerosol generating device 100 does not incorporate an integral flame producer. Instead, elements 118, 150, 120, 123, 114 and 115 illustrated in **Figure 5** are provided by a substitutable cigarette lighter removably inserted into the first receptacle 146a prior to use.

[0142] **Figure 7** schematically illustrates a side view of the internal arrangement of a portion of an aerosol generating device comprising airflow channels. A first gas channel 129a and a second gas channel 129b are provided between the air aperture portion 108 at the distal end 104 of the casing member 102a-d and the combustion chamber 130. The first 129a and second 129b gas channels provide a gas connection between the outside environment around the aerosol generating device and the combustion chamber. In an example, the first and second gas channels are mutually exclusive and permit no mixing of gas. In an example, the first and second gas channels 129a,b are partially connected along the length of the flame source portion 146. In this way, ambient air may be supplied to the combustion chamber 130, and exhaust gases may be removed from the combustion chamber 130.

[0143] In an embodiment, the casing member 102a-d comprises an internal linear moulding or form enabling a flame source to be inserted and removed from the distal end 104 of the aerosol generating device 100 so that at least a flame emitting nozzle 118 and an ignition mechanism 120 of the flame source are inserted at a predetermined rotational offset relative to the longitudinal axis of the aerosol generating device 100.

[0144] In an embodiment, the casing member 102a-d comprises an aperture, or cut-out, that exposes an ignition actuator 120 of a flame source for operation by a user, in use.

[0145] In an embodiment, the casing member 102a-d comprises an ignition button operatively connected to a mechanical relay mechanism, such that when a flame source is operatively positioned in the distal end 104 of the aerosol generating device, actuation of the ignition button of the casing member 102a-d will cause a corresponding ignition actuation of the flame source.

[0146] In an embodiment, a portion of the casing member 102a-d corresponding to an operative position of the flame source comprises a longitudinal transparent or translucent window extending substantially along a corresponding length of the casing member that accommodates the flame source, in use, to thus enable a user to monitor a remaining amount of fluid comprised in the flame source.

[0147] In an embodiment, a portion of the distal end 104 of the casing member 102a-d comprises a flame source retaining member, for example configured as a hinged door, or a threaded plug configured to meet a corresponding internal thread of the casing member 102a-d, to enable the flame source to be fixed into the distal end of the casing member.

[0148] In an embodiment, the flame source is permanently sealed within the casing member 102a-d.

[0149] In an embodiment, the casing member 102a-d comprises an aperture to enable an operator to press a fuel actuator 120 and/or an ignition means 150 to generate a flame inside the casing member 102a-d. Alternatively, in embodiment the casing member comprises a mechanism, such as a press button, that transfers an operator actuation impulse through the casing member 102a-d to a fuel actuator 120 and/or an ignition means 150 to generate a flame inside the casing member upon actuation of the mechanism.

[0150] In an embodiment, the flame source is a lighter, or a cigarette lighter.

[0151] In an embodiment, the casing member 102a-d comprises separable proximal and distal portions, for example joined using a permanent or semi-permanent joining fixture such as an internal screw thread or a detent arrangement of the casing member. In an embodiment, the proximal and distal portions of the casing member 102a-d may be separated (for example, by unscrewing) to enable replacement of a flame source (such as a cigarette lighter).

[0152] In an embodiment, the proximal portion comprises the second receptacle configured to receive an aerosol generating article 100a,b, the heat modulator 32, and the heat diffuser 34 of the first aspect, and the distal portion comprises the heat absorber 10 of the first aspect, and the first receptacle.

[0153] In an embodiment, the casing member 102a-d further comprises at least one gas flow channel 129 enabling gas to flow from the casing member 102a-d, into the heat absorber 30 of the heat transfer assembly 10, in use.

[0154] In an embodiment, the at least one gas flow channel 129 enables air to flow from the outside of the casing member 102a-d into the cavity of the heat absorber 30 of the heat transfer assembly 10. The at least one gas flow channel 129 is disposed as a longitudinally directed passage or cavity having an intake at the distal end 104 of the casing member and vent into the cavity of the heat absorber.

[0155] In an embodiment, the proximal separatable portion of the casing member 102a-d comprises one or more gas flow channels 129 enabling airflow from outside the proximal separatable portion into the downstream end of an aerosol generating device 100, when, in use, the aerosol generating device 100 is disposed in the second receptacle.

[0156] In an embodiment, the casing member 102a-d comprises at least one thermochromic element configured to display a first colour when the at least one thermochromic element is exposed to a first temperature, and configured to display a second colour when the at least one thermochromic element is exposed to a second temperature. In an embodiment, the at least one thermochromic element is positioned on the external portion of the casing member 102a-d corresponding internally to the heat modulator 132 and/or heat absorber 130.

[0157] In an embodiment, the second receptacle is configured to accommodate an aerosol generating article having an external diameter of between about 4 millimetres and about 14 millimetres, for example of between about 6 millimetres and about 8 millimetres.

[0158] In an embodiment, wherein the second receptacle is configured to accommodate an aerosol generating article having a total length of between about 25 millimetres and about 120 millimetres. The aerosol-generating article may have a total length of between 30 mm and 55 mm.

[0159] According to a third aspect, there is provided a heat not burn lighter assembly 200a. The lighter comprises a first 218a and a second 218b flame source (such as a nozzle connecting the fuel reservoir 214 to flame ignition cavity 230). A distal end 204a of the lighter comprises a first ignition mechanism 223 of the first flame source 218a, and a proximal end 206 of the lighter comprises a second flame source 218b and a second ignition mechanism 220. The proximal end of the lighter further comprises a cavity 229 configured to accommodate a second flame source 218b. The lighter assembly 200a further comprises a heat transfer assembly comprising a heat absorber 230, a heat modulator 232, and a heat diffuser 234 according to the first aspect or its embodiments. The lighter assembly 200a comprises a second receptacle 241 configured to receive an aerosol generating article.

[0160] In use, the second flame source 218b is configured to be actuatable by a user via a second ignition mechanism 220 of the second flame source 218b to thereby generate thermal energy, and to transfer the thermal energy to the heat absorber 230 of the heat transfer assembly. In use, the second receptacle 241 houses an aerosol generating article, and the heat transfer assembly comprising the heat absorber 230, the heat modulator 232, and the heat diffuser 234 is configured to transfer thermal energy from the second flame source to a portion of the aerosol generating device comprising the aerosol generating substrate, so that the aerosol generating substrate releases vapour to a user without burning.

[0161] According to the third aspect, the heat transfer assembly 10 of the first aspect can be used in combination with a cigarette lighter. This facilitates conversion of a cigarette lighter into a heat not burn smoking accessory. Additionally or alternatively, a cigarette lighter may have a heat transfer assembly 10 attached as a final step of production, with the heat transfer assembly 10 integrally formed is that it cannot be removed from the cigarette lighter. A cigarette lighter may be provided with an end cap comprising the heat transfer assembly 10. Additionally or alternatively, a cigarette lighter having two burners may be provided, enabling a casing member 211 comprising the heat transfer assembly 10 be permanently or semi-permanently attached to one end of the cigarette lighter having to burners.

[0162] **Figure 8a** schematically illustrates an isometric view of a first example of a heat not burn lighter assembly 200a according to the third aspect, without an aerosol generating article inserted. According to this example, the lighter assembly 200a comprises two sources of flame. A distal end 204 of the lighter assembly 200a comprises first flame source 218a ignited by an igniter 221 as actuated by a first ignition mechanism 223. A proximal end 206 of the lighter assembly 200a comprises a casing member 211 internally comprising a second source of flame (not visible in **Figure 8a**) and a heat transfer assembly 10 according to the first aspect. Therefore, this first example of a lighter assembly 200a can be thought of as a double-ended cigarette lighter. The first flame source 218a at the distal end 204 of the lighter assembly 200a is a conventional cigarette lighter. The second source of flame and heat transfer assembly 10 comprised within the casing member 211 operate as a heat not burn smoking assembly according to the first and second aspects above.

