Heating Smokeable Material

Field

The invention relates to heating smokeable material.

Background

Smoking articles such as cigarettes and cigars burn tobacco during use to create tobacco smoke. Attempts have been made to provide alternatives to these smoking articles by creating products which release compounds without creating tobacco smoke. Examples of such products are so-called heat-not-burn products which release compounds by heating, but not burning, tobacco.

Summary

According to the invention, there is provided an apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises a region of insulation; characterised by the apparatus comprising an electrical heater and by the region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation.

The insulation may be located between a smokeable material heating chamber and an exterior of the apparatus to reduce heat loss from heated smokeable material.

The insulation may be located co-axially around the heating chamber.

The smokeable material heating chamber may comprise a substantially tubular heating chamber and the insulation may be located around a longitudinal surface of the tubular heating chamber.

The insulation may comprise a substantially tubular body of insulation located around the heating chamber.

The smokeable material heating chamber may be located between the insulation and a heater.

Wall sections either side of the core region may converge to a sealed gas outlet.

Said wall sections may converge in an end region of the insulation.

A thickness of the insulation may be less than approximately 1mm.

A thickness of the insulation may be less than approximately 0.1mm.

A thickness of the insulation may be between approximately 1mm and 0.001mm.

~~The apparatus may be configured to heat the smokeable material using an electrically-powered heater.~~

The apparatus may be configured to heat the smokeable material without combusting the smokeable material.

~~According to an aspect of the invention, there is provided an apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, comprising an infra-red heater.~~

~~The infra-red heater may comprise a halogen infra-red heater.~~According to an aspect, there is provided an apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, the apparatus comprising: a housing; a smokeable material heating chamber within the housing, the heating chamber being hollow tubular and constructed and arranged to removably receive smokeable material which is insertable by a user into the smokeable material heating chamber and removable from the smokeable material heating chamber by the user after use; at least one electrical heater within the housing, the at least one heater being constructed and arranged to heat smokeable material received in use in the smokeable material heating chamber so as to volatilize at least one component of the smokeable material without combusting the smokeable material; a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation; a

controller configured to control activation of the at least one heater; and the housing having at least one air inlet, the at least one air inlet being located upstream of the smokeable material heating chamber, whereby in use air can enter the at least one air inlet, enter into the smokeable material heating chamber at a first end, pass through the smokeable material heating chamber and exit the smokeable material heating chamber at a second end; wherein the heater is located between the smokeable material heating chamber and the insulation; and, wherein the insulation is located between the at least one heater and the housing.

According to another aspect, there is provided an apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises an electrical heater and a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation and comprising a smokeable material heating chamber, the smokeable material heating chamber comprising a substantially tubular heating chamber which is open at both ends, the smokeable material heating chamber being constructed and arranged to removably receive smokeable material which is insertable by a user into the smokeable material heating chamber and removable from the smokeable material heating chamber by the user after use.

According to yet another aspect, there is provided an apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises an electrical heater and a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation, a wall of the region of insulation which defines the core region having a coating for absorbing gas in the core region.

For exemplary purposes only, embodiments of the invention are described below with reference to the accompanying figures in which:

Brief description of the figures

Figure 1 is a perspective, partially cut-away illustration of an apparatus configured to heat smokeable material to release aromatic compounds and/or nicotine from the smokeable material;

figure 2 is a perspective, partially cut-away illustration of an apparatus configured to heat smokeable material, in which the smokeable material is provided around an elongate ceramic heater divided into radial heating sections;

Claims

1. An apparatus comprising an electrical heater configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation.

2. An apparatus according to claim 1, wherein the insulation is located between a smokeable material heating chamber and an exterior of the apparatus to reduce heat loss from heated smokeable material.

3. An apparatus according to claim 2, wherein the insulation is located co-axially around the heating chamber.

4. An apparatus according to claim 2 or 3, wherein the smokeable material heating chamber comprises a substantially tubular heating chamber and the insulation is located around a longitudinal surface of the tubular heating chamber.

5. An apparatus according to claim 4, wherein the insulation comprises a substantially tubular body of insulation located around the heating chamber.

6. An apparatus according to any of claims 2 to 5, wherein the smokeable material heating chamber is located between the insulation and a heater.

7. An apparatus according to claim 2 or 3, wherein a heater is located between the smokeable material heating chamber and the insulation.

8. An apparatus according to claim 7, wherein the insulation is located externally of the heater.

9. An apparatus according to claim 7 or 8, wherein the heater is located co-axially around the heating chamber and the insulation is located co-axially around the heater.

10. An apparatus according to any preceding claim, wherein the insulation comprises an infra-red radiation-reflective material to reduce the propagation of the infra-red radiation through the insulation.

11. An apparatus according to any preceding claim, wherein the core region comprises a deep vacuum.

12. An apparatus according to claim 15, wherein the vacuum is a hyper deep vacuum.

13. An apparatus according to any preceding claim, wherein the insulation comprises an exterior wall which encloses the core region.

14. An apparatus according to claim 13, wherein an internal surface of the wall comprises an infra-red radiation-reflective coating to reflect infra-red radiation within the core region.

15. An apparatus according to claim 13 or 14, wherein the wall comprises a layer of stainless steel having a thickness of at least approximately 100 microns.

