AEROSOL GENERATING SYSTEM WITH MEANS FOR DISABLING CONSUMABLE

The present invention relates to an aerosol generating system. In particular, the present invention relates to an aerosol generating system in which the aerosol-forming substrate is liquid and is contained in a liquid storage portion.

WO 2007/078273 discloses an electric smoking utensil. A liquid is stored in a container which communicates with a heater vaporiser, powered by a battery supply, via a series of small apertures. The heater is in the form of a spirally wound electric heater mounted on an electrically insulating support. In use, the heater is activated by the mouth of a user to switch on the battery power supply. Suction on a mouthpiece by the user causes air to be drawn through holes in the container, over the heater vaporiser, into the mouthpiece and subsequently into the mouth of a user.

The aerosol generating systems of the prior art, including the smoking system referred to above, do have a number of advantages, but there is still opportunity for improvement in the design, particularly concerning the handling of the liquid storage portion.

According to a first aspect of the invention, there is provided an aerosol generating system comprising: a storage portion for storing an aerosol-forming substrate; an aerosol generating element for generating an aerosol from the aerosol-forming substrate; a control circuitry in communication with the storage portion or the aerosol generating element; and disabling means for rendering the storage portion inoperable in the aerosol generating system in response to a disable signal from the control circuitry, wherein the control circuitry is configured to determine or estimate when an amount of aerosol-forming substrate in the storage portion is below a threshold amount, and to issue the disable signal when the amount of aerosol-forming substrate in the storage portion is determined or estimated to be below the threshold amount, and wherein the aerosol generating system is an electrically operated smoking system.

Also disclosed is an aerosol generating system comprising:

a storage portion containing an aerosol-forming substrate;

an aerosol generating element for generating an aerosol from the aerosol-forming substrate;

control circuitry in communication with the storage portion or the aerosol generating element; and

disabling means for rendering the storage portion inoperable in the aerosol generating system in response to a disable signal from the control circuitry.

Preferably, the disabling means is part of the storage portion. As mentioned in the above first aspect, ~~Preferably~~ the aerosol generating system is an electrically operated system. The aerosol generating element is preferably electrically operated. Preferably, the storage portion is separable from a main body of the aerosol generating system, and the control circuitry is arranged in the main body of the aerosol generating system.

As mentioned in the above first aspect, the~~The~~ control circuitry is preferably configured to determine or estimate when an amount of aerosol-forming substrate in the storage portion is below a threshold amount, and to issue the disable signal when the amount of aerosol-forming substrate in the storage portion is determined or estimated to be below the threshold amount. The control circuitry may determine the amount of substrate in the storage portion by direct measurement, indirect measurement or by calculation. For example, the system may include means to directly measure the mass of the storage portion, such as balance. The control circuitry may be configured to calculate the mass of substrate consumed by monitoring the use of the system. For example, the control circuitry may calculate substrate consumption based on a number of times the aerosol generating element has been activated. Alternatively, the control circuitry may use a change in the behaviour of the system indicative of the storage portion becoming empty to estimate the amount of substrate remaining in the storage portion.

The threshold amount of liquid aerosol-forming substrate in the liquid storage portion may be an absolute amount or a relative amount, e.g. a percentage value.

If the amount of liquid aerosol-forming substrate has decreased, for example if the liquid storage portion is empty or nearly empty, insufficient liquid aerosol-forming substrate may be supplied to the aerosol generating element. In the case of a heater being used as the aerosol generating element, this may result in the temperature of the heater increasing. Thus, the temperature of the heater, as sensed by the temperature sensor may allow the electric circuitry to determine that the amount of liquid aerosol-forming substrate in the liquid storage portion has decreased to a predetermined threshold.

The control circuitry is preferably configured to issue the disable signal when the control circuitry has detected a malfunction in the system. For example, if a heater is used to generate aerosol, a temperature sensor may be used to detect any overheating of the heater or substrate. The temperature sensor is coupled to the control circuitry and the control circuitry issues a disable signal if the temperature sensed by the temperature sensor exceeds a first temperature threshold. This is advantageous as it allows the system to prevent the generation of undesirable or harmful aerosol constituents.

