AN ELECTRICALLY HEATED SMOKING SYSTEM

The present invention relates to an electrically heated smoking system having a unit for receiving a smoking article, wherein the unit includes a secondary power supply and the unit is connectable to a primary power supply.

A number of prior art documents disclose electrically operated smoking systems, having a number of advantages. One advantage is that they significantly reduce sidestream smoke, while permitting the smoker to selectively activate the smoking system during the smoking experience. The electrically operated smoking systems of the prior art typically include a housing for receiving a smoking article, heating elements to generate an aerosol, a power source and the necessary electronic circuitry. The circuitry may be activated manually or by insertion of a cigarette into the housing, and may limit operation of the heating elements to a pre-defined time period.

Some of the electrically operated smoking systems of the prior art have disadvantages, however. It would be advantageous if the devices could be made smaller and more convenient for the user, so that the size is closer to that of a lit-end cigarette and the device can be held between the fingers of a user in a similar way to a lit-end cigarette. It is therefore an object of the invention to provide an improved electrically heated smoking system.

According to a first aspect of the invention, there is provided an electrically heated smoking system comprising a secondary unit capable of receiving a smoking article having an aerosol-forming substrate, the secondary unit comprising: at least one heating element; an interface for connection to a primary power supply for supplying electrical power to the at least one heating element; a secondary power supply for supplying electrical power to the at least one heating element; and secondary circuitry arranged to control supply of electrical power from the primary power supply to the at least one heating element in a pre-heating mode during which the temperature of the aerosol-forming substrate is increased to an operating temperature, and arranged to control supply of electrical power from the secondary power supply to the at least one heating element in a smoking mode, during which the temperature of the aerosol-forming substrate is maintained at substantially the operating temperature.

There is also provided an electrically heated smoking system comprising a secondary unit capable of receiving a smoking article having an aerosol-forming substrate, the secondary unit comprising: at least one heating element; an interface for connection to a primary power supply for supplying electrical power to the at least one heating element during a pre-heating mode, to increase the temperature of the aerosol-forming substrate to an operating temperature; a secondary power supply arranged to supply electrical power to the at least one heating element during a smoking mode, to maintain the temperature of the aerosol-forming

substrate at substantially the operating temperature; and secondary circuitry.

The secondary unit is designed to receive a smoking article and be held by a user during the smoking experience. The power supply in the secondary unit maintains the temperature of the aerosol-forming substrate during the smoking experience. The secondary unit connects to a primary power supply. The primary power supply is used to heat up the aerosol-forming substrate to operating temperature before smoking begins. The primary power supply may form part of a primary unit, which is separate from the secondary unit.

By providing a secondary power supply in the secondary unit and a separate, external primary power supply (that is, by dividing the power supply for the smoking system between a primary power supply and a secondary power supply in the secondary unit), the size of the secondary unit can be reduced without increasing the time needed to pre-heat the substrate. The secondary unit is preferably only slightly larger than the smoking article. The secondary unit is preferably of a similar size to or slightly larger than a lit-end cigarette. Thus, the secondary unit can be held between the user's fingers in a similar way to a lit-end cigarette.

Preferably, the secondary power supply is chargeable by the primary power supply, during a charging mode, so that the secondary power supply has sufficient charge to maintain the temperature of the aerosol-forming substrate at substantially the operating temperature during the smoking mode. Even more preferably, the secondary circuitry is further arranged to control charging of the secondary power supply by the primary power supply during the charging mode.

Preferably, supply of electrical power from the primary power supply to the at least one heating element, during the pre-heating mode, is controlled by the secondary circuitry in the secondary unit. Preferably, supply of electrical power from the primary power supply, during the charging mode, to charge the secondary power supply, is controlled by the secondary circuitry in the secondary unit.

The interface for connection to the primary power supply allows power to be supplied from the primary power supply to the secondary unit during the pre-heating mode and, optionally, during the charging mode. For that purpose, the connection may be a wired connection such as a Universal Serial Bus (USB) connection or coaxial cable. A USB connection is advantageous because a USB communications link provides bi-directional communication and also a power link (usually 5 V).

The interface may alternatively or additionally facilitate other functionality and features for the smoking system. For that purpose, the connection may be a wired connection (such as a USB connection) or a wireless connection (such as a Bluetooth connection). Preferably, the interface facilitates bi-directional communication between the secondary unit and an intelligent device or host that has its own computing capability and is capable of acting as the primary power supply. This may allow data to be downloaded from the intelligent device or host to the

secondary unit and data to be uploaded from the secondary unit to the intelligent device or host.

Preferably, the connection operates under an interface standard. An interface standard is a standard that describes one or more functional characteristics, such as code conversion, line assignments, or protocol compliance, or physical characteristics, such as electrical, mechanical, or optical characteristics, necessary to allow the exchange of information between two or more systems or pieces of equipment. Examples of suitable interface standards for the communications link include, but are not limited to, the Recommended Standard 232 (RS-232) family of standards; USB; Bluetooth; FireWire (a brand name of Apple, Inc for their IEEE 1394 interface), IrDA (Infrared Data Association – a communications standard for the short-range exchange of data by Infrared light); Zigbee (a specification based on the IEEE 802.15.4 standard for wireless personal area networks) and other Wi-Fi standards.

Preferably, the secondary circuitry is programmable. The secondary circuitry may be programmable such that the secondary unit can be personalised to an individual user's smoking behaviour. For example, the secondary circuitry may be programmable to adjust the electrical power supplied to the at least one heating element during the smoking mode based on the particular user using the secondary unit, the particular smoking article contained in the secondary unit or both.

The primary power supply may be located in an external intelligent device or host such as a computer. The host may be a personal computer. The personal computer may be a desktop computer. The personal computer may be a laptop computer or a notebook computer. The personal computer may be a tablet computer such as a Personal Digital Assistant (PDA), a Personal Information Device (PID), a Portable Media Player (PMP, such as an Apple, Inc iPod®) or a Portable Video Player (PVP). The host may be a mobile cellular telephone. Additionally, the external host may be Internet-enabled. That is, preferably the external host, such as a computer, can connect to one or more Internet sites in order to upload data or download data or both upload and download data. This allows extended features to be implemented from the Internet via the computer, at the same time as keeping the hardware in the system itself relatively simple. Throughout the specification, in the context of the present invention, the term "Internet" is used to refer to the worldwide, publicly accessible series of interconnected computer networks that transmit data using the standard Internet Protocol (IP). It includes the World Wide Web (www) but also includes other domestic, academic, business, government and other networks outside the World Wide Web.

The primary power supply may simply be an external power source such as the commercial power supply (also known as mains power, household power, domestic power, wall power or grid power). That is to say, the interface on the secondary unit may be connectable to a wall socket. The primary power supply may be an in-vehicle power supply, for example, in a car. That is to say, the interface on the secondary unit may be connectable to a charging socket

in a vehicle.

