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

(11) EP 3 958 695 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
14.06.2023 Bulletin 2023/24

(21) Application number: **20719450.7**

(22) Date of filing: **22.04.2020**

(51) International Patent Classification (IPC):
A24F 40/40 *(2020.01)* ***A24F 13/08*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
A24F 40/40; A24F 13/08; A24F 40/20; A24F 40/465

(86) International application number:
PCT/EP2020/061146

(87) International publication number:
WO 2020/216762 (29.10.2020 Gazette 2020/44)

(54) **AEROSOL-GENERATING DEVICE FOR USE WITH AN AEROSOL-GENERATING ARTICLE**

AEROSOLERZEUGENDE VORRICHTUNG ZUR VERWENDUNG MIT EINEM AEROSOLERZEUGENDEN ARTIKEL

DISPOSITIF DE GÉNÉRATION D’AÉROSOL DESTINÉ À ÊTRE UTILISÉ AVEC UN ARTICLE DE GÉNÉRATION D’AÉROSOL

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

(30) Priority: **23.04.2019 EP 19170471**

(43) Date of publication of application:
02.03.2022 Bulletin 2022/09

(73) Proprietor: **Philip Morris Products S.A.**
2000 Neuchâtel (CH)

(72) Inventor: **RUSCIO, Dani**
2000 Neuchâtel (CH)

(74) Representative: **Bohest AG**
Holbeinstrasse 36-38
4051 Basel (CH)

(56) References cited:
EP-A1- 0 503 767
WO-A1-2018/050735
WO-A2-2017/194763

Processed by Luminess, 75001 PARIS (FR)

Description

[0001] The present invention relates to an aerosol-generating device which is configured for use with an aerosol-generating article to generate an aerosol by heating an aerosol-forming substrate contained within the article. The invention further relates to an aerosol-generating system comprising such a device and such an article.

[0002] Aerosol-generating devices for generating an inhalable aerosol by heating an aerosol-forming substrate are generally known from prior art. Such devices may comprise a heater, in particular a resistive heater or an inductive heater, for heating the aerosol-forming substrate within the device. The substrate itself may be integral part of an aerosol-generating article that may be at least partially received in a receiving chamber of the device. The receiving chamber, in particular the chamber walls, may provide a tight fit for the aerosol-generating article to hold the article in the receiving chamber during use of the device, for example, as known from WO 2017/194763 A2. However, the tight fit may lead to undesired heat losses due to direct thermal conduction from the aerosol-generating article to the inner surface of the receiving chamber. In addition, when the article tightly fits in the receiving chamber, condensate formation within the receiving chamber may cause an undesired moistening of the article, in particular of the substrate contained therein. Such condensate formation may occur when vaporized compounds of the aerosol-forming substrate are cooled in contact with those portions of the chamber walls which are at temperatures below the dew point. Furthermore, a tight fit may restrict airflow through the receiving chamber which in turn may cause a high resistance to draw (RID). However, a tight fit is necessary to a certain extent since otherwise the article may be displaced or fall out of the device. This applies all the more as the aerosol-forming substrate tend to shrink during use which may cause the retention of the article by the surrounding chamber to be reduced.

[0003] Therefore, it would be desirable to have an aerosol-generating device and an aerosol-generating system with the advantages of prior art solutions but without their limitations. In particular, it would be desirable to have an aerosol-generating device and a corresponding system providing an improved retention of an aerosol-generating article in the receiving chamber of the device.

[0004] In general, the first axial portion and the second axial portion may be considered as surfaces comprising peaks and valleys, wherein the peaks correspond to the areas of the first and second protrusions which have the shortest distance to the center axis or are closest thereto, and wherein the valleys correspond to the areas between neighboring protrusions which have the largest distance to the center axis or are furthest away from the center axis. The first and second protrusions are part of the first axial portion and the second axial portion and, therefore, part of the inner surface of the receiving chamber.