The aerosol-forming substrate preferably has physical properties, for

contained in either the shell or the mouthpiece. In a preferred embodiment, the housing includes a removable consumable cartridge comprising the storage portion, the capillary wick and the heater. In that embodiment, those parts of the aerosol generating system may be removable from the housing as a single component.

The housing may comprise any suitable material or combination of materials. Examples of suitable materials include metals, alloys, plastics or composite materials containing one or more of those materials, or thermoplastics that are suitable for food or pharmaceutical applications, for example polypropylene, polyetheretherketone (PEEK) and polyethylene. Preferably, the material is light and non-brittle.

Preferably, the aerosol generating system is portable. The aerosol generating system may be a smoking system and may have a size comparable to a conventional cigar or cigarette. The smoking system may have a total length between approximately 30 mm and approximately 100 mm. The smoking system may have an external diameter between approximately 5 mm and approximately 13 mm.

Preferably, the electrically operated aerosol generating system is an electrically heated smoking system.

In a second aspect, the invention provides a cartridge for use in an aerosol generating system, the cartridge comprising

an aerosol forming substrate; and

disabling means for rendering the cartridge inoperable in the aerosol generating system, the disabling means configured to be activated by a signal from the aerosol generating system.

The aerosol forming substrate and disabling means may take any of the forms described in relation to the first aspect of the invention. The cartridge may include a storage portion for storing the aerosol-forming substrate and may include a capillary wick as described in relation to the first aspect of the invention. The cartridge may further include an aerosol generating element as described in relation to the first aspect of the invention. The cartridge may further include one or more of control circuitry, a power supply and a user interface as described in relation to the first aspect of the invention.

In a third aspect, the invention provides an aerosol generating device for use with a consumable cartridge containing an aerosol-forming substrate and a disabling means configured to render the cartridge inoperable in the aerosol generating device in response to a disable signal, the aerosol generating system comprising: control circuitry configured to issue a disable signal to the disabling means when the amount of aerosol-forming substrate in the storage portion is determined or estimated to be below a threshold amount or when a malfunction is detected, wherein the aerosol generating device is an electrically operated smoking device.

Also disclosed is an aerosol generating device for use with a consumable cartridge, the consumable cartridge containing an

aerosol-forming substrate and a disabling means configured to render the cartridge inoperable in the aerosol generating device in response to a disable signal, the aerosol generating system comprising:

control circuitry configured to issue a disable signal to the disabling means when the amount of aerosol-forming substrate in the storage portion is determined or estimated to be below a threshold amount or when a malfunction is detected.

The control circuitry may be configured as described in relation to the first aspect of the invention. The aerosol generating device may further include an aerosol generating element as described in relation to the first aspect of the invention. The cartridge may further include one or more of a power supply and a user interface as described in relation to the first aspect of the invention.

According to a fourth aspect of the invention, there is provided a method in an electrically operated smoking~~aerosol-generating~~ system comprising a storage portion for storing aerosol-forming substrate, an aerosol generating element for generating an aerosol from the aerosol-forming substrate, control circuitry in communication with the storage portion and disabling means associated with the storage portion for rendering the storage portion inoperable in the aerosol generating system in response to a disable signal from the control circuitry, the method comprising:

sending a disable signal from the control circuitry to the disabling means following a determination that an amount of the aerosol-substrate in the storage portion is below a threshold level or following a determination of a malfunction in the system .

~~According to a fifth aspect of the invention, t~~There is also provided electric circuitry for an aerosol generating system, the electric circuitry being arranged to perform the method of the second aspect of the invention.

~~According to a sixth aspect of the invention, t~~There is further provided a computer program which, when run on programmable electric circuitry for an aerosol generating system, causes the programmable electric circuitry to perform the method of the second aspect of the invention.

Features described in relation to the aerosol generating system of the invention may also be applicable to the method of the invention. And, features described in relation to the method of the invention may also be applicable to the aerosol generating system of the invention.