In a preferred embodiment, the electrically heated smoking system further comprises a primary unit comprising the primary power supply and primary circuitry. In that embodiment, by providing a primary power supply in the primary unit and a secondary power supply in the secondary unit (that is, by dividing the power supply between the primary and secondary units), the size of the secondary unit can be reduced without increasing the time needed to preheat the substrate. In addition, in some embodiments, all the components required for the smoking experience can be contained in a single unit of a size and shape similar to a pack of lit-end cigarettes.

In the embodiment including a primary unit, the interface on the secondary unit may be for connection to the primary unit only, or to the primary unit and another external unit.

In the embodiment including a primary unit, preferably, supply of electrical power from the primary power supply in the primary unit to the at least one heating element, during the pre-heating mode, is controlled or partially controlled by the primary circuitry in the primary unit. Alternatively, supply of electrical power from the primary power supply in the primary unit to the at least one heating element, during the pre-heating mode, may be controlled entirely by the secondary unit. Preferably, supply of electrical power from the primary power supply in the primary unit to charge the secondary power supply is controlled by the primary circuitry in the primary unit. Alternatively, supply of electrical power from the primary power supply in the primary unit to charge the secondary power supply may be controlled by the secondary circuitry in the secondary unit. All functions may be controlled by either the secondary unit or the primary unit or by a combination of both units.

In one embodiment, the primary unit comprises an interface for connection to an external power supply for supplying electrical power to the primary power supply. The interface in the primary unit may allow power to be supplied from an external power supply to the primary power supply during the pre-heating mode, during the charging mode, during the smoking mode, when the smoking system is not in use or at any combination of those times. For that purpose, the connection may be a wired connection such as a USB connection or coaxial cable.

The interface in the primary unit may alternatively or additionally facilitate other functionality and features for the smoking system. For that purpose, the connection may be a wired connection (such as a USB connection) or a wireless connection (such as a Bluetooth connection). Preferably, the interface facilitates bi-directional communication between the primary unit and an intelligent device or host. The features described above in relation to the interface in the secondary unit also apply to the interface in the primary unit.

The external power supply may be located in an intelligent device or host such as a computer. As already discussed, the computer may be Internet-enabled and the interface in the primary unit may allow Internet data to be downloaded from the host and uploaded to the host.

The external power supply may simply be a power source such as the commercial power supply.

Preferably, the primary circuitry is programmable. If the primary power supply is chargeable by an external power supply, preferably, the primary circuitry controls charging of the primary power supply. If the primary unit includes an interface for connection to an external host, preferably, the primary circuitry controls communication between the primary unit and the external host.

In an embodiment which includes a primary unit, the electrically heated smoking system comprises one, and only one, secondary unit. Such an embodiment is advantageous as it is designed for a single user. In a preferred embodiment, the primary unit comprises storage means for the single secondary unit to form a single compact unit. Preferably, the single compact unit is easily transportable by the user.

In an alternative embodiment which includes a primary unit, the electrically heated smoking system comprises two, and only two, secondary units. Such an embodiment is advantageous as it is designed to be shared by two users. In a preferred embodiment, the primary unit comprises storage means for the two secondary units to form a single compact unit. In a preferred embodiment, the primary unit comprises a first module for receiving a first secondary unit and a second module for receiving a second secondary unit. Each module may include some or all of the functionality of the primary unit.

In an alternative embodiment which includes a primary unit, the electrically heated smoking system comprises more than two secondary units. Such an embodiment is advantageous as it is designed to be shared by a plurality of users. In one embodiment, the primary unit comprises storage means for the plurality of secondary units. In another embodiment, the primary unit includes a plurality of docking ports to receive respective secondary units for connection during the pre-heating mode and, optionally, during the charging mode.

When the electrically heated smoking system comprises two or more secondary units, the primary unit may include a plurality of connectable modules, each module including a docking port for a respective secondary unit. This allows two or more users to form a single primary unit comprising a nest or chain of modules.

Preferably, the primary unit includes storage means for one or more secondary units. This is advantageous since the primary unit and the secondary unit, when not in use, may form a single compact system, which may be easily transportable. The single compact system may be of a size and shape similar to a pack of lit-end cigarettes. In one embodiment, each secondary unit is removably attachable to a side of the primary unit. In another embodiment, each secondary unit is receivable in a respective docking cavity in the primary unit. The secondary units may be storable in the storage means when a smoking article is contained in

the secondary unit. Alternatively, the secondary units may be storable in the storage means when a smoking article is not contained in the secondary unit. The storage means may also provide means for connecting the primary unit and the secondary unit for the pre-heating mode and to charge the secondary power supply.

Preferably, the primary unit includes storage means for at least one smoking article. The storage means may include storage for used smoking articles, unused smoking articles or both. This is advantageous since the primary unit and secondary unit together provide all the components required for the smoking mode. In an embodiment in which the one or more secondary units are storable in the storage means and in which the primary unit includes storage for at least one smoking article, all the components required for the smoking experience can be contained in a single compact system. The single compact system may be of a size and shape similar to a pack of lit-end cigarettes. Additionally, or alternatively, the secondary unit may be capable of storing a smoking article when not in use. For the avoidance of doubt, the term "storage means" is used here to indicate storage for one or more secondary units, storage for one or more smoking articles, or storage for both secondary units and smoking articles.

In a preferred embodiment, the primary unit comprises a base portion and a lid portion connected to the base portion. The lid portion may be connected to the base portion by any suitable connection. For example, the lid portion may be connected to the base portion by a hinge. Alternatively, the lid portion may be a sliding lid. For example, the primary unit may comprise a shell portion and a slide portion arranged to slide relative to the shell portion. Alternatively, the lid portion may friction fit with the base portion. Alternatively, the lid portion may screw fit with the base portion.

In that embodiment, preferably the base portion of the primary unit comprises storage space for a plurality of smoking articles and storage space for at least one secondary unit. In that case, the lid portion may be closable on the base portion when the secondary unit is stored in the base portion. Even more preferably, the lid portion may be closable on the base portion when the secondary unit is stored in the base portion and a smoking article is contained in the secondary unit. In a preferred embodiment, when smoking articles and a secondary unit are stored in the base portion and the lid portion is closed, the smoking system has a size and shape similar to that of a pack of lit-end cigarettes.

The primary unit may include a display (for example a digital display) indicating information to the user. For example, the display may indicate smoking article usage, energy usage or other information.

Preferably, supply of electrical power from the secondary power supply to the at least one heating element, during the smoking mode, is controlled by the secondary circuitry. During the smoking mode, the secondary circuitry may monitor the time elapsed of the smoking mode. The secondary unit may include a display (for example a digital display) indicating information to

the user. For example, the display may indicate the time elapsed, the number of puffs taken, the number of puffs still remaining or other information. The secondary circuitry is preferably arranged to provide an output signal when the time elapsed is equal to a pre-determined period of time. Alternatively or in addition, the secondary circuitry may monitor the time elapsed between puffs during the smoking mode and provide an output signal when the time elapsed is equal to a pre-determined period of time, which is shorter than the pre-determined period of time for the smoking mode. Further, during the smoking mode, the secondary circuitry may monitor the number of puffs taken by a user. The secondary circuitry is preferably arranged to provide an output signal when the number of puffs taken is equal to a pre-determined number of puffs. Thus, there are three possible modes of operation. In a first mode, the smoking mode has a pre-determined maximum period of time. In a second mode, the smoking mode has a pre-determined maximum number of puffs. In a third mode, the smoking mode has a pre-determined maximum period of time between puffs.

