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(54) **AEROSOL GENERATION SYSTEM FOR HEATING CIGARETTE AND MULTI-CHANNEL COOLING FIRMWARE THEREOF**

(57) An aerosol generation system for a heating cigarette and multi-channel cooling firmware thereof. A multi-channel cooling section (30) of the aerosol generating system for the heating cigarette is provided with at least two communication channels (301), and the ratio of the spatial volume occupied by the communication channels (301) of the multi-channel cooling section (30) to the volume of the whole multi-channel cooling section (30) is

between 50% to 70%, thereby reducing the overall weight, and facilitating a compounding process for a filter rod, and in addition, the performances of the smoke temperature, the smoke amount, the suction resistance, etc. of the aerosol generation system for the heating cigarette during sensory evaluation vaping are significantly improved.

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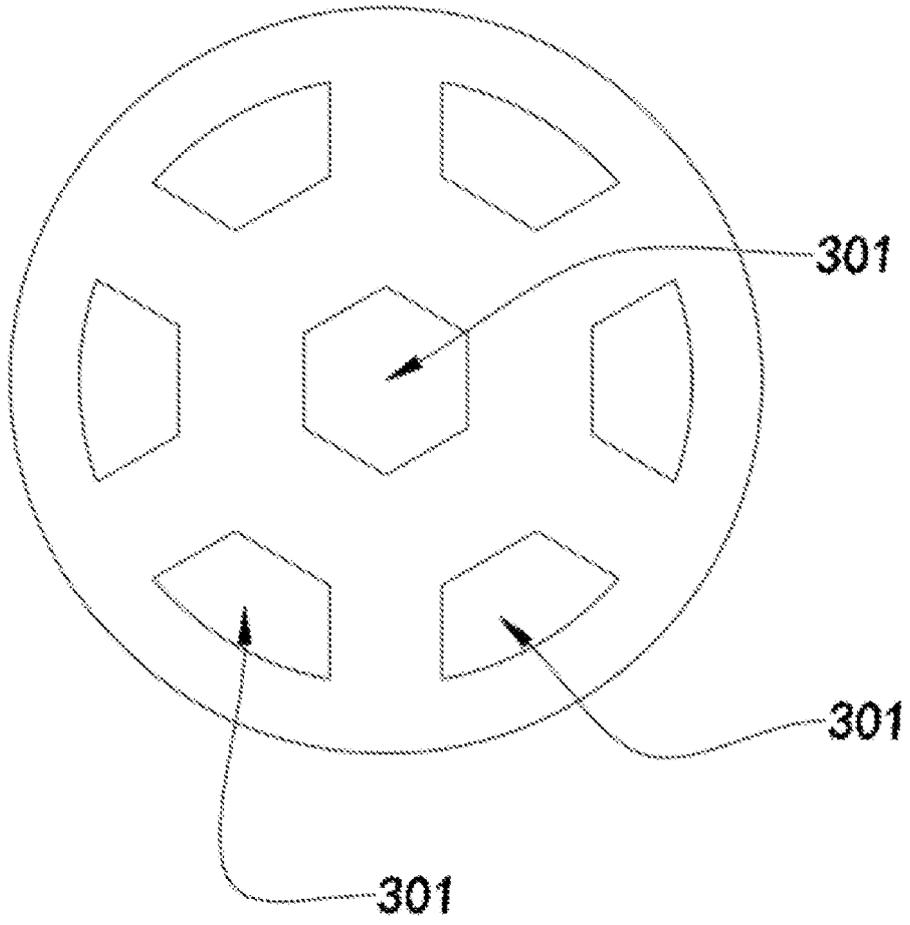


FIG. 6

## Description

### Cross-reference to Related Applications

[0001] The present disclosure claims the priority to the Chinese patent application with the filing No. 202120122461.1 filed with the Chinese Patent Office on January 18, 2021, entitled "Aerosol Generation System for Heating Cigarette and Multi-Channel Cooling Firmware Thereof", the contents of which are incorporated herein by reference in entirety.

### Technical Field

[0002] The present disclosure relates to an aerosol generation system for heat cigarette, and in particular to an aerosol generation system for heat cigarette (i.e., an aerosol generation system for heating cigarette) and its multi-channel cooling fixture (i.e., a multi-channel cooling firmware thereof).

### Background Art

[0003] As for the heat-not-burn cigarette, since the smoke is generated by heating the flavoring agents loaded on the tobacco sheet, the principle thereof bears some resemblance to that of the traditional cigarettes, thus leading to a favorable acceptance of the smoke sensation. Currently, the mainstream smoking set for providing the necessary heat energy for heating the heat-not-burn cigarette in the market is of the central heating design. In the central heating design, a heating sheet (or needle) of the heat cigarette is necessary to be inserted into the core end of the cigarette. To prevent potential backward movement of the smoking material upon insertion, a support segment is typically employed for supporting. When the smoke passes through the support segment, it becomes concentrated, thereby leading to a temporary increase in smoke temperature, which distinguishes the smoke from that of traditional cigarettes, and greatly affects the final smoking experience by perception.

[0004] Additionally, in heat cigarette, the draw resistance and weight of the cigarette are also important indicators that affect its quality. During the production process of filter sticks, a filter-stick forming machine is typically used. The weight of the filter stick directly affects the effect of the composite process on the machine. Heavier filter sticks are not conducive to the composite effect in the forming machine. Meanwhile, the fluctuation in the draw resistance of the filter stick segment significantly impacts the draw resistance of the entire cigarette, thereby affecting the sensory quality.