[0163] The effect of this arrangement is that a user can choose whether or not to light a conventional cigarette, or to smoke and heat not burn cigarette, using the same lighter assembly 200a. The first example of a heat not burn lighter assembly 200a according to the third aspect accordingly requires a modified design of cigarette lighter having two flame

generating elements, one at the distal end 204 and one at the proximal end 206.

[0164] **Figure 8b** schematically illustrates a side view of the first example of a heat not burn lighter assembly 200a according to the third aspect, without an aerosol generating article inserted. The lighter assembly 200a comprises at its distal end 204 a first flame source 218a and a first ignition mechanism 223, as in a conventional cigarette lighter. When the first ignition mechanism 223 is actuated, a flame suitable for burning a cigarette is emitted from the flame source 221. At the proximal end 206 of the lighter assembly 200a, the casing member 211 comprises a second ignition mechanism 220 (not visible in **Figure 8b**) which, when actuated by user, causes a second flame source comprised within, or covered by, the casing member 211 to heat a heat absorber 30 of a heat transfer assembly 10 comprised within the casing member 211. A user may insert an aerosol generating article (see number cigarette) into a receptacle at the proximal end 206 of the lighter assembly 200a for heat not burn operation.

[0165] The lighter assembly 200a is described further in **Figure 10.**

[0166] **Figure 9a** schematically illustrates an isometric view of second example of an aerosol generating device 200b (heat not burn lighter assembly), with an aerosol generating article inserted. According to the second example of the aerosol generating device 200b, a conventional cigarette lighter 201 having one flame source (not shown) is supplemented with a casing member 211 comprising a heat transfer assembly 10 according to the first aspect. The casing member 211 comprises an ignition mechanism 223 functionally attached to the conventional igniter of the conventional cigarette lighter 201. In this second example of the aerosol generating device 200b, the casing member 211 comprising the heat transfer assembly 10 may be sold as a separate product that can be retrofitted to a conventional cigarette lighter 201. The casing member 211 may comprise a "snap fit" connection or adhesive connection for permanent attachment to the functional end of a conventional cigarette lighter 201 such as the BIC J26 "Maxi" (TM). This enables the permanent conversion of a conventional cigarette lighter 201 to heat not burn operation. Alternatively, the casing member 211 is configured to be removable from the conventional cigarette lighter 211.

[0167] **Figure 9b** schematically illustrates a side view of a second example of the aerosol generating device 200b, with a heat not burn aerosol generating article 110 inserted into a receptacle at the proximal end 206 of the aerosol generating device 200b.

[0168] **Figure 10** schematically illustrates a cut through side view along a longitudinal axis between the distal end 204 and the proximal end 206 of the lighter assembly 200a introduced above in **Figure 8a** and **Figure 8b.**

[0169] Beginning from the proximal end 206, the lighter assembly 200a comprises a heatable product receptacle 240 for heating not burning an aerosol generating article, a heat management portion 242, a combustion chamber portion 244, a reservoir portion 246, and a lighter portion 250 for lighting a conventional cigarette.

[0170] The reservoir portion 246 and the lighter portion 250 resemble a conventional cigarette lighter at the distal end 204. For example, the distal end 204 of the lighter assembly 200a comprises a first ignition mechanism 223 and a first flame source 218a in proximity to a first flame source 218a. A wind guard may surround the first flame source 218a to protect an ignited flame from being extinguished by strong breezes. The first flame source 218a (for example, and as illustrated, a nozzle) is in fluidic connection, via a first lumen 227a, to a fuel reservoir 214. For example, the fuel reservoir 214 may contain pressurised liquid butane.

[0171] In contrast to a conventional cigarette lighter, the reservoir portion 246 comprises a second lumen 227b configured to fluidly connect the fuel reservoir 214 to a second flame source 218b (for example, and as illustrated, a nozzle). In an embodiment, a reservoir divider 225 is provided between the distal and proximal ends of the reservoir 214, partially or completely dividing the reservoir 214 into a first region comprising the first lumen 227a and a second region comprising the second lumen 227b.

[0172] The combustion chamber portion 244, the heat management portion 242, and the heatable product receptacle 240 may be comprised within the same casing member 211. The casing member 211 may, for example, be an injection moulded temperature resistant plastic, Delrin (TM) or resin article, supplemented with additional parts of the combustion chamber portion 244, the heat management portion 242, and the heatable product receptacle 240 supported on the casing member 211.

[0173] The second flame source 218b generates a flame upon actuation by user of a second ignition mechanism 220. For clarity, **Figure 10** does not illustrate some elements of the ignition mechanism, but it may comprise for example a valve member configured to enable fuel to flow from the second lumen 227b into the combustion chamber 230. The ignition member may further comprise a sparking element configured to provide sparks able to ignite a flame in proximity to the second flame source 218b. Of course, a piezoelectric ignition mechanism or another ignition mechanism may be used.

[0174] The casing member 211 may further comprise in the heat management portion a heat modulator 232. The heat modulator 232 comprises, in an embodiment, a phase change material 35. The casing member 211 further comprises a heatable product receiver (second receptacle) 241 comprising a heat diffuser 234. In an embodiment, the heat diffuser 234 may be an elongate metal blade. In an embodiment, the heat diffuser 234 may be a tubular heat diffuser. The heat absorber 230, heat modulator 232, and heat diffuser 234 perform an analogous role to the heat absorber 30, heat modulator 32, and heat diffuser 34 of the first aspect (heat transfer assembly 10), or the combustion chamber 130, heat

modulator 132, or integrated heat diffuser 134 of the second aspect (aerosol generating device 100a,b). Accordingly, all variations and description of operation provided above in relation to the first and second aspects also apply to the heat absorber 230, heat modulator 232, and heat diffuser 234 of the heat not burn lighter assembly 200a.

[0175] In examples, when the second ignition mechanism 220 is actuated and lights a flame in proximity to the second flame source 218b, the heat absorber (cavity) 23 encloses, and absorbs heat from the flame. A thermal path exists between the heat absorber 230, the heat modulator 232, and the heat diffuser 234. The phase change material 35 comprised in the heat modulator 232 is configured to absorb the thermal energy emitted from the heat absorber 230 in a first temperature range, and to conduct thermal energy to the heat diffuser 234 in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range, wherein the heat modulator comprises at least one phase change material 35.

[0176] In an embodiment, the heat modulator 232 may also function as a time delay element to delay the time at which heat is emitted from the heat diffuser 234 in relation to the time at which the heat was stored in the heat modulator 232. An effect of this is that a user may prime the heat not burn functionality of the lighter assembly 200a by igniting the flame using the second ignition mechanism 220 for a predefined amount of time (such as ten seconds, or half a minute). In an embodiment, a thermochromic element visible to the user and thermally coupled to the heat absorber 230 provides feedback on when to stop heating using flame by changing colour. After priming the heat modulator 232, the user inserts an aerosol generating article into the heatable product receiver 240. The heat modulator 232 then emits the heat stored in its phase change material 35 via the heat diffuser 234.

[0177] In an example, the lighter assembly may be in the form of an add-on (such as a clip-on element comprised in casing member 211) to an existing lighter. In this case, the device does not incorporate a lighter, but instead provides a mating means to an existing cigarette lighter.

[0178] Although **Figure 10** illustrates a lighter assembly 200a having a first ignition mechanism 223 at the distal end 204, and the second ignition mechanism 220 at the proximal end 206, the placement of the ignition mechanism may be different. In an example, the two ignition mechanisms could be side-by-side on a face of the lighter between the distal and proximal ends of the lighter assembly.