[0005] According to the invention there is provided an aerosol-generating device for use with an aerosol-generating article. The device comprises a receiving chamber for removably receiving at least a portion of the aerosol-generating article. The receiving chamber has an inner surface and a center axis. Along the center axis, the inner surface comprises a first axial portion, a second axial portion and an intermediate axial portion. The intermediate axial portion is located between the first axial portion and the second axial portion. The first axial portion comprises a plurality of first protrusions. The second axial portion comprises a plurality of second protrusions. The plurality of first protrusions and the plurality of second protrusions are configured to contact at least a portion of the aerosol-generating article, preferably a first support element and a second support element of the aerosol-generating article, respectively, for retention of the article in the receiving chamber. That is, the plurality of first protrusions preferably is configured to contact a first support element of the aerosol-generating article, and the plurality of second protrusions preferably is configured to contact a second support element of the aerosol-generating article. The plurality of first protrusions and the plurality of second protrusions extend beyond the intermediate axial portion of the inner surface in a direction towards the center axis. Preferably, the intermediate axial portion is configured to surround a substrate element of the aerosol-generating article when the article is received in the receiving chamber. Preferably, the substrate element of the aerosol-generating article is located between the first support element and the second support element of the aerosol-generating article.

[0006] As used herein, the term "extending in a direction towards the center axis" means that the plurality of first protrusions and the plurality of second protrusions extend into the interior of the receiving chamber. Depending on the general shape of the receiving chamber, the direction towards the center axis may be in particular perpendicular to the center axis. Furthermore, "extending beyond the intermediate axial portion of the inner surface in a direction towards the center axis" in particular means that in a direction towards the center axis each protrusion of the plurality of first protrusions and the plurality of second protrusions extends beyond a corresponding area of the intermediate portion having the same azimuthal position with regard to the center axis of the receiving chamber. That is, at a given azimuthal position of a respective first or second protrusion, the intermediate portion is outwardly recessed relative that respective first or second protrusion as seen in an outward direction extending away from the center axis.

[0007] As used herein, the term "configured to contact at least a portion of the aerosol-generating article" is to be understood such that each protrusion of the plurality of first protrusions and of the plurality of second protrusions is in contact with the aerosol-generating article, when the aerosol-generating article is received in the chamber.

[0008] Due to the plurality of first protrusions and the plurality of second protrusions extending in a direction towards the center axis beyond the intermediate axial portion, the aerosol-generating article is not in physical contact with the intermediate axial portion when being received in the chamber. Accordingly, any direct thermal conduction from the aerosol-generating article to the intermediate portion is suppressed. Advantageously, this leads to a reduction of undesired heat losses and thus to an enhancement of the heating efficiency. Furthermore, as there is no direct physical contact between the intermediate axial portion and those portions of the article which directly face the intermediate axial portion when the article is received in the receiving chamber, moistening of the article due to condensation is avoided at least in these portions.

[0009] Furthermore, it is to be understood that the aerosol-generating article is only in contact with the respective first and second protrusions of the first and second axial portion. Accordingly, the contact surface between the article and the receiving chamber is reduced as compared to a receiving chamber having no protrusions. Therefore, conductive heat exchange between the aerosol-generating article and the surrounding receiving chamber as well as moistening of the article are further reduced. Preferably, the plurality of first protrusions and the plurality of second protrusions comprise a contact surface for contacting the aerosol-generating article. The shape of the contact surface is adapted to the shape of the respective portion of the aerosol-generating article which the respective contact surface gets into contact with upon insertion of the article into the receiving chamber. In particular, the contact surface may be curved.

[0010] Although not being in physical contact with the intermediate axial portion, the aerosol-generating article is still securely retained in the receiving chamber by the first and second protrusions of the first and the second axial portion, respectively. In particular, due to the local nature of the contact between the aerosol-generating article and the first and second protrusions, the retaining pressure between the article and the protrusions is locally enhanced such that the protrusion may form enlarged local depressions into the aerosol-generating article. Advantageously, the local depressions allow for compensating a possible shrinking of the article during use. Thus, the risk of the article to be displaced or to fall out of the aerosol-generating device advantageously is reduced.

[0011] The plurality of first protrusions and the plurality of second protrusions are distanced from each other such that an airflow passage is formed in between neighboring first protrusions and neighboring second protrusions, respectively.