### Summary

[0005] The advantages of the present disclosure include, at least, providing an aerosol generation system for the heat cigarette and its multi-channel cooling fixture.

The multi-channel cooling fixture is provided with multiple channels with thin wall, which reduces the overall weight and facilitates the filter-stick composite process.

[0006] Furthermore, the advantages of the present disclosure at least include providing an aerosol generation system for the heat cigarette and its multi-channel cooling fixture. By the design of multiple small channels, the incoming smoke can be dispersed into various channels, thereby creating multiple stable airflows. This design ensures the stability of draw resistance in heat-not-burn cigarette.

[0007] Moreover, the advantages of the present disclosure include, at least, providing an aerosol generation system for the heat cigarette and its multi-channel cooling fixture. The multi-channel cooling fixture can reduce the temperature of the smoke and improve the stability of airflow, thereby enhancing the inhalation experience of the user.

[0008] The present disclosure provides a multi-channel cooling section of an aerosol generation system for the heat cigarette, wherein at least one interconnected channel can be provided between two ends of the multi-channel cooling section of the aerosol generation system for the heat cigarette. A sectional shape of the interconnected channel of the multi-channel cooling section can be regular polygon, wherein a center axis of the interconnected channel of the regular polygon can coincide with a center axis of the multi-channel cooling section.

[0009] According to the embodiment of the present disclosure, a ratio of the volume of space occupied by the interconnected channel and the total volume of the multi-channel cooling section can be 50% to 70%.

[0010] According to the embodiment of the present disclosure, the multi-channel cooling section can also be provided with multiple interconnected channels opposite to each side of the regular polygon, wherein the multiple interconnected channels each have a section of sector-like shape, wherein the sector-like shape can be defined as follows: the shape is obtained by removing, from the sector, the triangle formed by connecting two points respectively on two different radii of the sector and the center of the circle to each other, wherein the two points are at equal distance from the center of the circle.

[0011] According to the embodiment of the present disclosure, the line formed by the points on the two radii of the sector-like shape can be defined as a straight-line boundary. The sector-like section of each interconnected channel has the boundary directly opposite to one side of the regular polygon section of the interconnected channel. In the preferred embodiment, the straight-line boundary of the sector-like shape is substantially parallel to one side of the regular polygon. A separating wall between the sector-like channel and the regular polygon channel is defined between the straight-line boundary of the sector-like shape and one side of the regular polygon.

[0012] According to the embodiment of the present disclosure, the distance between the boundary on the section of each interconnected channel and the side on the

section of the interconnected channel can range from 0.5mm to 1.0mm, i.e., the wall thickness of the separating wall is between 0.5mm to 1.0mm.

**[0013]** According to the embodiment of the present disclosure, the line formed by the points on the two radii of the section of the sector-like interconnected channel can be defined as a straight-line boundary. The arc opposite to the straight-line boundary is defined as an arc boundary. The section of each sector-like interconnected channel has the arc boundary located on a circumference with the same center as the section of the interconnected channel.

**[0014]** According to the embodiment of the present disclosure, the distance between the arc boundary in the section of each sector-like interconnected channel and the edge of the multi-channel cooling section can range from 1.2mm to 2.0mm. That is, the edge wall of the multi-channel cooling section is defined between the arc boundary in the section of the sector-like interconnected channel and the edge of the multi-channel cooling section, and the thickness of the edge wall is between 1.2mm and 2.0mm.

**[0015]** According to the embodiment of the present disclosure, the sectional shape of the interconnected channel of the regular polygon can be a regular triangle.

**[0016]** According to the embodiment of the present disclosure, the sectional shape of the interconnected channel of the regular polygon can be a regular quadrilateral.

**[0017]** According to the embodiment of the present disclosure, the sectional shape of the interconnected channel of the regular polygon can be a regular hexagon.

**[0018]** According to the embodiment of the present disclosure, the multi-channel cooling section can be formed by performing extrusion molding on the plant component using plant powder as the raw material.

**[0019]** According to the embodiment of the present disclosure, the outer wall of the multi-channel cooling section can be provided with cooling grooves extending along the extension direction of the multi-channel cooling section.

**[0020]** According to another aspect of the present disclosure, the present disclosure provides an aerosol generation system for the heat cigarette, comprising:

a smoking segment;

a cooling segment; and

the multi-channel cooling section as described in the embodiments of the present disclosure. The interconnected channel can be provided with at least one communicating port at both ends of the multi-channel cooling section. The communicating port connected to the cooling segment on the multi-channel cooling section can be configured to face the cooling segment.

**[0021]** According to the embodiment of the present dis-

closure, the aerosol generation system for the heat cigarette further comprises a filtering segment, wherein the filtering segment can be provided with at least one smoke channel, and the smoke channel can be provided with at least one outlet at each end of the filtering segment. Meanwhile, the communicating port connected to the filtering segment on the multi-channel cooling section is in communication with the smoke channel.

**[0022]** According to the embodiment of the present disclosure, one end of the smoking segment and one end of the multi-channel cooling section can be respectively arranged at the two ends of the filtering segment, and the cooling segment can be arranged at the other end of the multi-channel cooling section.

**[0023]** According to the embodiment of the present disclosure, the cooling segment can be made of acetate fibers or polylactic acid.

**[0024]** According to the embodiment of the present disclosure, the filtering segment can be wrapped by a film.

**[0025]** According to the embodiment of the present disclosure, the cooling segment can be in a three-dimensional mesh-like structure, and its longitudinal porosity can range from 50% to 90%.

**[0026]** According to the embodiment of the present disclosure, the filtering segment can be in a three-dimensional mesh-like structure or a polymeric rod-like structure with through holes formed by foaming using foaming techniques.