[0179] According to a fourth aspect, there is provided a kit of parts comprising an aerosol generating device according to the first aspect, a lighter capable of being accommodated in the first receptacle of the aerosol generating device, and one or more aerosol generating articles capable of being accommodated in the second receptacle of the aerosol generating device.

[0180] According to a fifth aspect, there is provided a lighter assembly 200a for heating an aerosol generating medium without burning, comprising a second flame source 218b, a heat absorber 230, a heat diffuser 234, a heatable product receiver 241, and a heat regulator 224. The heat absorber 230 is configured to absorb heat emitted by the second flame source 218b, in use. The heat diffuser 234 is thermally coupled to the heat absorber 230 and the heatable product receiver 241 to enable a transfer of heat from the second flame source 218b to the heatable product receiver 241, in use.

[0181] The heat regulator 224 is operably coupled to the second flame source 218b and/or the heat absorber 230. The heat regulator 224 is configured to cause the second flame source 218b and/or the heat absorber 230 provide thermal energy to the heat diffuser 234 in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range.

[0182] **Figure 10** also illustrates an example of a lighter assembly 200a according to the fifth embodiment, with the exception that a heat regulator 221 schematically represented by a dotted line is required, and the phase change material 35 thermally coupling the heat absorber 230 to the heat diffuser is not required.

[0183] In an example, the heat regulator 224 is operably connected to the second ignition mechanism 220. The second ignition mechanism 220 and/or the heat diffuser 234 may comprise a thermostat (not illustrated). The heat regulator 224 is configured to adjust the second ignition mechanism based on the heat diffuser 234. For example, the heat regulator 224 may adjust the tension and the duration of the flame, by controlling the gas supply, in order to regulate a temperature on the heat diffuser 234 appropriate to "heat not burn" operation.

[0184] In an embodiment, the heat regulator 224 may be provided as a thermally active leaf spring (such as a bimetallic strip) in thermal conduction with the heat diffuser 234, and mechanically connected to a closure of a flame source 218b (for example, a nozzle) of the aerosol generating medium. As the temperature of the heat diffuser 234 climbs during burning to approach the highest temperature of the first temperature range, the heat regulator 224 reduces or extinguishes the second flame source 218b according to the movement of the bimetallic strip. Alternatively, the heat regulator 224 may be provided as a variable gas flow linkage (not illustrated) between the second ignition mechanism 220 and the second flame source 218b.

[0185] According to a sixth aspect, there is provided a method 300 for heating an aerosol generating medium without burning using an aerosol generating device according to the first aspect.

[0186] **Figure 11** schematically illustrates a method according to a sixth aspect. The method comprises:

- inserting 302 a lighter into the first receptacle of the aerosol generating device;
- inserting 304 an aerosol generating article into the second receptacle of the aerosol generating device;
- actuating 306 an ignition mechanism of the lighter so that a flame source emits thermal energy at a first temperature to be absorbed by the heat absorber of the heat transfer assembly of the aerosol generating device, wherein the ignition mechanism of the lighter is actuated for a predetermined time interval;
- modulating 308 the thermal energy from the first temperature down to a second temperature using the heat modulator comprising at least one phase change material, and to conducting thermal energy to the heat diffuser in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range; and
- distributing 310 heat into the aerosol generating article in second receptacle of the aerosol generating device via the heat diffuser.

[0187] As an example, in use, the user mounts a heat not burn consumable product onto the heatable product receptacle 140, 240 of an aerosol generating device 100a,b. A user may press a button 120, 220 that activates a fuel valve and igniter of the aerosol generating device 100a,b. Fuel is then released from a second flame source 218b (in the illustrated example, a fuel nozzle) and a flame is produced inside a combustion chamber 130, 230 of the aerosol generating device 100a,b. In an embodiment, the flame burns efficiently owing to gas provided via at least first 129a and/or second 129b gas channels. The thermal energy produced by the flame is regulated down to, for example, 350°C by a phase change material. The regulated heat is transferred through a heat distribution pathway to the heat not burn consumable product in the heatable product receptacle 140, 240 of an aerosol generating device 100a,b. The heat not burn consumable product is, therefore, warmed up to around 350°C, for example, and emits a vapour by heating, but not burning. The user may consume this vapour. At the end of the smoking session, the user and mounts the consumed heat not burn product and disposes of it. The aerosol generating device 100a,b is then ready to be used again, or stored.

[0188] In the preceding specification, numerous specific details are set forth in order to provide a thorough understanding. It will be apparent, however, to one having ordinary skill in the art that the specific detail need not be employed to practice the present disclosure. In other instances, well-known materials or methods have not been described in detail in order to avoid obscuring the present disclosure.

[0189] Reference throughout the preceding specification to "one embodiment", "an embodiment", "one example" or "an example", "one aspect" or "an aspect" means that a particular feature, structure or characteristic described in connection with the embodiment or example is included in at least one embodiment of the present disclosure. Thus, appearances of the phrases "in one embodiment", "in an embodiment", "one example" or "an example", "one aspect" or "an aspect" in various places throughout this specification are not necessarily all referring to the same embodiment or example.

[0190] Furthermore, the particular features, structures, or characteristics may be combined in any suitable combinations and / or sub-combinations in one or more embodiments or examples.

REFERENCE NUMERALS

8	Heat not burn assembly	129b	Second gas channel
10	Heat transfer assembly	130	Combustion chamber
12	Flame source	131a	First gas inlet
14	Fuel reservoir	131b	Second gas inlet
16	Fuel valve	132	Heat modulator
18	Fuel nozzle	133	Tubular heat diffuser
20	Igniter	134	Integrated heat diffuser
22	Air circulation	134a	Plug portion
24	Heat not burn consumable product	136	Sealed body
30	Heat absorber (combustion chamber)	136a	(...) first portion of
		136b	(...) second portion of
31	Heat insulation	137	Thermal PCM bypass
32	Heat modulator	140	Heatable product receptacle
33	Air vents	141	Heatable product receiver (second receptacle)
34	Heat diffuser		
35	Phase change material	142	Heat management portion
37	Heat transfer material	144	Combustion chamber portion
		146	Flame source portion
100	Aerosol generating device	146a	First receptacle

(continued)

102	Casing member	150	Ignition means
102a	(...) distal casing portion	162	Insulating portion of internal periphery of cavity
102b	(...) actuator casing portion		
102c	(...) central casing portion	163	portion of heat absorber in contact with combustion chamber
102d	(...) proximal casing portion		
104	distal end	200a,b	Lighter assembly
106	proximal end	201	Lighter
108	Air aperture portion	202	Casing member
110	Aerosol generating article	204	Distal end
114	Fuel reservoir	206	Proximal end
115	Pressurized lining	210	Aerosol generating article
118	Nozzle	211	Casing member
118a	Flame (example)	212	Reservoir casing
119	Shell	214	Fuel reservoir
120	Fuel actuator	218a	First flame source (nozzle)
123	Lumen	218b	Second flame source (nozzle)
129a	First gas channel	219	Wind guard
220	Second ignition mechanism	242	Heat management portion
221	Igniter	244	Combustion chamber portion
223	First ignition mechanism	246	Reservoir portion
224	(optional) heat regulator	250	Lighter portion
225	Reservoir divider		
227a	First lumen		
227b	Second lumen	300	Method
229	Cavity	302	inserting a lighter
230	Heat absorber	304	article inserting an aerosol generating
232	Heat modulator		
234	Heat diffuser	306	actuating an ignition mechanism
237	Heat absorber wall	308	modulating the thermal energy
240	Heatable product receptacle	310	distributing heat
241	Heatable product receiver (second receptacle)		

Claims

1. A heat transfer assembly (10) for heating an aerosol generating medium without burning, wherein the heat transfer assembly comprises:

- a heat absorber (30, 130, 230);
- a heat modulator (32, 132, 232); and
- a heat diffuser (34, 133, 134, 234);

wherein the heat absorber (30, 130, 230) is configured to absorb thermal energy from a proximate heat source (12) in a first temperature range;
wherein the heat absorber (30, 130, 230) is thermally coupled to the heat modulator (32, 132, 232), and the heat modulator (32, 132, 232) is thermally coupled to the heat diffuser (34, 133, 134, 234);
wherein the heat modulator (32, 132, 232) is configured to absorb the thermal energy emitted from the heat source, and to provide thermal energy to the heat diffuser (34, 133, 134, 234) in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range; and wherein the heat modulator (32, 132, 232) comprises at least one phase change material (35).