[0012] Advantageously, the number, the shape and the distance of the plurality of first protrusions and the plurality of second protrusions, respectively, may be chosen such that upon inserting an aerosol-generating article in the receiving chamber of the device a resistance to draw (RTD) is in a desired range. The resistance to draw may be in a range of 70 mmWG to120 mmWG. Preferably, the resistance to draw (RTD) may be between 40 mmWG and 70 mmWG, in particular 45 mmWG and 65 mmWG, for example 55 mmWG.

[0013] The plurality of first protrusions and the plurality of second protrusions may comprise least two first and second protrusions, respectively. In particular, the plurality of first protrusions and the plurality of second protrusions portion may comprise two, three, four or more first protrusions and second protrusions, respectively. Preferably, the plurality of first protrusions comprises twelve first protrusions. Likewise, the plurality of second protrusions comprises twelve second protrusions. Such numbers provide a reasonable balance between a sufficiently large retention of the article and a sufficient reduction of the above described adverse effects.

[0014] The plurality of first protrusions or the plurality of second protrusions or both, the plurality of first protrusions and the plurality of second protrusions, may be arranged along the inner circumference of the receiving chamber in a regular pattern. The plurality of first protrusions and the plurality of second protrusions, respectively, may be uniformly distributed along the inner circumference of the receiving chamber. In particular, the plurality of first protrusions and the plurality of second protrusions, respectively, may be uniformly spaced apart from each other by respective valleys (interstices) arranged in between two neighboring protrusions. Advantageously, this causes the retention of the aerosol-generating article to be uniform and thus particularly secure.

[0015] The receiving chamber may have a substantially cylindrical shape. As used herein, the term "substantially cylindrical shape" refers to a shape of the receiving chamber when masking out the protrusions or without considering any protrusions, that is, to a shape of an envelope through the radially outermost parts of the inner surface of the receiving chamber. In case of a substantially cylindrical receiving chamber, the plurality of first protrusions and the plurality of second protrusions extend beyond the intermediate axial portion towards the center axis in a radial inward direction. In particular, any distances between the inner surface and the center axis are measured in a radial direction with regard to the center axis, that is, in a direction perpendicular to the center axis. Preferably, an envelope surface intersecting the peak of each protrusion of the plurality of first protrusions preferably also has a substantially cylindrical shape. Likewise, an envelope surface intersecting the peak of each protrusion of the plurality of second protrusions preferably also has a substantially cylindrical shape.

[0016] Alternatively, the receiving chamber may have a substantially tapered, in particular substantially conical or substantially frustoconical shape. As used herein, the term "substantially tapered, in particular substantially conical or substantially frustoconical shape" refers to a shape of the receiving chamber when masking out the protrusions or without considering any protrusions that is, to a shape of an envelope through the radially outermost parts of the inner surface of the receiving chamber. For any of these shapes, any distances between the inner surface and the center axis are preferably measured perpendicular to a surface of the substantially tapered, in particular substantially conical or substantially frustoconical shape. Preferably, an envelope surface intersecting the peak of each protrusion of the plurality of first protrusions also has a substantially tapered, in particular a substantially conical or a substantially frustoconical shape. Likewise, an envelope surface intersecting the peak of each protrusion of the plurality of second protrusions may also have a substantially tapered, in particular substantially conical or substantially frustoconical shape.

[0017] Preferably, the intermediate portion is free of any protrusions or is without any protrusions. That is, the intermediate portion preferably does not comprise any protrusions. In particular, the plurality of first protrusions and the plurality of second protrusions may be the only protrusions of any axial portion of the inner surface. Likewise, the intermediate portion preferably is free of any indentations or is without any indentations. That is, the intermediate portion preferably does not comprise any indentations. In particular, the intermediate portion of the inner surface may be even. As used herein, the term "even" refers to a smooth surface which may be flat or plane as well as curved. Accordingly, the intermediate axial portion may smooth, in particular may have no protrusion and no indentations.