**[0027]** According to the embodiment of the present disclosure, both the cooling segment and the filtering segment can be of acetate fiber bundles.

**[0028]** The present disclosure further provides a multi-channel cooling section of the aerosol generation system for the heat cigarette. The multi-channel cooling section of the aerosol generation system for the heat cigarette is provided with at least one interconnected channel. A ratio of the volume of space occupied by the interconnected channel of the multi-channel cooling section and the total volume of the multi-channel cooling section is 50% to 70%.

**[0029]** According to the embodiment of the present disclosure, the interconnected channels on the multi-channel cooling section are symmetrically arranged.

#### 45 **Brief Description of Drawings**

**[0030]**

FIG. 1 shows a sectional view of the aerosol generation system for the heat cigarette according to the present disclosure;

FIG. 2 shows a schematic view of the aerosol generation system for the heat cigarette being heated by a heating tool according to the present disclosure;

FIG. 3 shows a perspective view of an optional embodiment of the multi-channel cooling section of the

aerosol generation system for the heat cigarette according to the present disclosure;

FIG. 4 shows a perspective view of an optional embodiment of the multi-channel cooling section of the aerosol generation system for the heat cigarette according to the present disclosure;

FIG. 5 shows a top view of the multi-channel cooling section of the aerosol generation system for the heat cigarette according to the present disclosure; and

FIG. 6 shows a top view of an optional embodiment of the multi-channel cooling section of the aerosol generation system for the heat cigarette according to the present disclosure.

### Detailed Description of Embodiments

**[0031]** The following description is provided to disclose the present disclosure and enable those skilled in the art to implement the present disclosure. The preferred embodiments described below are merely illustrative, and those skilled in the art can envision other obvious modifications. The fundamental principles of the present disclosure defined in the following description can be applied to other embodiments, variations, improvements, equivalent arrangements, and other technical solutions without departing from the scope and spirit of the present disclosure.

**[0032]** It should be understood by those skilled in the art that, in the present disclosure, terms such as "longitudinal", "transversal", "up", "down", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside" etc., indicating orientations or position relationships, are based on the orientations or position relationships shown in the drawings. They are merely used for convenience the describing of the present disclosure and simplification of the description and do not indicate or imply that the device or element mentioned must be in a specific orientation or be constructed and operated in a specific orientation. Therefore, the aforementioned terms should not be construed as limiting the present disclosure.

**[0033]** It can be understood that the term "a/an" should be understood as "at least one" or "one or more", which means that in one embodiment, the quantity of an element can be one, while in another embodiment, the quantity of the same element can be multiple. The term "a/an" should not be construed as limiting the quantity.

**[0034]** With reference to FIG. 1 to FIG. 6, an aerosol generation system for the heat cigarette according to the embodiment of the present disclosure will be described in detail below. Specifically, the aerosol generation system for the heat cigarette comprises a smoking segment 10, a filtering segment 20, a multi-channel cooling section 30, and a cooling segment 40. The filtering segment 20 and the multi-channel cooling section 30 together form

a filter stick.

**[0035]** One end of the smoking segment 10 and one end of the multi-channel cooling section 30 is arranged at the two ends of the filtering segment 20, respectively.

5 The cooling segment 40 is arranged at the other end of the multi-channel cooling section 30. In this way, the smoking segment 10, the filtering segment 20, the multi-channel cooling section 30, and the cooling segment 40 can form the aerosol generation system for the heat cigarette.

10 **[0036]** The filtering segment 20 is provided with at least one smoke channel 201, wherein the smoke channel 201 is provided with at least one outlet at each end of the filtering segment 20. After the smoking segment 10 is heated to produce aerosol, the aerosol flows through the smoke channel 201 from the outlet at one end of the filtering segment 20, which is connected to the smoking segment 10, and then passes through the vapor channel 201 to flow towards the outlet at the other end of the filtering segment 20, which is connected to the multi-channel cooling section 30.

20 **[0037]** In an optional embodiment, the multi-channel cooling section 30 is provided with at least one interconnected channel 301. Each interconnected channel 301 is provided with at least one communicating port at each end of the multi-channel cooling section 30. The communicating port on the multi-channel cooling section 30, which is connected to the filtering segment 20, is in communication with the smoke channel 201. The communicating port on the multi-channel cooling section 30, which is connected to the cooling segment 40, is configured to face the cooling segment 40.

25 **[0038]** The cooling segment 40 can be made of acetate fibers or polylactic acid. Based on the above description, it can be understood that when the user draws through the cooling segment 40 and the smoking segment 10 is heated, the smoke generated from the smoking segment 10 can sequentially pass through the smoke channel 201 and the interconnected channel 301 before being drawn by the user.

30 **[0039]** Preferably, a ratio of the volume of space occupied by the interconnected channel 301 on the multi-channel cooling section 30 and the total volume of the multi-channel cooling section 30 is 50% to 70%. If it exceeds this range, it indicates that there are too many interconnected channels 301 on the multi-channel cooling section 30, such that when producing the multi-channel cooling section 30, it is difficult to shape the multi-channel cooling section 30 or the shape after forming is uneven. If it is below this range, it will lead to a decrease in the overall cooling effectiveness of the multi-channel cooling section 30.