As already mentioned, the secondary unit preferably has a diameter that is only slightly larger than the diameter of the smoking article. Additionally, the length of the secondary unit may be similar to the length of a lit-end cigarette (for example, a cigarette having a length of between approximately 70 mm and approximately 128 mm), or the secondary unit may be longer or shorter. This is possible because the secondary power supply does not need to increase the temperature of the aerosol-forming substrate to an operating temperature but only needs to maintain the operating temperature. Thus, the secondary power supply can be relatively small. In one embodiment, the smoking article used has a diameter and length that is smaller than a standard lit-end cigarette (for example, a cigarette with a diameter of approximately 7.9 mm and a length of approximately 85 mm) which allows the secondary unit to be of a similar size to a lit-end cigarette. This allows a user to hold the secondary unit between the user's fingers in a similar way to a lit-end cigarette.

Preferably, the secondary unit is insulated. This reduces heat loss from the secondary unit and allows the aerosol-forming substrate to be maintained at substantially the operating temperature for the desired period of time. The secondary unit may comprise a base portion capable of receiving the smoking article and a cap portion for enclosing the smoking article or closing the base portion.

The aerosol-forming substrate preferably comprises a tobacco-containing material containing volatile tobacco flavour compounds which are released from the substrate upon heating. Alternatively, the aerosol-forming substrate may comprise a non-tobacco material such as those used in the devices of EP-A-1 750 788 and EP-A-1 439 876. Preferably, the aerosol-forming substrate further comprises an aerosol former. Examples of suitable aerosol formers are glycerine and propylene glycol. Additional examples of potentially suitable aerosol formers are described in EP-A-0 277 519 and US-A-5 396 911.

The aerosol-forming substrate may be a solid substrate. The solid substrate may comprise, for example, one or more of: powder, granules, pellets, shreds, spaghettis, strips or sheets containing one or more of: herb leaf, tobacco leaf, fragments of tobacco ribs, reconstituted tobacco, homogenised tobacco, extruded tobacco and expanded tobacco. Optionally, the solid substrate may contain additional tobacco or non-tobacco volatile flavour compounds, to be released upon heating of the substrate. Optionally, the solid substrate may be provided on or embedded in a thermally stable carrier. The carrier may take the form of powder, granules, pellets, shreds, spaghettis, strips or sheets. Alternatively, the carrier may be a tubular carrier having a thin layer of the solid substrate deposited on its inner surface, such as those disclosed in US-A-5 505 214, US-A-5 591 368 and US-A-5 388 594, or on its outer surface, or on both its inner and outer surfaces. Such a tubular carrier may be formed of, for example, a paper, or paper like material, a non-woven carbon fibre mat, a low mass open mesh metallic screen, or a perforated metallic foil or any other thermally stable polymer matrix. The solid substrate may be deposited on the surface of the carrier in the form of, for example, a sheet, foam, gel or slurry. The solid substrate may be deposited on the entire surface of the carrier, or alternatively, may be deposited in a pattern in order to provide a non-uniform flavour delivery during use. Alternatively, the carrier may be a non-woven fabric or fibre bundle into which tobacco components have been incorporated, such as that described in EP-A-0 857 431. The non-woven fabric or fibre bundle may comprise, for example, carbon fibres, natural cellulose fibres, or cellulose derivative fibres.

The aerosol-forming substrate may be a liquid substrate and the smoking article may comprise means for retaining the liquid substrate. The aerosol-forming substrate may alternatively be any other sort of substrate, for example, a gas substrate, or any combination of the various types of substrate.

According to another aspect of the invention, there is provided a primary unit for the electrically heated smoking system of the first aspect of the invention, the primary unit comprising a primary power supply and primary circuitry.

According to another aspect of the invention, there is provided a method of operating an electrically heated smoking system comprising a secondary unit capable of receiving a smoking article having an aerosol-forming substrate, the secondary unit comprising at least one heating element, an interface for connection to a primary power supply, a secondary power supply, and secondary circuitry, the method comprising the steps of: during a pre-heating mode, connecting the at least one heating element to the primary power supply via the interface, such that the primary power supply supplies electrical power to the at least one heating element to increase the temperature of the aerosol-forming substrate to an operating temperature; and during a smoking mode, connecting the at least one heating element to the secondary power supply, such that the secondary power supply supplies electrical power to the at least one

heating element to maintain the temperature of the aerosol-forming substrate at substantially the operating temperature.

The method may further comprise the step of: during a charging mode, charging the secondary power supply by the primary power supply, such that the secondary power supply has sufficient charge to maintain the temperature of the aerosol-forming substrate at substantially the operating temperature during the smoking mode.

Features described in relation to one aspect of the invention may also be applicable to another aspect of the invention.

The invention will be further described, by way of example only, with reference to the accompanying drawings, of which:

Figures 1a, 1b, and 1c show three versions of a first embodiment of the present invention;

Figures 2a and 2b show two alternative views of a second embodiment of the present invention;

Figures 3a and 3b show two versions of a third embodiment of the present invention;

Figures 4a, 4b and 4c show two embodiments of the smoking system of the present invention in comparison with a pack of lit-end cigarettes; and

Figure 5 shows a graph of power versus time during operation of the smoking system according to a preferred embodiment.

In general, the invention does not require the primary unit, in which case the secondary unit may be a standalone unit connectable to an existing external power supply. However, as discussed above, in one embodiment, the electrically heated smoking system of the invention comprises a primary unit and one or more secondary units capable of receiving a smoking article. The primary unit includes a primary power supply and electronic circuitry. The secondary unit includes a secondary power supply, electronic circuitry and at least one heating element. The primary power supply in the primary unit may be used for charging the secondary power supply in the secondary unit, in the charging mode, and for the initial heating of the aerosol-forming substrate of the smoking article, in the pre-heating mode. Once the temperature of the aerosol-forming substrate is raised to an operating temperature, the secondary power supply in the secondary unit is used to maintain the temperature of the substrate during the smoking experience, in the smoking mode. The required operating temperature will depend upon the particular aerosol-forming substrate in the smoking article. The operating temperature is controlled by the primary power supply, the number and type of heating elements and the structure of the secondary unit. By dividing the power supply between the primary unit and the secondary unit, the size of the secondary unit can be reduced, such that it is only slightly larger than the smoking article. In addition, in some embodiments, all the components required for the smoking experience can be contained in a single unit of a size and shape similar to a pack of lit-end cigarettes. Various embodiments will now be described and features described in relation to any embodiment may equally be applicable to any of the other embodiments.