2. The heat transfer assembly (10) according to claim 1,

wherein the heat source (12) is configured, in use, to generate a flame, and at least a portion of the heat absorber (30, 130, 230) is configured, in use, to absorb heat emitted by the flame.

3. The heat transfer assembly (10) according to claim 1 or 2,
wherein the heat absorber (30, 130, 230) comprises a cavity configured to substantially surround the flame produced by the heat source (12), and to conduct thermal energy from the flame source towards the heat diffuser (34, 133, 134, 234), in use.

4. The heat transfer assembly (10) according to claim 3,
wherein the heat absorber (30, 130, 230) forming the cavity comprises an internal periphery with an insulating portion (162) configured to insulate against thermal conduction to a corresponding external periphery of the heat absorber (30, 130, 230), in use.

5. The heat transfer assembly (10) according to claim 4,
wherein the heat absorber (30, 130, 230) further comprises a thermally conductive portion (136a) capable of transferring heat from inside the cavity to a surface of the heat modulator (32, 132, 232).

6. The heat transfer assembly (10) according to one of the preceding claims,
wherein the heat modulator (32, 132, 232) comprises a sealed body (136) containing the at least one phase change material (35), wherein a first portion (136a) of the sealed body is in thermally conductive contact with the heat absorber, and a second portion (136b) of the sealed body is in thermally conductive contact with the heat diffuser (34, 134, 234).

7. The heat transfer assembly (10) according to one of claims 1 to 5,
wherein the heat modulator (32, 132, 232) is further configured to thermally conduct a proportion of the heat from the heat absorber (30, 130, 230) to the heat diffuser (34, 134, 234) via a bypass (137) through the at least one phase change material (35) comprised in the heat modulator.

8. The heat transfer assembly (10) according to one of the preceding claims,
wherein the heat diffuser (34, 134, 234) is configured to transfer heat to a heat not burn cigarette to enable aerosolization of one or more volatile compounds therein.

9. The heat transfer assembly (10) according to one of the preceding claims,
wherein the heat diffuser (34, 134, 234) comprises at least one elongate thermally conductive member (134) thermally coupled to the heat modulator (32, 132, 232), wherein the elongate thermally conductive member (134) is configured to lodge within a heat not burn cigarette upon insertion of the heat not burn cigarette into the heat diffuser (34, 134, 234).

10. An aerosol generating device (100, 200a, 200b) for generating an aerosol from an aerosol generating substrate comprised in an aerosol generating article (110, 210), wherein the aerosol is generated by heating, not burning, the aerosol generating substrate, wherein the aerosol generating device comprises:

- a first receptacle (146a) configured to receive a flame source (12);
- a heat transfer assembly (10) according to one of claims 1 to 9, and
- a second receptacle (141, 241) configured to receive an aerosol generating article (110, 210);

wherein, in use, the flame source (12) adjacent to, or comprised in, the first receptacle (146a) is configured to be actuatable by a user to generate thermal energy, and to transfer the thermal energy to the heat absorber of the heat transfer assembly (10);
wherein the second receptacle (141, 241) is configured to accept an aerosol generating article (110, 211), and the heat transfer assembly is configured to transfer thermal energy from the flame source (12) to a portion of the aerosol generating device (110; 211) comprising the aerosol generating substrate, so that the aerosol generating substrate releases vapour to a user without burning.

11. The aerosol generating device (100, 200a, 200b) according to claim 10,
wherein the aerosol generating device (110, 210) is arranged longitudinally within a casing member (102a-d, 202) between a proximal end (106, 206) comprising the second receptacle (141, 241) and a distal end (104, 204) comprising the first receptacle (146a).

12. The aerosol generating device (100, 200a, 200b) according to claim 11, wherein the casing member (102, 202) houses a replaceable flame source at the distal end (104, 204) of the aerosol generating device (110, 210).

13. A heat not burn lighter assembly (200a) comprising a first (218a) and a second flame (218b) source;
wherein a distal end (204a) of the lighter assembly comprises a first ignition mechanism (223) of the first flame source (218a), and a proximal end (206) of the lighter comprises a second flame source (218b) and a second ignition mechanism (220);
wherein the proximal end of the lighter assembly further comprises:

- a first receptacle (230) configured to absorb heat from the second flame source (218b);
- a heat transfer assembly (232,234) according to one of claims 1 to 10, and
- a second receptacle (241) configured to receive an aerosol generating article;

wherein, in use, the second flame source is configured to be actuatable by a user via a second ignition mechanism (220) of the second flame source (218b) to thereby generate thermal energy, and to transfer the thermal energy to the heat absorber (232) of the heat transfer assembly;
wherein, in use, the second receptacle (241) houses an aerosol generating article, and the heat transfer assembly (232, 234) is configured to transfer thermal energy from the second flame source to a portion of the aerosol generating device comprising the aerosol generating substrate, so that the aerosol generating substrate releases vapour to a user without burning.

14. A kit of parts comprising:

- an aerosol generating device (200a, 200b) according to claim 10;
- a lighter capable of being accommodated in the first receptacle of the aerosol generating device; and
- one or more aerosol generating articles (110, 210) capable of being accommodated in the second receptacle of the aerosol generating device.

15. A lighter assembly (200a) for heating an aerosol generating medium without burning, comprising:

- a flame source (218b);
- a heat absorber (230);
- a heat diffuser (234);
- a heatable product receiver (241) and
- a heat regulator (224);

wherein the heat absorber (230) is configured to absorb heat emitted by the flame source (218b), in use;
wherein the heat diffuser (234) is thermally coupled to the heat absorber (230) and the heatable product receiver (241) to enable a transfer of heat from the flame source (218b) to the heatable product receiver (241), in use;
wherein the heat regulator (224) is operably coupled to the flame source (218b) and/or the heat absorber (230), wherein the heat regulator (224) is configured to cause the flame source (218b) and/or the heat absorber (230) provide thermal energy to the heat diffuser (234) in a second temperature range different to the first temperature range, wherein the lowest temperature of the first temperature range is greater than the highest temperature of the second temperature range.