35 **[0040]** Furthermore, a sectional shape of the interconnected channel 301 is a regular polygon, wherein a center axis of the interconnected channel 301 of the regular polygon coincides with a center axis of the multi-channel cooling section 30. With this design, the multi-channel cooling section 30 can be made by extruding some plant

slurry. Especially during extrusion, as the section of the interconnected channel 301 is of a regular polygon, the multi-channel cooling segment 30 can be evenly stressed during extrusion, which not only guarantees cooling performance of the multi-channel cooling section 30, but also reduces overall weight of the multi-channel cooling section 30.

**[0041]** Optionally, the multi-channel cooling section 30 is also provided with multiple interconnected channels 301 opposite to each side of the regular polygon, wherein the multiple interconnected channels 301 each have a section of sector-like shape. The sector-like shape described in the present disclosure is defined as the following shape: the shape is obtained by removing, from the sector, the triangle formed by connecting two points respectively on two different radii of the sector and the center of the circle to each other, wherein the two points are at equal distance from the center of the circle. The line formed by the points on the two radii of the sector-like shape is defined as a straight-line boundary, and the arc opposite to the straight-line boundary is an arc boundary.

**[0042]** Additionally, the boundary on the section of each interconnected channel 301 is opposite directly to one of the sides on the section of the interconnected channel 301. Preferably, the distance between the boundary on the section of each interconnected channel 301 and the side on the section of the interconnected channel 301 is between 0.5 mm and 1.0 mm.

**[0043]** It is understood that, as the boundary on the section of each interconnected channel 301 is opposite directly to one side on the section of the interconnected channel 301, during the extrusion process to form the multi-channel cooling section 30, each part of the multi-channel cooling section 30 can receive even and symmetrical force. Consequently, the multi-channel cooling section 30 becomes more compact, thereby enhancing the cooling effect of the multi-channel cooling section 30.

**[0044]** More preferably, the arc boundary on the section of each sector-like interconnected channel 301 is located on a circumference with the same center as the section of the interconnected channel 301. Moreover, the distance between the arc boundary on the section of each sector-like interconnected channel 301 and the edge of the multi-channel cooling section 30 is between 1.2 mm and 2.0 mm.

**[0045]** This can ensure the overall structural stability of the multi-channel cooling section 30. Additionally, it can effectively prevent the multi-channel cooling section 30 from being deformed because the wall between the channels is too thin when the multi-channel cooling section 30 is produced by extrusion molding.

**[0046]** The interconnected channel 301 of the regular polygon can be of a regular triangle, a regular quadrilateral, and so on.

**[0047]** Preferably, the interconnected channel 301 of the regular polygon can be of a regular hexagon. Correspondingly, six sector-like interconnected channels 301 are provided. With such a configuration, the overall struc-

ture of the multi-channel cooling section 30 exhibits excellent stability while also achieving better cooling performance.

**[0048]** In addition, the interconnected channels 301 on the multi-channel cooling section 30 are symmetrically arranged. Therefore, when the smoking segment 10 is heated to produce aerosol, the aerosol can uniformly spread through the smoke channel 201. As a result, when the user draws, the draw resistance caused by uneven distribution of aerosol will not occur.

**[0049]** It is understood that the multi-channel cooling section 30 can be formed by performing extrusion molding on the plant component using plant powder as the raw material. Preferably, the filtering segment 20 can be wrapped by a film. The smoking segment 10 comprises reconstituted tobacco made using a combination of the random orientation papermaking method and the thick pulp method and expanded stems, or reconstituted tobacco made using the dry method and expanded stems.

**[0050]** The cooling segment 40 is in a three-dimensional mesh-like structure, and its longitudinal porosity can range from 50% to 90%.

**[0051]** Preferably, the filtering segment 20 is in a three-dimensional mesh-like structure or a polymeric rod-like structure with through holes formed by foaming using foaming techniques. Preferably, both the cooling segment 40 and the filtering segment 20 are acetate fiber bundles.

**[0052]** Preferably, the outer wall of the multi-channel cooling section 30 is provided with multiple cooling grooves 302 that extend along the length direction of the multi-channel cooling section 30. With this design, the weight of the multi-channel cooling section 30 can be reduced, and the cooling effectiveness can be enhanced by dispersing the airflow. As an example, the multi-channel cooling section 30 can also be symmetrically arranged.

**[0053]** The person skilled in the art should understand that the above description and the embodiments of the present disclosure shown in the drawing are merely exemplary and do not limit the present disclosure. The advantages of the present disclosure have been fully and effectively achieved. The functionality and structural principles of the present disclosure have been demonstrated and described in the embodiments. The embodiments of the present disclosure can be modified or altered in any way without departing from the disclosed principles.

#### Industrial practicality

**[0054]** The present disclosure provides an aerosol generation system for the heat cigarette and its multi-channel cooling fixture. The multi-channel cooling fixture is designed with multiple channels having thin wall, which reduces the overall weight, and makes it convenient for filter-stick composite process. Meanwhile, it ensures the stability of draw resistance of the heat-not-burn cigarette, decreases the temperature of the smoke, and improves

the stability of the airflow, thereby enhancing the inhalation experience of the user.

[0055] Additionally, it is important to note that an aerosol generation system for the heat cigarette and its multi-channel cooling fixture described in the present disclosure are reproducible and applicable in various industrial applications.