Figures 1a, 1b and 1c each show a version of a first embodiment of the invention. In Figures 1a and 1b, the primary unit is in the form of a flip-top box of a size and shape similar to a standard pack of lit-end cigarettes. Other pack configurations are discussed below with reference to Figure 4a. Although not expressly shown, the primary unit may be another suitable size.

In Figure 1a, smoking system 101 comprises primary unit 103 and secondary unit in the form of holder 105. The primary unit 103 has the form of a flip-top box, with a base portion 103a and a lid portion 103b, separated by a hinge 103c. The lid portion 103b is shown open in Figure 1a. The hinge 103c runs along a long edge of the top side of the base portion 103a. The holder 105 can be stored in the base portion 103a of the primary unit 103 (as shown in Figure 1a) by insertion into a docking port. In Figure 1a, the docking port for holder 105 is provided at one side of the base portion 103a, but the docking port could equally be provided on the opposite side of the base portion 103a or in the centre of the base portion 103a. In the embodiment of Figure 1a, when the holder 105 is stored in the primary unit 103, the top of the holder 105 protrudes above the top side of the base portion 103a. The lid portion 103b is, nonetheless, able to close onto the base portion 103a when the holder 105 is stored in the primary unit 103, including when a smoking article is contained in the holder 105. Alternatively, the top unit of the holder 105 may be virtually flush with the top side of the base portion 103a. The primary unit 103 also has storage for smoking articles 107, in this case to one side of the holder docking port. A further smoking article may, of course, be stored in the holder 105. Although not expressly shown, the docking port for holder 105 may be located on either side of the base portion 103a and the storage for smoking articles 107 may be located on the side opposite the holder 105. If the docking port for holder 105 is located towards the centre of the base portion 103a, storage for smoking articles 107 may be located on one or both sides of the docking port.

Additionally, in the base portion 103a of the primary unit 103 of Figure 1a, there is an interface 109 for receiving a USB plug (not shown). The USB connection may be used for charging the power supply in the primary unit, for checking the functionality or for other purposes where connection to a computer is required. Such a USB interface, or indeed any other suitable interface, may be included on any of the described embodiments. Additionally or alternatively, a USB interface, or any other suitable interface, may be included on the holder, although this is not shown in Figure 1a. The USB connection will be discussed further below.

In Figure 1b, smoking system 101' comprises primary unit 103' and secondary unit in the form of holder 105'. As in Figure 1a, the primary unit 103' has the form of a flip-top box, with a base portion 103a' and a lid portion 103b', separated by a hinge 103c'. However, in Figure 1b, the hinge runs along a short edge of the top side of the base portion 103a'. The lid portion 103b' is shown open in Figure 1b. The holder 105' can be stored in the base portion 103a' of the primary unit 103' (as shown in Figure 1b) by insertion into a docking port. In Figure 1b, the

docking port for holder 105' is provided towards the front of the base portion 103a', that is, furthest from the hinge 103c', but the docking port could equally be provided towards the rear end of the base portion 103a', that is, closest to the hinge 103c', or in the centre of the base portion 103a'. In the embodiment of Figure 1b, when holder 105' is stored in the primary unit 103', the top of the holder 105' may be virtually flush with the top side of the base portion 103a'. The lid portion 103b' is able to close onto the base portion 103a', including when a smoking article is contained in the holder 105'. Alternatively, the top of the holder 105' may protrude above the top side of the base portion 103a'. The primary unit 103' also has storage for smoking articles 107, in this case, towards the rear of the base portion 103a', that is, nearer to the hinge 103c'. A further smoking article may, of course, be stored in the holder. If the docking port 105' is located towards the rear of the base portion 103a', the storage for smoking articles 107' may be located at the end opposite the holder 105', that is towards the front of the base portion 103a'. If the docking port for holder 105' is located towards the centre of the base portion 103a', storage for smoking articles 107' may be located at one or both ends of the base portion 103a'.

In Figure 1c, smoking system 101" comprises primary unit 103" and secondary unit in the form of holder 105". The holder 105" can be stored in the primary unit 103" (as shown in Figure 1c) by insertion into a docking port. In Figure 1c, the docking port for holder 105" is provided at one side of the base portion 103a", but the docking port could equally be provided on the opposite side of the base portion 103a" or in the centre of the base portion 103a".The primary unit 103" and holder 105" together form a single compact unit. In the embodiment of Figure 1c, when the holder 105" is stored in the primary unit 103", the top of the holder 105" protrudes above the top side of the primary unit 103". Alternatively, the top unit of the holder 105" may be virtually flush with the top side of the primary unit 103". In the embodiment of Figure 1c, the primary unit 103" does not have any storage for smoking articles, although a single smoking article may be stored in the holder 105". However, additional storage for smoking articles could be provided. Additionally, as in Figure 1a, an interface 109" is provided in the primary unit 103" for receiving a USB plug (not shown).

In the embodiments shown in Figures 1a, 1b and 1c, the smoking system comprises a primary unit and one separate holder. The smoking system is designed for a single user. The holder may be stored in the primary unit. A smoking article may be received in the holder when the holder is stored in the primary unit or when the holder is separate from the primary unit. When the holder is connected to the primary unit, the primary power supply may be connected to the heating elements, in order to heat the substrate in the pre-heating mode. Additionally, the primary unit may provide storage for smoking articles. The storage for smoking articles may be sized to store between 1 and 20 smoking articles in any suitable configuration. The holder and primary unit together form a compact smoking system that can easily be carried by a user. The various features of Figures 1a, 1b and 1c are interchangeable.

Figures 2a and 2b show alternative views of a second embodiment of the smoking system of the invention. In Figures 2a and 2b, smoking system 201 comprises primary unit 203 comprising a main part 203a and a separable docking port 203b, and two secondary units in the form of holders 205a and 205b. Each holder 205a, 205b may be received in the primary unit 203. In the embodiment of Figures 2a and 2b, first holder 205a may be received in a docking port which is integral with the main part 203a of the primary unit 203. Second holder 205b may be received in docking port 203b, which is separate from the main part 203a of the primary unit 203, but may be attached to one side of the main part 203a via interface 209. Alternative connections between the docking port 203b and the main part 203a of the primary unit 203 are, of course, possible. Docking port on main part 203a includes a recess 211a which is designed to cooperate with a protrusion 213a on holder 205a, for securing the holder 205a in the docking port 203. Similarly, holder 205b includes a protrusion 213b for cooperation with a recess 211b in the docking port 203b, which is separate from the main part 203a of the primary unit 203. In addition, a mechanism may be provided for securing a smoking article in the holder.

In Figure 2a, the holders 205a and 205b are shown received in their respective docking ports, and docking port 203b is shown separate from the main part 203a of the primary unit 203. In Figure 2b, the holders 205a and 205b are shown separately from their respective docking ports and in use with a smoking article 207.