[0018] Alternatively, the intermediate portion may comprise one or more third protrusions. For example, the intermediate portion may be corrugated. However, each of the one or more third protrusions of the intermediate portion is outwardly recessed with regard to an envelope surface intersecting the peak of each protrusion of the plurality of first protrusions and the plurality of second protrusions. That is, each one of the one or more third protrusions preferably does not extend inward towards the center axis beyond an envelope surface intersecting the peak of each protrusion of the plurality of first and second protrusions.

[0019] The receiving chamber may comprise an insertion opening through which an aerosol-generating article may be inserted into the receiving chamber. As used herein, the direction in which the aerosol-generating article is inserted is denoted as insertion direction. Preferably, the insertion direction corresponds to the extension of the center axis of the receiving chamber. Upon insertion into the receiving chamber, at least a portion of the aerosol-generating article may still extend outwards through the insertion opening. The outwardly extending portion preferably is provided for interaction with a user, in particular for being taken into a user’s mouth. Hence, during use of the device, the insertion opening may be close to the user’s mouth. As used herein, sections close to the insertion opening or close to a user’s mouth in use of the device, respectively, are denoted with the prefix "proximal". Sections which are arranged further away are denoted with the prefix "distal".

[0020] Accordingly, the receiving chamber may be arranged or located in a proximal portion of the aerosol-generating device. Likewise, the insertion opening may be arranged or located at a proximal end of the aerosol-generating device.

[0021] Preferably, the first axial portion is located at least partially in a distal end portion of the receiving chamber. Likewise, the second axial portion preferably is located at least partially in a proximal end portion of the receiving chamber.

[0022] The aerosol-generating device may be comprises a lid for covering an insertion opening of the receiving chamber. The lid may be releasably attached to a main body of the aerosol-generating device. In particular, the lid may be hinged, that is, the lid may be attached to a main body of the aerosol-generating device by hinges. Likewise, the receiving chamber of the aerosol-generating device may be hinged, that is openable by hinges. For example, the aerosol-generating device may comprise two housing portions, both forming at least a portion of the receiving chamber, which are coupled to each other by hinges. In any of these configurations, the receiving chamber may be accessible laterally with regard to the center axis. That is, the aerosol-generating article may be inserted into the receiving chamber laterally with regard to the center axis. In addition to the lateral accessibility, the receiving chamber may further comprise an opening through which at least a portion of the aerosol-generating article - upon being inserted into the receiving chamber - may extend outwards, in particular in a direction corresponding to the direction of the center axis of the receiving chamber.

[0023] In general, the length of the first axial portion, the second axial portion and the intermediate axial portion may depend on the design of the aerosol-forming article to be received and retained in the receiving chamber. As will be described in more detail below, the article may comprise different elements. In particular, in case the aerosol-generating article substantially has a rod shape, the article may comprise different elements sequentially arranged along a length axis of the article. Preferably, each portion of the inner surface of the receiving chamber, that is, the first axial portion, the second axial portion and the intermediate axial portion, is assigned to a specific element of the aerosol-forming article.

[0024] The first axial portion and the second axial portion may have equal lengths in the direction of the center axis. Advantageously, equal lengths of the first and second axial portions provide a uniform retention of the article in the receiving chamber. Alternatively, the first axial portion and the second axial portion may have different lengths in the direction of the center axis.

[0025] The intermediate axial portion may have a length of at least 20 percent of the length of the inner surface or of the receiving chamber in direction of the center axis. Preferably, the intermediate portion has a length of in a range of 20 percent to 40 percent, in particular 25 percent to 40 percent, in particular 30 percent to 35 percent of the length of the inner surface or of the receiving chamber. Advantageously, such lengths provide a sufficient reduction of the above described adverse effects.

[0026] The first axial, the second axial portion and the intermediate axial portion together may have a length of at least 50%, in particular 75%, preferably at least 80%, more preferably at least 90%, even more preferably at least 95%, most preferably sustainably 100% of the overall length of the inner surface or of the receiving chamber in the direction of the center axis. That is, the first axial, the second axial portion and the intermediate axial portion together may cover at least 50%, in particular 75%, preferably at least 80%, more preferably at least 90%, even more preferably at least 95%, most preferably sustainably 100% of the overall length of the inner surface or of the receiving chamber in the direction of the center axis.