### Claims

1. A multi-channel cooling section of an aerosol generation system for a heat cigarette, **characterized in that** at least one interconnected channel is provided between two ends of the multi-channel cooling section of the aerosol generation system for the heat cigarette, wherein a sectional shape of the interconnected channel of the multi-channel cooling section is a regular polygon, and a center axis of the interconnected channel of the regular polygon coincides with a center axis of the multi-channel cooling section.
2. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to claim 1, wherein a ratio of a volume of a space occupied by the interconnected channel and a total volume of the multi-channel cooling section is 50% to 70%.
3. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to claim 1 or 2, wherein the multi-channel cooling section is further provided with multiple interconnected channels opposite to each side of the regular polygon, wherein the multiple interconnected channels each have a section of a sector-like shape, wherein the sector-like shape is defined as follows: a shape is obtained by removing, from a sector, a triangle formed by connecting two points respectively on two different radii of the sector and a center of a circle to each other, wherein the two points are at equal distance from the center of the circle.
4. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to claim 3, wherein a line formed by the points on the two radii of the sector-like shape is defined as a straight-line boundary; and the section of the sector-like shape of each interconnected channel has the straight-line boundary directly opposite to one side of the section of the regular polygon of the interconnected channel.
5. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to claim 4, wherein a distance between the straight-line boundary on the section of the sector-like shape of each interconnected channel and the one side on the section of the regular polygon of the interconnected channel ranges from 0.5mm to 1.0mm.
6. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to claim 4, wherein the line formed by the points on the two radii of the section of the sector-like shape of each interconnected channel is defined as the straight-line boundary; and an arc opposite to the straight-line boundary is an arc boundary, wherein the section of the sector-like shape of each interconnected channel has the arc boundary located on a circumference with the same center as the section of the interconnected channel.
7. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to claim 5, wherein a distance between the arc boundary in the section of the sector-like shape of each interconnected channel and an edge of the multi-channel cooling section ranges from 1.2mm to 2.0mm.
8. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to any one of claims 1-7, wherein a sectional shape of the interconnected channel of the regular polygon is a regular triangle.
9. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to any one of claims 1-7, wherein a sectional shape of the interconnected channel of the regular polygon is a regular quadrilateral.
10. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to any one of claims 1-7, wherein a sectional shape of the interconnected channel of the regular polygon is a regular hexagon.
11. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to any one of claims 1-10, wherein the multi-channel cooling section is formed by performing extrusion molding on a plant component using plant powder as a raw material.
12. The multi-channel cooling section of the aerosol generation system for the heat cigarette according to any one of claims 1-11, wherein an outer wall of the multi-channel cooling section is provided with cooling grooves extending along an extension direction of the multi-channel cooling section.
13. An aerosol generation system for a heat cigarette, **characterized by** comprising:

- a smoking segment;  
 a cooling segment; and  
 the multi-channel cooling section according to any one of claims 1-12, wherein the interconnected channel is provided with at least one communicating port at each end of the multi-channel cooling section, wherein a communicating port connected to the cooling segment on the multi-channel cooling section is configured to face the cooling segment. 5
- 14.** The aerosol generation system for the heat cigarette according to claim 13, further comprising a filtering segment, wherein the filtering segment is provided with at least one smoke channel, wherein the smoke channel is provided with at least one outlet at each end of the filtering segment; and a communicating port connected to the filtering segment on the multi-channel cooling section is in communication with the smoke channel. 10 15 20
- 15.** The aerosol generation system for the heat cigarette according to claim 14, wherein one end of the smoking segment and one end of the multi-channel cooling section is respectively arranged at two ends of the filtering segment; and the cooling segment is arranged at the other end of the multi-channel cooling section. 25
- 16.** The aerosol generation system for the heat cigarette according to any one of claims 13-15, wherein the cooling segment is made of acetate fibers or polylactic acid. 30
- 17.** The aerosol generation system for the heat cigarette according to any one of claims 14-16, wherein the filtering segment is wrapped by a film. 35
- 18.** The aerosol generation system for the heat cigarette according to any one of claims 13-15, wherein the cooling segment is of a three-dimensional mesh-like structure, and has a longitudinal porosity ranging from 50% to 90%. 40
- 19.** The aerosol generation system for the heat cigarette according to any one of claims 14-16, wherein the filtering segment is in a three-dimensional mesh-like structure or a polymeric rod-like structure with through holes formed by foaming using foaming techniques. 45 50
- 20.** The aerosol generation system for the heat cigarette according to claim 14 or 15, wherein both the cooling segment and the filtering segment are acetate fiber bundles. 55
- 21.** A multi-channel cooling section of an aerosol generation system for a heat cigarette, **characterized**
- in that** the multi-channel cooling section of the aerosol generation system for the heat cigarette is provided with at least one interconnected channel, wherein a ratio of a volume of a space occupied by the interconnected channel of the multi-channel cooling section and a total volume of the multi-channel cooling section is 50% to 70%.
- 22.** The multi-channel cooling section according to claim 21, wherein the at least one interconnected channel on the multi-channel cooling section is symmetrically arranged.