In the embodiment shown in Figures 2a and 2b, the smoking system comprises a primary unit and two separate holders. The smoking system is designed to be shared by two users. Alternatively, the smoking system can be used by a single user, in which case one of the holders acts as a back-up. Holder 205a can be stored directly in main part 203a of the primary unit. Holder 205b can be stored in docking port 203b which is attachable to the main part 203a of the primary unit 203. The holders and primary unit together form a compact smoking system. A smoking article may be received in each holder when that holder is connected to the primary unit or when the holder is separate from the primary unit. Additionally, the primary unit may provide storage for smoking articles, although this is not shown in Figures 2a or 2b.

Figures 3a and 3b each show a version of a third embodiment of the invention. In Figure 3a, smoking system 301 comprises primary unit 303 and a plurality of secondary units in the form of holders 305. In Figure 3a, three holders 305i, 305ii and 305iii are shown connected to the primary unit 303 and one holder 305iv is shown separate from the primary unit 303. In Figure 3a, the primary unit 303 provides docking ports for four holders 305, but any number of docking ports could be provided. For example, as many or 40 or 50 docking ports may be provided. In other embodiments, between 2 and 10 holders may be docked in primary unit 303 for charging and pre-heating. The primary unit 303 provides first storage 311 which may be used to store either smoking articles (used and unused) or holders, or both smoking articles and holders. The primary unit 303 also provides second storage 313 which may also be used to

store either smoking articles or holders, or both smoking articles and holders.

In Figure 3a, holders 305i and 305ii are shown docked in primary unit 303. They are each in use with a smoking article 307 and the power supply in the primary unit is being used for re-charging the power supply in the holder (charging mode), or for pre-heating the smoking article substrate (pre-heating mode). Holder 305iii is also shown docked in primary unit 303, but without a smoking article. The power supply in the holder 305iii is being recharged from the power supply in the primary unit 303 (charging mode). Holder 305iv is shown separate from the primary unit 303 and in use with a smoking article 307. The power supply in holder 305iv is being used to maintain the operating temperature of the smoking article substrate (during the smoking mode).

In Figure 3a, primary unit 303 is connected to an external power supply (not shown) via connection 315. The external power supply may be used for re-charging the power supply in the primary unit, for supplying power to the holders for charging the holders or during the pre-heating mode, or any combination of those.

In Figure 3a, each docking port in primary unit 303 includes its own interface 309. This may include a display and a switch for initiating the pre-heating mode when a smoking article is received in the holder docked in the docking port.

In Figure 3b, smoking system 301' comprises a modular primary unit 303' and a plurality of secondary units in the form of holders 305'. Several configurations are shown in Figure 3b.

In the first configuration, A, the primary unit 303' comprises a single module 304. The module 304 provides a docking port for a single holder 305'. In the first configuration, A, the holder 305' is shown separate from the module 304 of the primary unit 303' and in use with a smoking article 307. The power supply in holder 305' is being used to maintain the operating temperature of the smoking article substrate during the smoking mode. The module 304 includes its own interface 309' for its docking port and may also include storage (not shown). The primary unit 303' is connected to an external power supply (not shown) via connection 315'.

In the second configuration, B, the primary unit 303' comprises four modules 304. Of course, any number of modules may be provided. Again, each module 304 provides a docking port for a single holder 305'. In the second configuration, the four modules are shown connected to one another in a "nest" formation. In the nest formation, each module may be connected to 1, 2, 3, 4, 5 or 6 other modules. The connection between modules 304 may be a magnetic connection or any other type of suitable connection. In the second configuration, B, three holders 305' with smoking articles 307 are shown docked in respective modules 304 and the primary unit 303' is being used for re-charging the power supply in each holder or for pre-heating the smoking article substrate. As in configuration A, each module 304 includes its own interface 309' for its docking port and may also include storage (not shown). The primary unit 303' is connected to an external power supply (not shown) via connection 315'. Note that only a

single power connection is required for the primary unit 303', which provides power to all the modules 304.

In the third configuration, C, the primary unit 303' comprises four modules 304. Of course, again, any number of modules may be provided. Again, each module 304 provides a docking port for a single holder 305'. In the third configuration, the four modules are shown connected to one another in a "chain" formation. In the chain formation, each module may be connected to only 1 or 2 other modules. The connection between modules 304 may be a magnetic connection or any other type of suitable connection. In the third configuration, C, three holders 305' with smoking articles 307 are shown docked in respective modules 304 and the primary unit 303' is being used for re-charging the power supply in each holder or for pre-heating the smoking article substrate. As in configurations A and B, each module 304 includes its own interface 309' for its docking port and may also include storage (not shown). The primary unit 303' is connected to an external power supply (not shown) via connection 315'. Note that only a single power connection is required for the primary unit 303', which provides power to all the modules 304.

In the embodiment of Figure 3b, each user may have their own holder 305' and module 304. As users join the group, new modules are added to the configuration. As users leave the group, modules are removed from the configuration.

In the embodiments shown in Figures 3a and 3b, the smoking system comprises at least one primary unit and a plurality of holders. The smoking system is designed to be used by many users. Unlike the embodiments of Figures 1 and 2, the smoking system shown in Figure 3a may not necessarily be transportable, and may be permanently positioned in a location accessible to a plurality of users.

Each of the embodiments shown in Figures 1 to 3 includes at least one primary unit and one or more secondary units. However, a primary unit need not be included in the smoking system. In that case, the holder will be connectable directly to an external power source, such as a mains supply, or a host computer. This may be via a wired connection such as a USB connection. Connection to an in-vehicle charging port is also possible. In that case, the holder will include the necessary electronic circuitry to control the charging in the charging mode, and the heating of the smoking article substrate in the pre-heating mode. Various features common to all the illustrated embodiments will now be described.

The power supply in the primary unit may be any suitable power supply. The primary power supply may be chargeable by an external source. For example, the primary unit power supply may be a battery, such as a lithium ion, lithium iron phosphate, lithium manganese, nickel cadmium or nickel metal hydride battery. The external source may be an external computer connectable to the primary unit via a connection, for example a USB (Universal Serial Bus) connection. The external source may be mains electricity supply connectable to the

primary unit via a plug and socket. The power capability of the primary unit's power source is preferably 3 to 6 Watts. The requirements that constrain the minimum size of the primary unit power supply are energy and charging time.

The electronic circuitry in the primary unit may include a microcontroller, a microprocessor, a digital signal processor (DSP), an application specific integrated circuit (ASIC) or any other programmable digital or analogue circuitry. The electronic circuitry in the primary unit has a number of functions including: to charge the primary unit power supply from an external source, to charge the secondary power supply in the secondary unit when not in use, and to control the heating elements in the secondary unit during the pre-heating mode. The electronic circuitry may also be arranged to communicate with a host via a wired connection, for example USB, or via a wireless connection, for example Bluetooth to provide bi-directional transfer of data between the host and the primary and secondary units. The communication between the secondary unit and the primary unit may be facilitated when the secondary unit is in a docking port on the primary unit or when the secondary unit is stored in storage means in the primary unit.