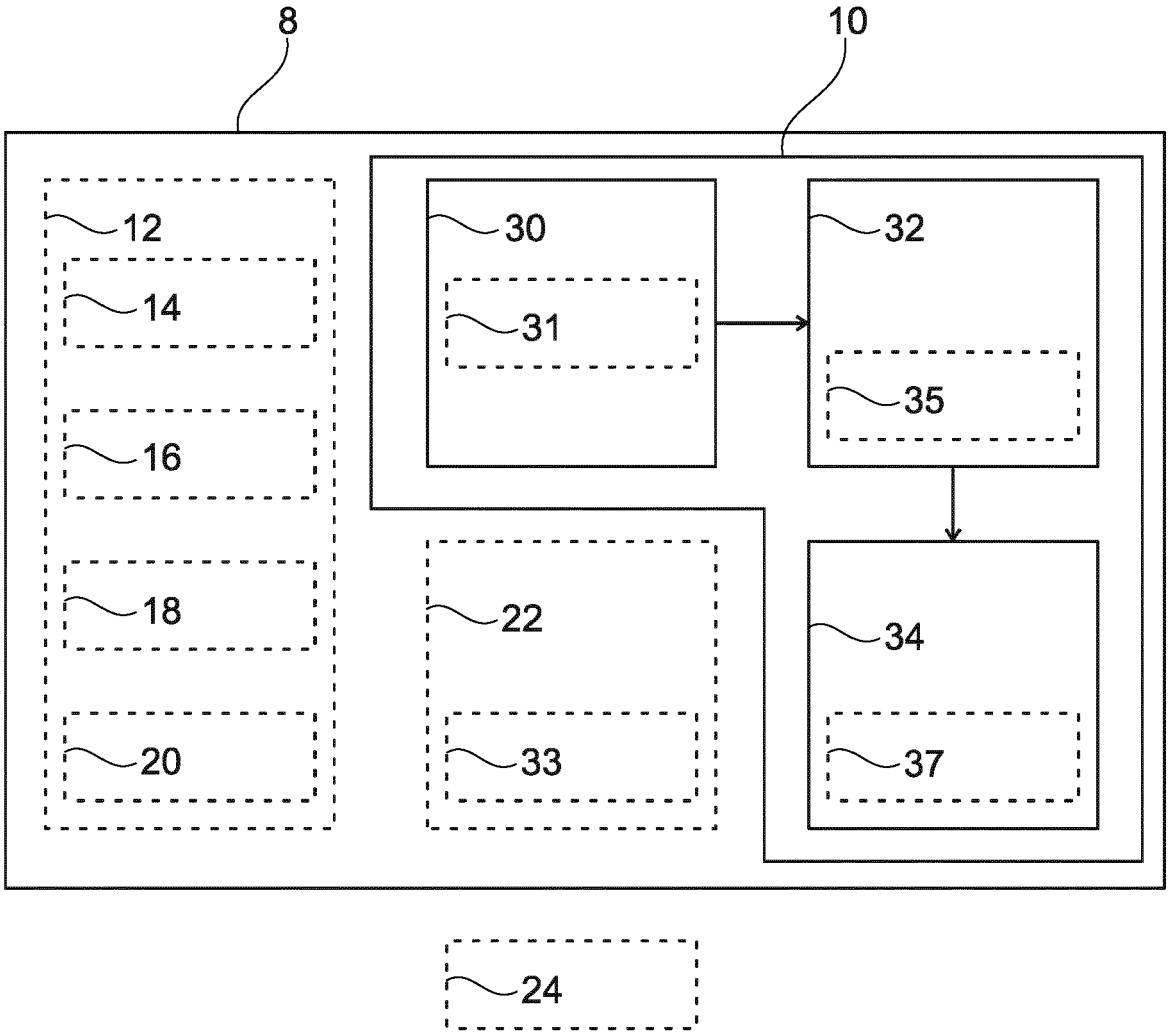


Fig. 1

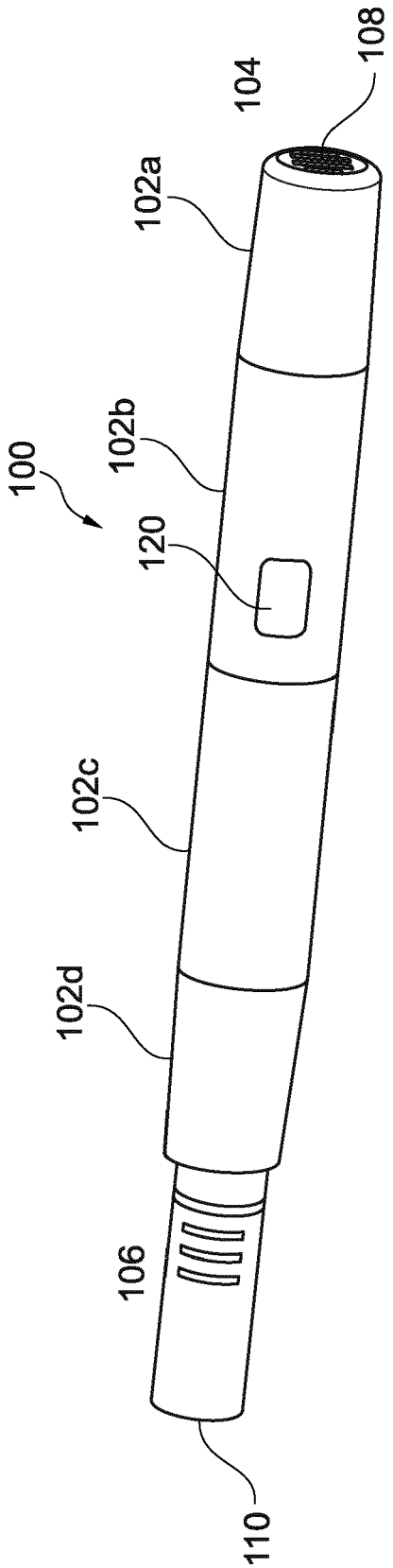

100
102a
102b
102c
102d
104
106
108
110
120

Fig. 2a

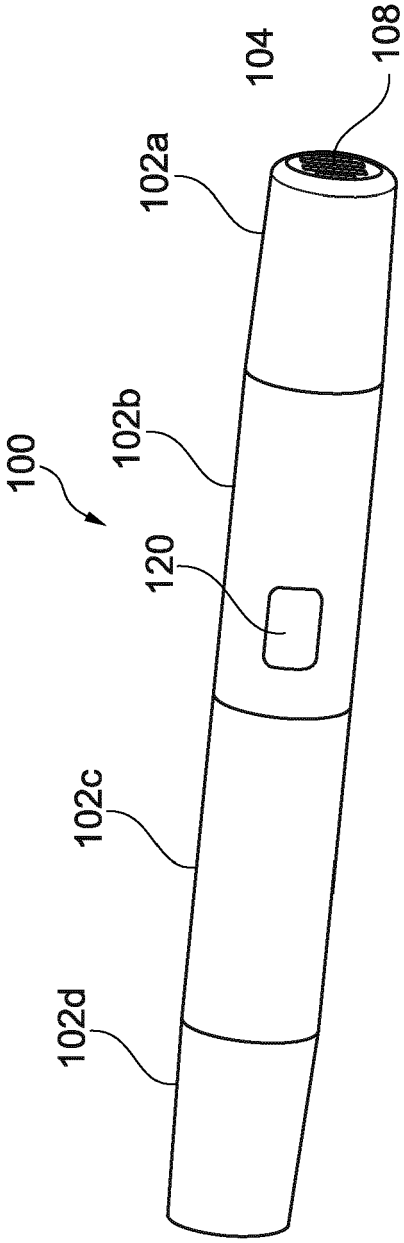

100
102a
102b
102c
102d
104
108
120

Fig. 2b

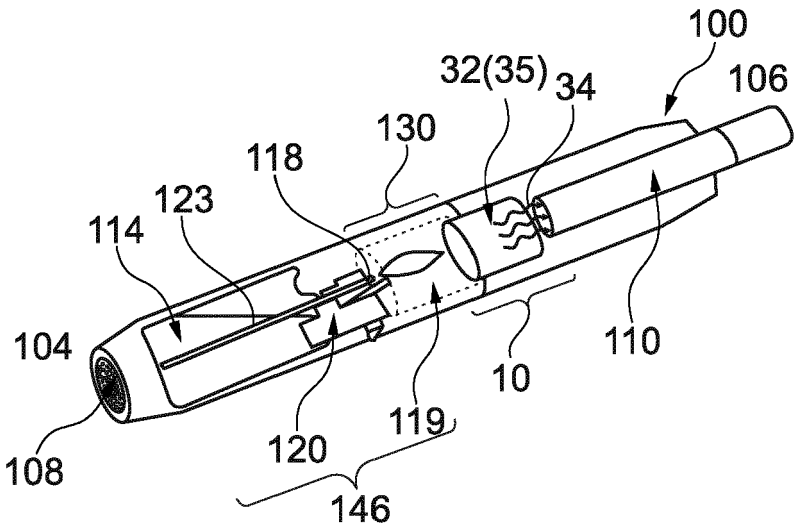

100
32(35)
34
106
130
118
123
114
104
110
10
119
120
108
146

Fig. 3

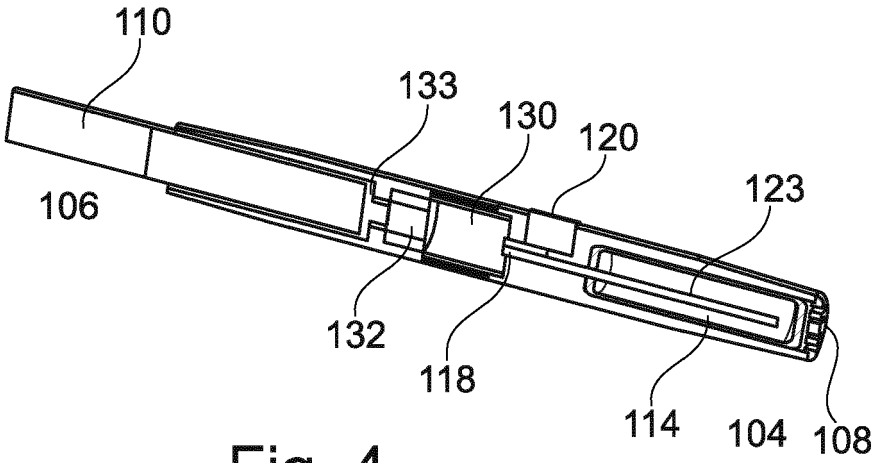