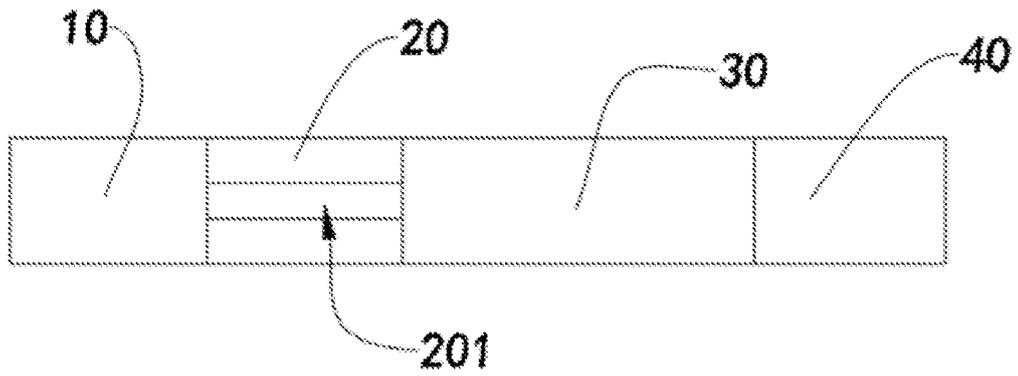


FIG. 1

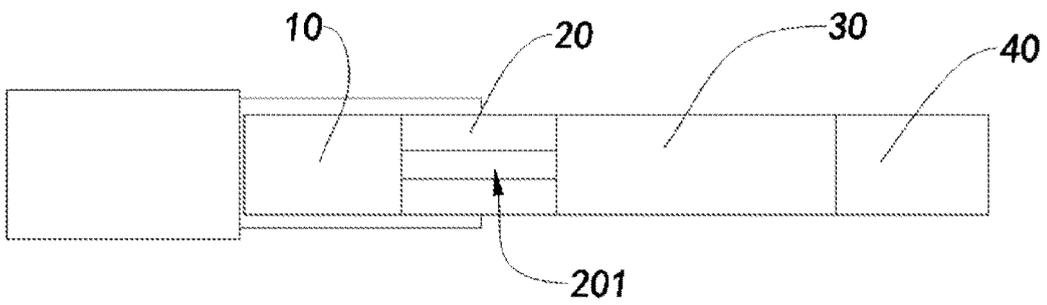


FIG. 2

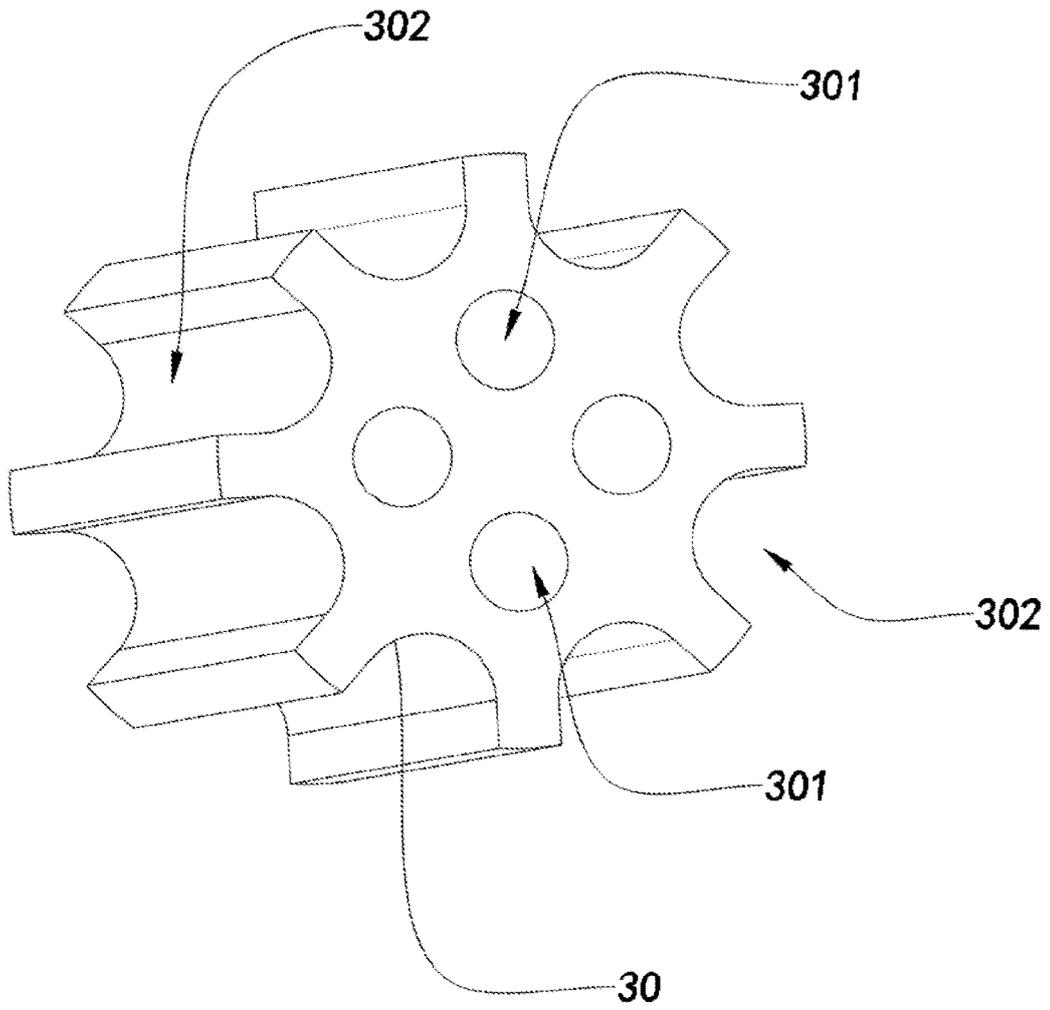


FIG. 3

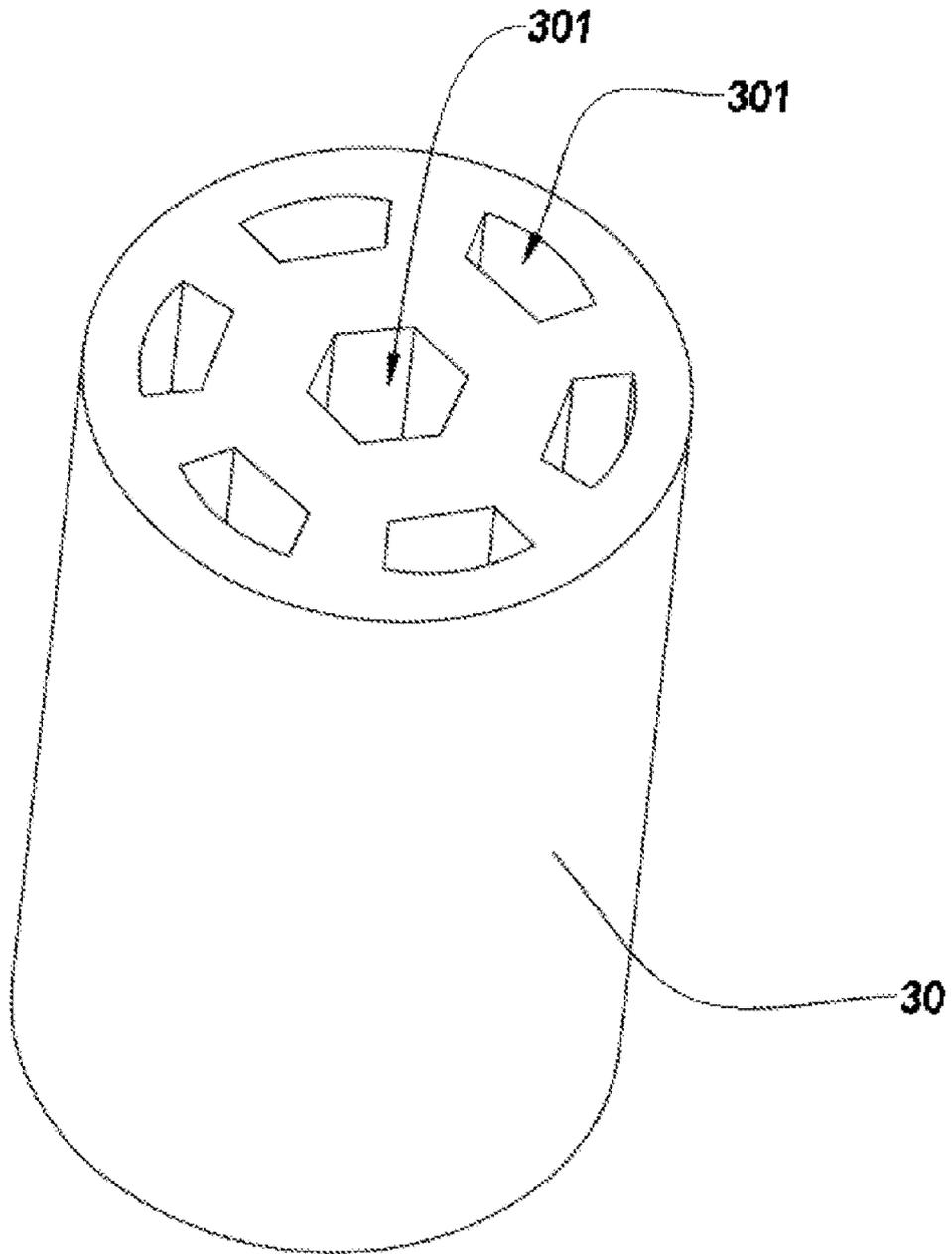


FIG. 4

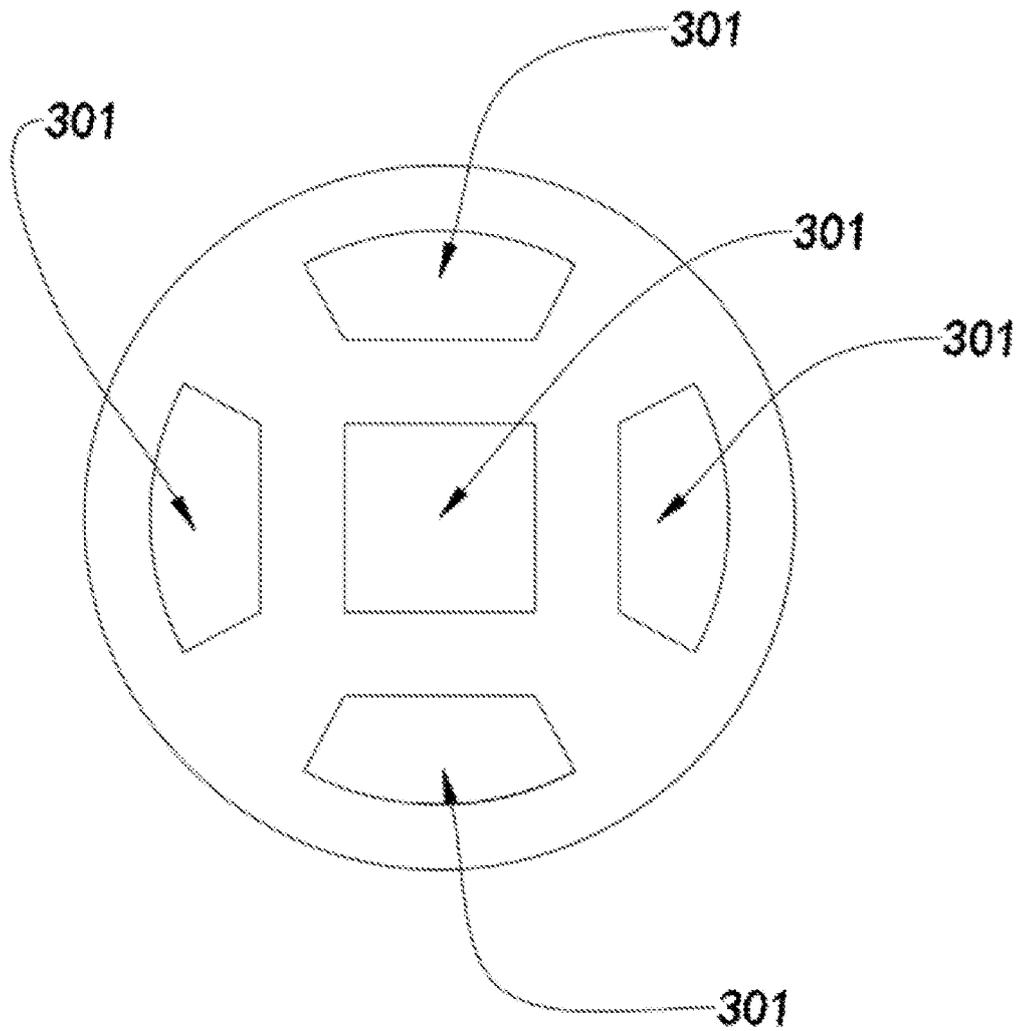


FIG. 5

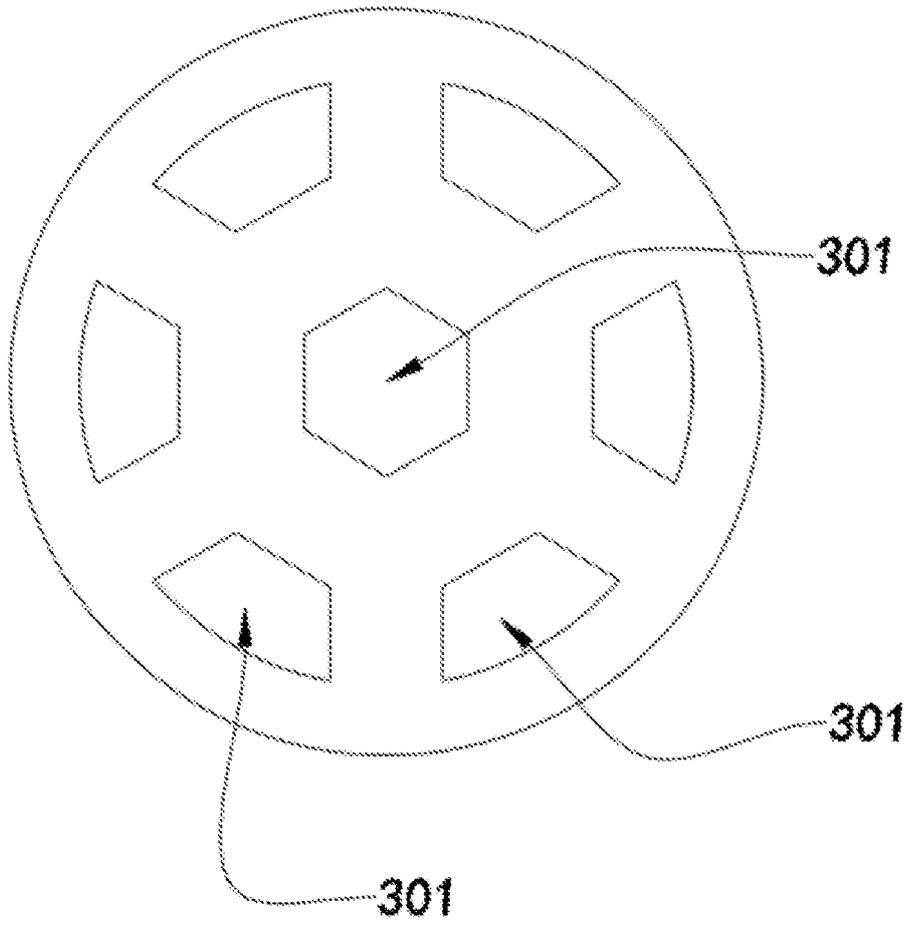


FIG. 6

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/098845

5	<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
	A24F 40/57(2020.01)i; A24F 40/40(2020.01)i; A24F 40/46(2020.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
	<b>B. FIELDS SEARCHED</b>		
10	Minimum documentation searched (classification system followed by classification symbols)		