As already mentioned, the primary unit may include an interface for external connection. Preferably, the interface operates under an interface standard. The connection may be a wired connection such as a USB link, or a wireless connection, such as Bluetooth. The wired connection may include a retractable cable. This may be used for charging the primary power supply. The connection may alternatively or additionally be used for extra functionality. For example, when the primary unit is connected to an external computer, the operation of the system may be checked and the user may be advised when maintenance is required, for example, when the primary or secondary unit power supply needs to be replaced. Additionally, the connection with a computer can allow the user to place an order for more smoking articles, download updates for any software, set personal consumption targets for individual users and share information. Further extended capabilities may be provided, not limited to those listed above. One or both of the primary and secondary units may include a digital display.

The power supply in the secondary unit provides enough energy to the heating elements to maintain the aerosol-forming substrate of the smoking article at an operating temperature, for a predetermined period of time or predetermined number of puffs taken during the smoking mode. The power supply in the secondary unit may be a battery, a supercapacitor, a fuel cell or any other suitable power supply which can provide enough energy to maintain the substrate at working temperature for the predetermined period of time or for the predetermined number of puffs. In one embodiment, the secondary unit power supply comprises a plurality of lithium iron phosphate cells. In another embodiment, the secondary unit power supply comprises a lithium polymer battery. The predetermined period of time may be between 5 and 20 minutes. The predetermined number of puffs may be between 5 and 20 puffs. The power capability of the

secondary unit's power source is preferably 1 to 3 Watts. The requirements that constrain the minimum size of the secondary unit power supply are energy provided per smoking experience, charging time and cycle life (that is, how often the power supply will need to be replaced).

As already mentioned, the secondary unit may include an interface for connection directly to an external source. Preferably, the interface operates under an interface standard. The connection may be a wired connection such as a USB link, or a wireless connection, such as Bluetooth. The wired connection may include a retractable cable. This may be used for charging the secondary power supply. The connection may alternatively or additionally be used for supplying power to the secondary power supply for the pre-heating mode. The connection may alternatively or additionally be used for extra functionality. Preferably, the connection allows bi-directional flow of data. For example, when the secondary unit is connected to an external computer, the operation of the system may be checked and the user may be advised when maintenance is required, for example, when the secondary unit power supply needs to be replaced or the secondary unit needs to be cleaned. Further extended capabilities may be provided, not limited to those listed above.

The electronic circuitry in the secondary unit may include a microcontroller, a microprocessor, a digital signal processor (DSP), an application specific integrated circuit (ASIC) or any other programmable digital or analogue circuitry. The secondary unit electronic circuitry works in conjunction with the primary unit electronic circuitry. The pre-heating mode may be initiated when the secondary unit is detected to be in connection with the primary power supply and a smoking article is detected in the secondary unit. This may be detected by the secondary circuitry or primary circuitry. Alternatively, a user may manually initiate the pre-heat, for example, by activating a switch on the primary or secondary unit or by opening the primary unit. During the pre-heating mode, the electronic circuitry in the secondary unit may communicate with the primary unit electronic circuitry to determine when the smoking article is ready to be smoked. During the smoking mode, the user may begin the smoking experience and continue the smoking experience puff by puff. The electronic circuitry in the secondary unit controls the heating elements to maintain the substrate at the operating temperature, or as close to the operating temperature as possible. The electronic circuitry in the secondary unit may be arranged to keep track of the number of puffs taken by the user, the amount of time between puffs and the amount of time that the heating elements have been energized. When either the number of puffs reaches the maximum number for the smoking article (so that the smoking article is depleted), the user has not taken a puff before the predetermined time, or the predetermined period of time has expired, but there are puffs remaining, a signal from the electronic circuitry notifies the user to return the secondary unit to the primary unit. Then, if appropriate, the power supply in the secondary unit can be recharged and the substrate returned to operating temperature. In this way, the user is able to stop and start the smoking

experience, and restart the smoking experience until the smoking article is depleted.

In addition, the electronic circuitry may identify the smoking article in the secondary unit, adjust the heating profile based on the smoking article type and determine when the holder needs maintenance, for example when the heating elements need to be cleaned. The electronic circuitry in the secondary unit can also allow the secondary unit to be personalized for an individual's smoking behaviour. For example, duration of the smoking experience, time of each puff, time between puffs and intensity of each puff, may be recorded, the individual's consumption patterns may be tracked and the individual's preferred smoking article may be monitored. This may work in conjunction with a lock on the secondary unit, which allows only a particular user to use the secondary unit.

In order for the electronic circuitry in the secondary unit to count the number of puffs taken, the electronic circuitry may include a puff sensor for sensing air flow indicative of a puff. The sensor may be any suitable type of sensor, for example a thermistor, an optical device, an opto-mechanical device, an electro-mechanical device, or a micro electro mechanical systems (MEMS) device.

The shape and size of the secondary unit will, to a certain extent, depend on the size and shape of the secondary unit power supply. In principle, however, the secondary unit may be any suitable shape. Typically, the secondary unit is an elongate cylindrical unit having a size only slightly larger than the smoking article. The cross sectional shape of the secondary unit may be round, rectangular, or oval. The secondary unit may include a cap for covering the smoking article when it is received in the secondary unit, for protection of the smoking article or for limiting odour. The secondary unit may include a cap for covering the open end of the secondary unit. Typically, when the smoking article is received in the secondary unit, approximately half the length of the smoking article protrudes from the secondary unit. In other embodiments, less than half of the length of the smoking article protrudes from the secondary unit.

The heating element or elements in the secondary unit may be internal or external heating elements and are shaped to most effectively heat the aerosol-forming substrate. There may be a single heating element or multiple heating elements. The heating elements may be made from an electrically resistive material including, but not limited to, a metal, a metal alloy, a ceramic or a semiconductor material. The most appropriate form for the heating element or elements will depend on the particular aerosol-forming substrate in the smoking article. The aerosol-forming substrate is preferably a solid substrate but may, alternatively, be a liquid or gas substrate.

Preferably, the secondary unit is insulated to minimise heat loss during the smoking mode. The better insulated the secondary unit, the longer the substrate can remain at operating temperature, which can extend the predetermined period of time for the smoking mode.

Figure 4a shows a pack of lit-end cigarettes. Figure 4b shows one embodiment of the smoking system of the present invention, in which the secondary unit in the form of the holder may be stored in the primary unit. Figure 4c shows one embodiment of the smoking system of the present invention, in which the holder may be stored in the primary unit, even when a smoking article is received in the holder. Figures 4a, 4b and 4c are provided to show the relative sizes of embodiments of the smoking system of the present invention and a pack of lit-end cigarettes.