110
133
130
120
123
106
132
118
114
104
108

Fig. 4

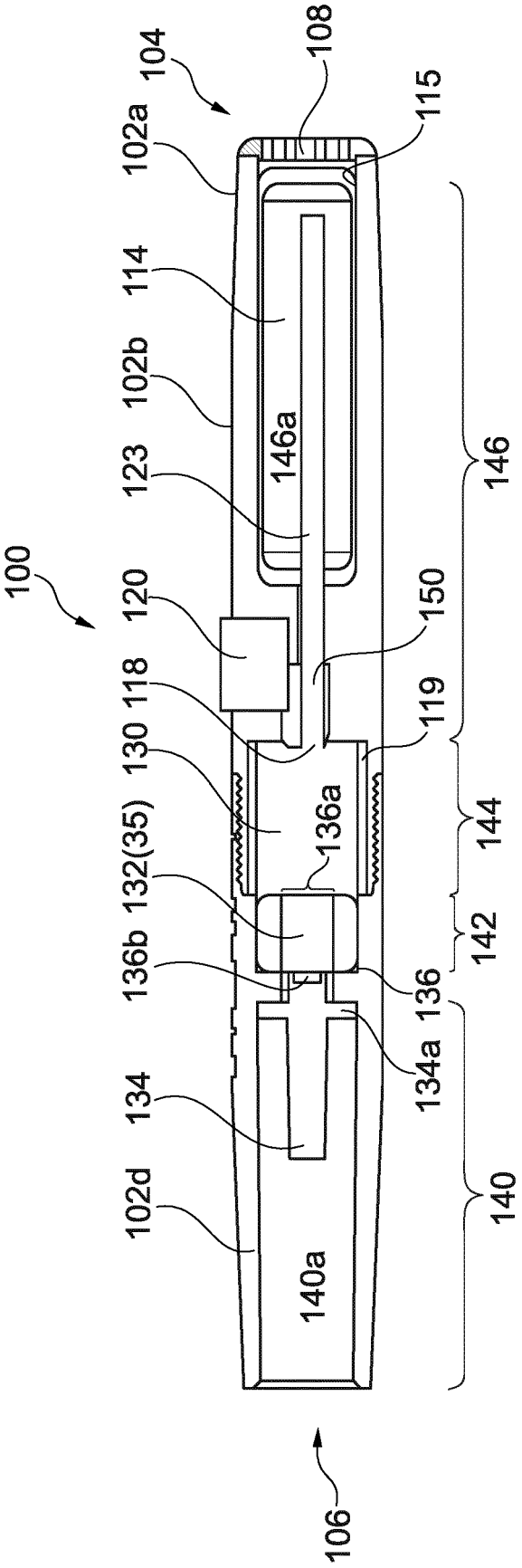

104
108
115
102a
114
102b
123
146a
146
100
120
150
118
119
130
136a
144
132(35)
142
136b
136
134a
134
140
102d
140a
106

Fig. 5

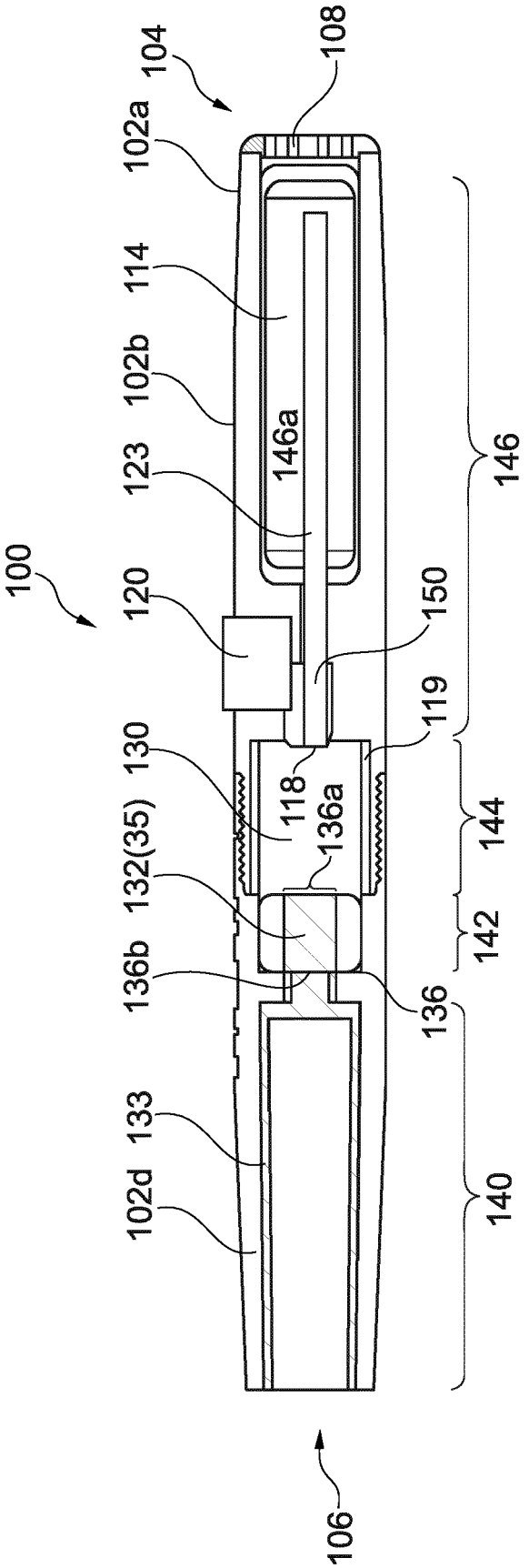

104
108
102a
114
102b
123
146a
146
100
120
150
119
130
118
136a
144
132(35)
142
136b
136
133
102d
140
106