16. An apparatus according to any one of claims 13 to 15, wherein wall sections either side of the core region are connected by a joining wall section which follows an indirect path between the wall sections either side of the core region.

17. An apparatus according to claim 13 or 14, wherein wall sections either side of the core region converge to a sealed gas outlet.

18. An apparatus according to claim 17, wherein said wall sections converge in an end region of the insulation.

19. An apparatus according to claim 17 or 18, wherein a thickness of the insulation is less than approximately 1mm.

20. An apparatus according claim 17 or 18, wherein a thickness of the insulation is less than approximately 0.1mm.

21. An apparatus according to claim 17 or 18, wherein a thickness of the insulation is between approximately 1mm and 0.001mm.

22. An apparatus according to any preceding claim, wherein a pressure in the core region is between approximately 0.1 and approximately 0.001 mbar.

23. An apparatus according to any of claims 1 to 21, wherein a pressure in the core region is of the order 10^{-7} Torr.

24. An apparatus according to any preceding claim, wherein a heat transfer coefficient of the insulation is between approximately 1.10 $W/(m^2K)$ and approximately 1.40 $W/(m^2K)$ when a temperature of the insulation is in a range of from 100 degrees Celsius to 250 degrees Celsius.

25. An apparatus according to any preceding claim, wherein the core region comprises a porous material.

26. An apparatus according to any preceding claim, wherein the apparatus is configured to heat the smokeable material without combusting the smokeable material.

Claims

1. An apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises a region of insulation; characterised by the apparatus comprising an electrical heater and by the region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation.

2. An apparatus according to claim 1, wherein the insulation is located between a smokeable material heating chamber and an exterior of the apparatus to reduce heat loss from heated smokeable material.

3. An apparatus according to claim 2, wherein the insulation is located co-axially around the heating chamber.

4. An apparatus according to claim 2 or 3, wherein the smokeable material heating chamber comprises a substantially tubular heating chamber and the insulation is located around a longitudinal surface of the tubular heating chamber.

5. An apparatus according to claim 4, wherein the insulation comprises a substantially tubular body of insulation located around the heating chamber.

6. An apparatus according to any of claims 2 to 5, wherein the smokeable material heating chamber is located between the insulation and the heater.

7. An apparatus according to claim 2 or 3, wherein the heater is located between the smokeable material heating chamber and the insulation.

8. An apparatus according to claim 7, wherein the heater is located co-axially around the heating chamber and the insulation is located co-axially around the heater.

9. An apparatus according to any preceding claim, wherein the core region comprises a deep vacuum.

10. An apparatus according to claim 9, wherein the vacuum is a hyper deep vacuum.

11. An apparatus according to any preceding claim, wherein the insulation comprises an exterior wall which encloses the core region.

12. An apparatus according to claim 11, wherein the wall comprises a layer of stainless steel having a thickness of at least approximately 100 microns.

13. An apparatus according to claim 11, wherein wall sections either side of the core region converge to a sealed gas outlet.

14. An apparatus according to claim 13, wherein a thickness of the insulation is less than approximately 1mm.

15. An apparatus according to any preceding claim, wherein a heat transfer coefficient of the insulation is between approximately 1.10 $W/(m^2K)$ and approximately 1.40 $W/(m^2K)$ when a temperature of the insulation is in a range of from 100 degrees Celsius to 250 degrees Celsius.

16. An apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, the apparatus comprising:

a housing;

a smokeable material heating chamber within the housing, the heating chamber being hollow tubular and constructed and arranged to removably receive smokeable material which is insertable by a user into the smokeable material heating chamber and removable from the smokeable material heating chamber by the user after use;

at least one electrical heater within the housing, the at least one heater being constructed and arranged to heat smokeable material received in use in the smokeable material heating chamber so as to volatilize at least one component of the smokeable material without combusting the smokeable material;

a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation;

a controller configured to control activation of the at least one heater; and

the housing having at least one air inlet, the at least one air inlet being located upstream of the smokeable material heating chamber, whereby in use air can enter the at least one air inlet, enter into the smokeable material heating chamber at a first end, pass through the smokeable material heating chamber and exit the smokeable material heating chamber at a second end;

wherein the heater is located between the smokeable material heating chamber and the insulation; and,

wherein the insulation is located between the at least one heater and the housing.

17. An apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises an electrical heater and a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation and comprising a smokeable material heating chamber, the smokeable material heating chamber comprising a substantially tubular heating chamber which is open at both ends, the smokeable material heating chamber being constructed and arranged to removably receive smokeable material which is insertable by a user into the smokeable material heating chamber and removable from the smokeable material heating chamber by the user after use.

18. An apparatus according to claim 17, comprising a housing which has at least one air inlet, the at least one air inlet being located upstream of the smokeable material heating chamber, whereby in use air can enter the at least one

air inlet, enter into the smokeable material heating chamber at a first end, pass through the smokeable material heating chamber and exit the smokeable material heating chamber at a second end.

19. An apparatus configured to heat smokeable material to volatilize at least one component of the smokeable material, wherein the apparatus comprises an electrical heater and a region of insulation having a core region which is evacuated to a lower pressure than an exterior of the insulation, a wall of the region of insulation which defines the core region having a coating for absorbing gas in the core region.

20. An apparatus according to claim 19, wherein the coating for absorbing gas in the core region comprises titanium oxide.