Figure 4a shows a pack 401 for lit-end cigarettes 403. The lower view in Figure 4a is a cross sectional side view. The upper view in Figure 4a is a cross sectional top view. This pack has a width of 55 mm, a height of 90 mm and a depth of 24 mm. Figure 4a shows one example of a pack of lit-end cigarettes. Generally, packs of lit-end cigarettes have a height of between about 60 mm and about 150 mm, more typically a height of between about 70 mm and about 125 mm. Generally, packs of lit-end cigarettes have a width of between about 12 mm and about 150 mm, more preferably a width of between about 70 mm and about 125 mm. Generally, packs of lit-end cigarettes have a depth of between about 6 mm and about 100 mm, more preferably a depth of between about 12 mm and about 25 mm. Preferably, the dimensions of the packs are adapted to the length of the cigarettes, and the collation of the cigarettes.

Packs of lit-end cigarettes may be in the shape of a rectangular parallelepiped, with right-angled longitudinal and right-angled transverse edges. Alternatively, the pack may comprise one or more rounded longitudinal edges, rounded transverse edges, bevelled longitudinal edges or bevelled transverse edges, or combinations thereof. Alternatively, the pack may have a non-rectangular transversal cross section, for example polygonal such as triangular or hexagonal, or oval, semi-oval, circular or semi-circular. The packs may be used to package smoking articles including, but not limited to, conventional lit-end cigarettes, cigars or cigarillos, heated smoking articles comprising a combustible fuel element or heat source and an aerosol-generating substrate (for example cigarettes of the type disclosed in US-A-4,714,082) and smoking articles for use with electrical smoking systems (for example cigarettes of the type disclosed in US-A-5,692,525).

Through an appropriate choice of the dimensions thereof, packs may be designed to hold different total numbers of smoking articles, or different arrangements of smoking articles. Packs may hold smoking articles of the same type or brand, or of different types or brands. In addition, both filterless smoking articles and smoking articles with various filter tips may be contained, as well as smoking articles of differing length and diameter. In addition, the smoking articles may differ in strength of taste, resistance to draw and total particulate matter delivery. The pack may comprise more than one of the different types of smoking articles listed above.

Figure 4b shows a first embodiment of a smoking system according to the invention. The lower view in Figure 4b is a cross sectional side view. The upper view in Figure 4b is a cross

sectional top view. The system comprises a primary unit 405 and a holder 407. The primary unit includes a primary power supply in the form of battery 409, storage for smoking articles 411, and a docking port 413 for receiving the holder. The holder includes heating elements, indicated schematically at 415. In this embodiment, when the holder is stored in the docking port of the primary unit, the lid portion (not shown) can be closed. However, when the holder is stored in the docking port of the primary unit with a smoking article is received in the holder (as shown in Figure 4b), the lid portion cannot be closed. The smoking system has a width of 56 mm, a height of 95 mm and a depth of 25 mm.

Figure 4c shows a second embodiment of a smoking system according to the invention. The lower view in Figure 4c is a cross sectional side view. The upper view in Figure 4c is a cross sectional top view. The system comprises a primary unit 405' and a holder 407'. The primary unit includes a battery 409', storage for smoking articles 411', and a docking port 413' for receiving the holder. The holder 407' includes heating elements, indicated schematically at 415'. In this embodiment, when the holder is stored in the docking port of the primary unit, even with a smoking article received in the holder (as shown in Figure 4c), the lid portion (not shown) can be closed. This is because the holder 407' has a different construction from holder 407, in particular the heating elements are positioned differently. The smoking system has a width of 56 mm, a height of 95 mm and a depth of 25 mm.

It can be seen from Figures 4a, 4b and 4c that at least two embodiments of the smoking system of the present invention are of a similar size and shape as a pack of lit-end cigarettes. Other embodiments of the smoking system may be of a similar size and shape to other pack sizes and shapes, as described above. All the components required for the smoking experience are contained in the single compact unit.

Operation of the electrically heated smoking system according to an embodiment of the present invention will now be described with reference to Figure 5. Figure 5 is a graph of power used W and temperature T versus time t for the pre-heating and smoking modes.

First, the user inserts a smoking article into the secondary unit. At this time, the secondary unit can be connected to, or separate from, the primary unit.

Second, the secondary unit is connected to the primary unit (if not already connected) (or an alternative source of power) and the primary power supply in the primary unit begins to charge the secondary power supply in the secondary unit. The charging time will depend on the details of the smoking system, but is not more than approximately 5 minutes in a preferred embodiment. The order of the first two steps may be reversed. For example, the secondary unit may be stored in or on the primary unit when not in use, so that the secondary power supply is fully charged and the secondary unit is ready for a user to initiate the smoking experience at any time. In that case, the secondary power supply in the secondary unit is charged before a smoking article is inserted into the portable secondary unit.

Third, once the secondary power supply is fully charged (this can be indicated by a signal on the primary or secondary unit), the user may begin the pre-heating mode. Additionally, the pre-heating mode may be initiated prior to or at the same time that the charging mode begins. The pre-heating mode may be started by the user pressing a button or flipping a switch when he or she is ready to begin the smoking experience. Alternatively, the user may begin the pre-heating mode by shaking the unit a predetermined number of times to begin the pre-heat phase. At the beginning of the pre-heating mode, at time 0 in the graph of Figure 5, the primary power supply is then connected to the heating elements in the secondary unit, under control of the electronic circuitry in the primary and secondary units. The heating elements are energized until the substrate in the smoking article reaches the desired operating temperature T1 (e.g., between approximately 150 and 250 °C). During the pre-heating mode (shown by the shaded box in Figure 5), the temperature of the substrate is raised rapidly, but in a controlled manner in order to avoid overshoot. In one embodiment, a temperature sensor is located in the primary unit. The secondary unit may also include a temperature sensor. In another embodiment, the primary unit or the secondary unit may detect that the substrate has reached the desired operating temperature T1 after an energizing period t1 has elapsed. The energizing period may be between approximately 10 seconds and approximately 150 seconds. At the end of this pre-heating period, t1 in Figure 5, electronic circuitry in the primary unit may generate a signal to indicate that the pre-heating period mode is complete and that the user can begin the smoking experience.

Fourth, the user may now remove the portable secondary unit (with the received smoking article) from the primary unit to begin the smoking mode. This is at time t1 in the graph of Figure 5. During the smoking mode, the secondary power supply in the secondary unit, is used to maintain the substrate at or close to operating temperature T1. The heating elements provide enough heat to the substrate to maintain the substrate at operating temperature, thereby compensating for heat losses through the secondary unit, and as air is drawn through the secondary unit during each puff. The electronic circuitry in the secondary unit records the time elapsed, the time between puffs and/or the number of puffs taken, since the portable secondary unit was removed from the primary unit at time t1.

In Figure 5, three plots are shown during the smoking mode. The first, solid line indicates the temperature when the secondary unit is insulated. This is the preferred embodiment and, as can be seen from Figure 5, maintains the substrate very close to the operating temperature T1 and power W1. The second, dotted line indicates the temperature when the secondary unit is not insulated. In that embodiment, the substrate is still maintained close to the operating temperature T1 but there is more heat loss than when the secondary unit is insulated. The third, dashed line indicates the temperature without any secondary power supply in the secondary unit. In that arrangement, the temperature of the substrate falls away quickly during the smoking

mode.