Fig. 6

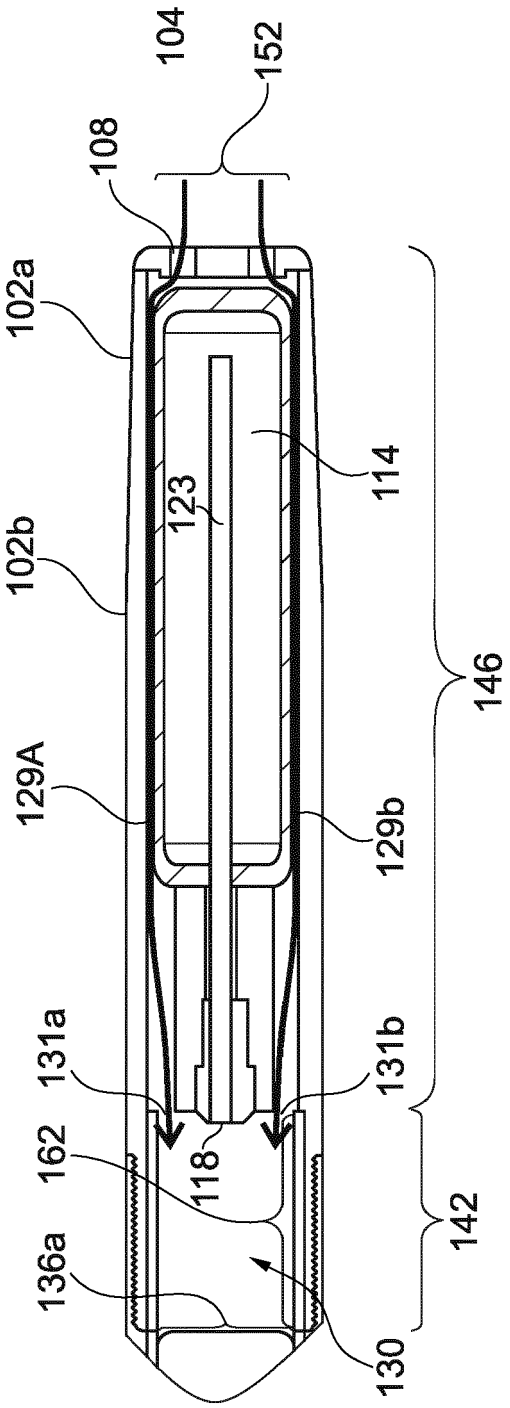
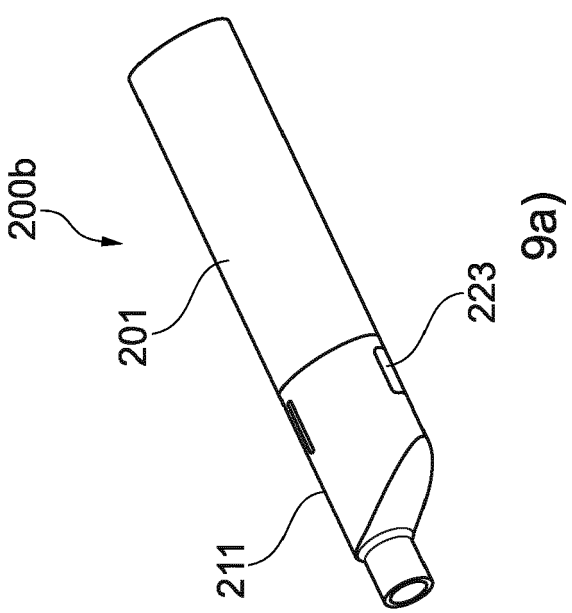

104
152
108
102a
114
123
102b
146
129A
129b
131a
131b
162
118
142
136a
130

Fig. 7


200b
201
223
211
9a)

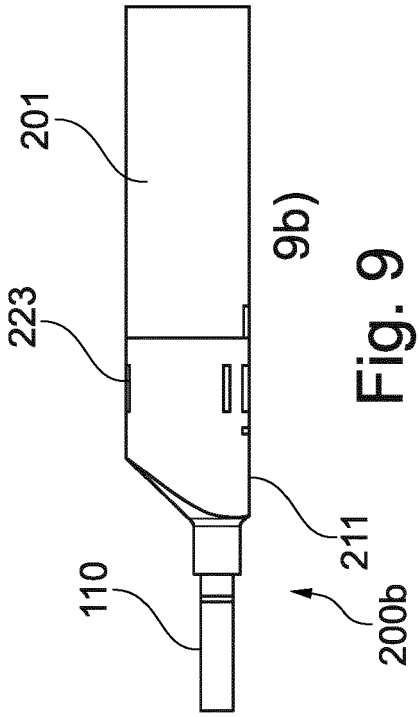
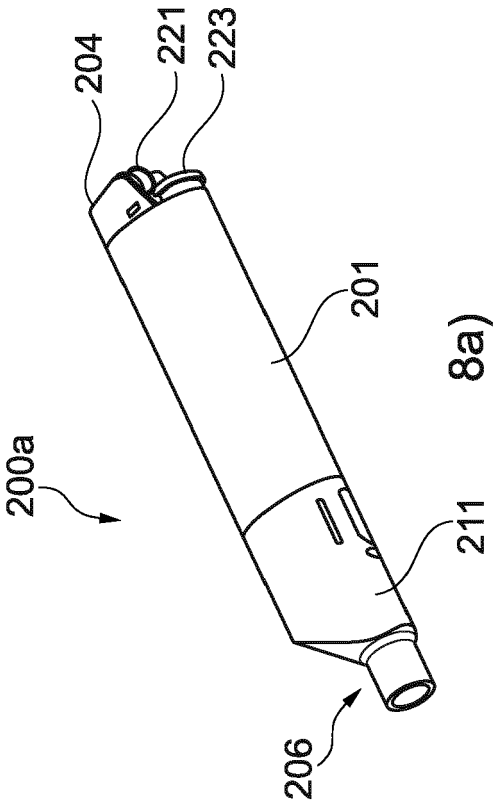

201
223
211
110
200b
9b)

Fig. 9


204
221
223
201
200a
211
206
8a)

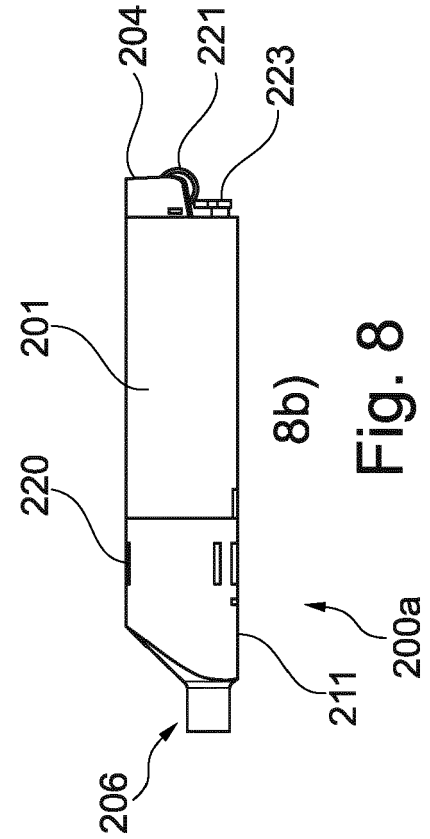

204
221
223
201
220
211
200a
206
8b)