	A24F; A24D		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	CNPAT, CNKI, WPI, EPODOC: 上海华宝生物科技有限公司, 广东省金叶科技开发有限公司, 降温, 冷却, 制冷, 散热, 正3d形, 正方形, 方形, 六边形, 三角形, 孔, 通道, 扇形, 圆弧, 弧形, cool+, heat+, square, hexagon, triangle, hole?, channel?, passage?, sector+, arc		
	<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	X	CN 211129720 U (BOJIE (SHANGHAI) MANAGEMENT CONSULTING CO., LTD. et al.) 31 July 2020 (2020-07-31) description paragraphs [0042]-[0059], [0071]-[0073], figures 1, 3A	1-22
25	X	CN 212260455 U (YUNNAN ENDIAN TECHNOLOGY INDUSTRIAL DEVELOPMENT CO., LTD.) 01 January 2021 (2021-01-01) description, paragraphs [0005]-[0011], and figures 1-5	1-2, 8-22
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35	A	CN 108113051 A (GONGQINGCHENG DAOLE INVESTMENT MANAGEMENT PARTNERSHIP (LIMITED PARTNERSHIP)) 05 June 2018 (2018-06-05) entire document	1-22
	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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50	Date of the actual completion of the international search	Date of mailing of the international search report	
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	Facsimile No. (86-10)62019451		Telephone No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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