Fifth, the electronic circuitry in the secondary unit either detects that the maximum number of puffs (e.g., between approximately 5 and 20 puffs per smoking article) has been reached, or the maximum amount of time for the smoking mode (e.g., approximately 5 to 20 minutes after the user has removed the holder from the primary unit) has expired, or the maximum amount of time between puffs (e.g., approximately 30 sec to 5 minutes) has expired. This is time t2 in the graph of Figure 5. In the first case, if the electronic circuitry in the secondary unit detects that the maximum puff count has been reached for the smoking article, the electronic circuitry will stop energizing the heating elements to maintain the substrate at the desired operating temperature. If the maximum number of puffs have been taken by the user during the smoking mode, the electronic circuitry in the secondary unit generates a signal to the user indicating that the maximum number of puffs have been taken. This signal may be in the form of a display on the portable secondary unit (for example indicating the number of puffs remaining), one or more indicator lights, such as LEDs, which switch on or off as the puffs are taken, an audible notification such as a buzzer, a silent notification such as a vibration, or any other suitable signal. In the second case, if the electronic circuitry in the secondary unit detects that the maximum amount of time for the smoking mode has expired, the electronic circuitry will stop maintaining the operating temperature at the substrate and will generate a signal to the user indicating that time for the smoking mode has expired. This signal can be any suitable signal as described above. In the third case, if the maximum amount of time allowed for the user to take consecutive puffs has expired, the electronic circuitry generates a signal to the user indicating that a puff has not been taken during the allowed time. This signal can be any suitable signal as described above. The signals can indicate that the secondary unit should be returned to the primary unit for charging and to start the pre-heating mode.

Sixth and finally, the user may reconnect the portable secondary unit and the primary power supply and the primary unit begins to recharge the secondary power supply in the portable secondary unit again. Once the secondary power supply in the secondary unit is fully charged, if puffs remain, the user can restart the smoking experience from the third step. Thus, the user can start and stop the smoking experience.

As described, embodiments of the invention provide a number of advantages. First, by dividing the system, in particular the power supply, into two portions, the size of the secondary unit can be reduced. Second, the secondary unit can facilitate puff on demand, and the smoking experience can be started and stopped. Embodiments for a single user, which have a size and shape similar to that of a pack of lit-end cigarettes, are advantageous since there will need to be minimal disruption to the user's smoking behaviour for the user to adopt the product. In addition, the user need only carry the single unit which provides all the components required for the smoking experience. Embodiments which provide a plurality of secondary units for use by a

plurality of users are advantageous since they facilitate social interaction. Embodiments in which the secondary unit is personalised allow the user to prevent unauthorised use and the performance may be adapted to best suit the user.

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CLAIMS

1. An electrically heated smoking system (101, 201, 301) comprising a secondary unit (105, 205a, 205b, 305, 407) capable of receiving a smoking article (107, 207, 307, 411) having an aerosol-forming substrate, the secondary unit comprising:

at least one heating element (415);

an interface for connection to a primary power supply (409) for supplying electrical power to the at least one heating element;

a secondary power supply for supplying electrical power to the at least one heating element; and

secondary circuitry arranged to control supply of electrical power from the primary power supply (409) to the at least one heating element (415) in a pre-heating mode during which the temperature of the aerosol-forming substrate is increased to an operating temperature, and arranged to control supply of electrical power from the secondary power supply to the at least one heating element (415) in a smoking mode, during which the temperature of the aerosol-forming substrate is maintained at substantially the operating temperature.

2. An electrically heated smoking system (101, 201, 301) according to claim 1, wherein the secondary power supply is chargeable by the primary power supply, during a charging mode, so that the secondary power supply has sufficient charge to maintain the temperature of the aerosol-forming substrate at substantially the operating temperature during the smoking mode.

3. An electrically heated smoking system (101, 201, 301) according to claim 2, wherein the secondary circuitry is further arranged to control charging of the secondary power supply by the primary power supply (409) during the charging mode.

4. An electrically heated smoking system (101, 201, 301) according to any preceding claim, wherein the interface provides bi-directional communication between the secondary unit (105, 205a, 205b, 305, 407) and an intelligent device.

5. An electrically heated smoking system (101, 201, 301) according to any preceding claim, further comprising a primary unit (103, 203, 303, 405) comprising the primary power supply and primary circuitry.

6. An electrically heated smoking system (101, 201, 301) according to claim 5, wherein the primary unit (103, 203, 303, 405) comprises an interface (109, 209) for connection to an external power supply for supplying electrical power to the primary power supply.

7. An electrically heated smoking system (101, 201, 301) according to claim 5 or claim 6 , comprising a plurality of secondary units (205a, 205b, 305).

8. An electrically heated smoking system (101, 201, 301) according to claim 7, wherein the primary unit (303) includes a plurality of connectable modules (304), each module including a docking port for a respective secondary unit (305).

9. An electrically heated smoking system (101, 201, 301) according to any of claims 5 to 8, wherein the primary unit (103, 203, 303, 405) includes storage means for one or more secondary units (105, 205a, 205b, 305, 407).

10. An electrically heated smoking system (101, 201, 301) according to any of claims 5 to 9, wherein the primary unit (103, 203, 303, 405) includes storage means for at least one smoking article (107, 207, 307, 411).

11. An electrically heated smoking system (101, 201, 301) according to any of claims 5 to 10, wherein the primary unit (103, 405) comprises a base portion (103a) and a lid portion (103b).

12. An electrically heated smoking system (101, 201, 301) according to any preceding claim, wherein the secondary unit (105, 205a, 205b, 305, 407) is insulated.

13. A primary unit (103, 203, 303, 405) for the electrically heated smoking system (101, 201, 301) of any of the preceding claims, the primary unit comprising a primary power supply (409) and primary circuitry.

14. A method of operating an electrically heated smoking system (101, 201, 301) comprising a secondary unit (105, 205a, 205b, 305, 407) capable of receiving a smoking article (107, 207, 307, 411) having an aerosol-forming substrate, the secondary unit comprising at least one heating element (415), an interface for connection to a primary power supply (409), a secondary power supply, and secondary circuitry, the method comprising the steps of:

during a pre-heating mode, connecting the at least one heating element (415) to the primary power supply (409) via the interface, such that the primary power supply (409) supplies electrical power to the at least one heating element (415) to increase the temperature of the aerosol-forming substrate to an operating temperature; and

during a smoking mode, connecting the at least one heating element (415) to the secondary power supply, such that the secondary power supply supplies electrical power to the at least one heating element (415) to maintain the temperature of the aerosol-forming substrate at substantially the operating temperature,.

15. A method according to claim 14, further comprising the step of:

during a charging mode, charging the secondary power supply by the primary power supply, such that the secondary power supply has sufficient charge to maintain the temperature of the aerosol-forming substrate at substantially the operating temperature during the smoking mode.