Fig. 8

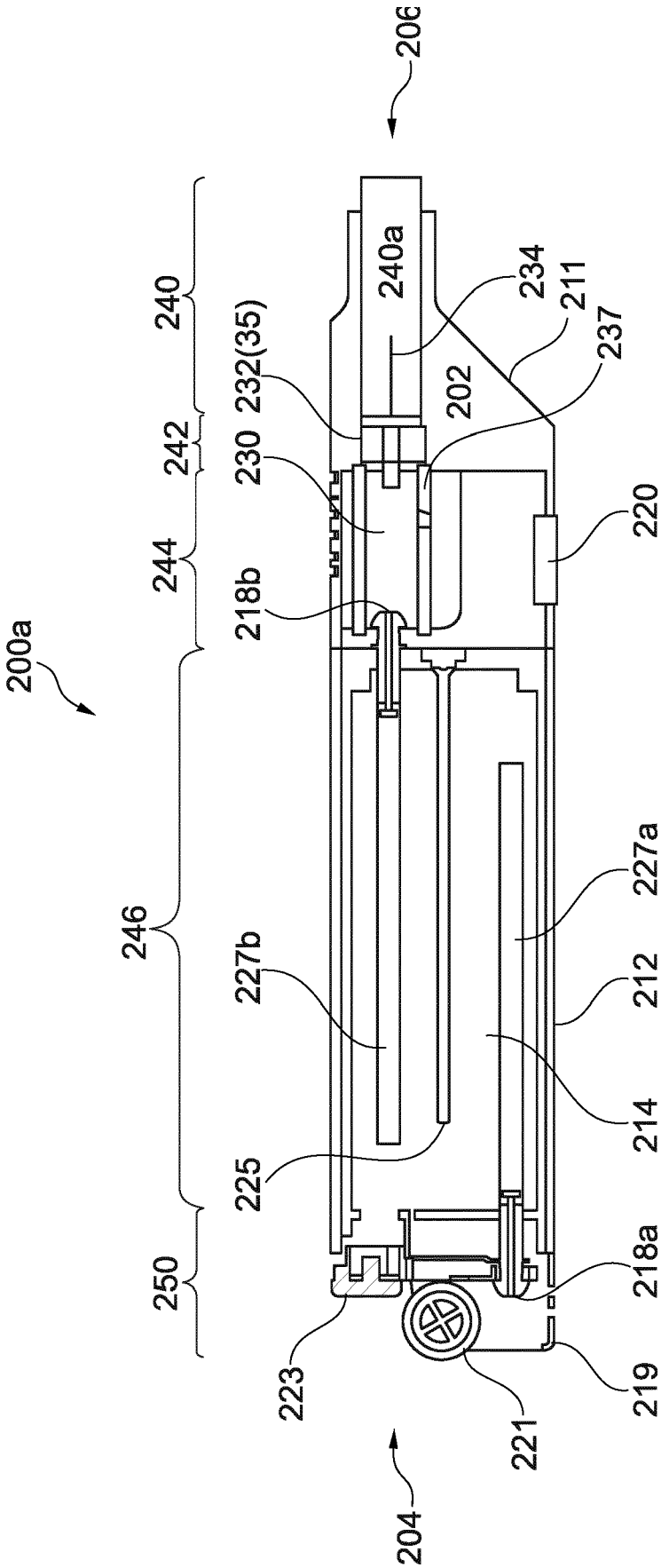

206
240
240a
234
211
237
232(35)
202
242
230
220
244
218b
200a
246
227a
227b
212
214
225
250
218a
223
219
221
204

Fig. 10

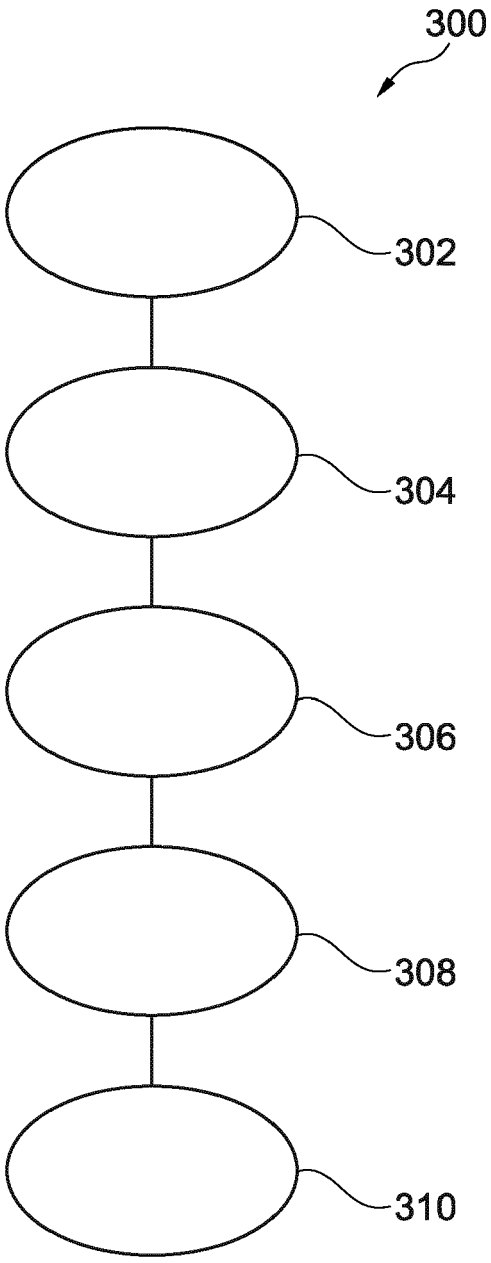


Fig. 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 17 0455

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/029381 A2 (OGLESBY & BUTLER RES & DEV LTD [IE]; OGLESBY ALFRED PETER [IE] ET AL.) 13 March 2008 (2008-03-13)	15	INV. A24F42/10
A	* page 14, line 16 - page 28, line 6; figures 1-24 *	1-14	

X	WO 2013/009883 A1 (KUMAR JAY [US]; KUMAR VIKRAM [US]) 17 January 2013 (2013-01-17)	15	
A	* page 4, line 1 - page 11, line 15; figures 1-4 *	14	

A	WO 03/034847 A1 (BRITISH AMERICAN TOBACCO CO [GB]) 1 May 2003 (2003-05-01) * page 4, line 3 - page 5, line 13; figures 1,2 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

A24F
A61M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 October 2021	Klintebäck, Daniel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 17 0455

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-10-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008029381 A2	13-03-2008	EP 2068985 A2	17-06-2009
		US 2010024834 A1	04-02-2010
		US 2012247494 A1	04-10-2012
		WO 2008029381 A2	13-03-2008
WO 2013009883 A1	17-01-2013	US 2013014755 A1	17-01-2013
		WO 2013009883 A1	17-01-2013
WO 03034847 A1	01-05-2003	AR 038794 A1	26-01-2005
		AT 346515 T	15-12-2006
		AU 2002337298 B2	16-02-2006
		BR 0213508 A	19-10-2004
		CA 2464226 A1	01-05-2003
		CA 2637802 A1	01-05-2003
		CN 1575135 A	02-02-2005
		DE 60216492 T2	31-05-2007
		EP 1441607 A1	04-08-2004
		ES 2275915 T3	16-06-2007
		JP 4547150 B2	22-09-2010
		JP 2005506080 A	03-03-2005
		KR 20040050925 A	17-06-2004
		MX PA04003881 A	16-07-2004
		MY 131497 A	30-08-2007
		RU 2297781 C2	27-04-2007
		TW 592641 B	21-06-2004
		US 2003075188 A1	24-04-2003
		WO 03034847 A1	01-05-2003
		ZA 200402979 B	28-09-2005

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Non-patent literature cited in the description

- Heated Tobacco Products, a Brief. WHO, 2020 **[0026]**