[0027] One or more, in particular all of the plurality of first protrusions may extend in a direction substantially along the center axis of the receiving chamber. Likewise, one or more, in particular all of the plurality of second protrusions may extend in a direction substantially along the center axis of the receiving. A direction of extension substantially along the center axis may be parallel to the center axis, in particular in case of a substantially cylindrical receiving chamber. Accordingly, one or more, in particular all of the plurality of first protrusions may extend parallel to the center axis. Likewise, one or more, in particular all of the plurality of second protrusions may extend parallel to the center axis. Likewise, a direction of extension of the respective protrusions substantially along the center axis may be inclined with regard to the center axis (for example, by 2 degree to 5 degree), but still lying in a respective common plane with the center axis. The latter situation in particular applies to a substantially tapered, for example conical or frustoconical receiving chamber. Hence in general, one or more, in particular all of the plurality of first protrusions may extend along a respective plane containing the center axis. Likewise, one or more, in particular all of the plurality of second protrusions may extend along a respective plane containing the center axis.

[0028] Advantageously, a direction of extension of the respective protrusions substantially along the center axis facilitates insertion and extraction of the aerosol-generating article into and from the receiving chamber. This holds in particular in case the insertion direction corresponds to the direction of the center axis.

[0029] As seen in the direction of the center axis, the plurality of first protrusions and the plurality of second protrusions may be arranged such that a positon of each first protrusion coincides with a positon of a respective second protrusion. In particular, the plurality of first protrusions and the plurality of second protrusions may be arranged such that each first protrusion superposes a respective second protrusion as seen in the direction of the center axis.

[0030] The aerosol-generating device may comprise one or more end stops arranged within the receiving chamber, in particular at a distal end of the receiving chamber. The one or more end stops preferably are configured to limit an insertion depth of an aerosol-generating article into the receiving chamber. In particular, the one or more end stops may be configured to prevent an aerosol-generating article from abutting the inner surface of the receiving chamber at a distal end of the receiving chamber that is opposite to an insertion opening of the receiving chamber at a proximal end of the receiving chamber. Thus, the one or more end stops advantageously provide free space within a distal portion of the receiving chamber allowing free airflow between a distal end of the receiving chamber and a distal end of an aerosol-generating article when the article is received in the receiving chamber. The one or more end stops may comprise a contact surface which an aerosol-generating article, in particular a distal end of an aerosol-generating article may abut when the article is received in the receiving chamber.

[0031] Preferably, the aerosol-generating device may comprise a plurality of separate end stops, for example three end stops, which are arranged within the receiving chamber, in particular at a distal end of the receiving chamber.

[0032] The plurality of end stops may be symmetrically arranged around the center axis. In particular, the plurality of end stops may be arranged equally spaced around the center axis. As described above, this enables free airflow around the end stops and an article received in the receiving chamber.

[0033] The one or more ends stops preferably have a dimension in the direction of the center axis in a range of 0.5 millimeter to 5 millimeter, in particular in a range of 1 millimeter to 4 millimeter, preferably in a range of 1 millimeter to 2 millimeter, for example 1.4 millimeter.

[0034] The one or more ends stops preferably have a shape and dimension such as to extend in a direction towards the center axis beyond the plurality of first protrusions and the plurality of second protrusions. The one or more ends stops preferably have a radial extension perpendicular to the center axis in range of 0.7 millimeter to 6 millimeter, in particular in range of 1 millimeter to 5 millimeter, preferably in a range of 2 millimeter to 4 millimeter.

[0035] Preferably, the one or more end stops may have the shape of a ring-segment, in particular in case the receiving chamber has a substantially cylindrical shape. The ring segment may have a height dimension in the direction of the center axis and a radial dimension perpendicular to the center axis. As mentioned before, the height dimension of a ring segment may be in a range of 0.5 millimeter to 5 millimeter, in particular in a range of 1 millimeter to 4 millimeter, preferably in a range of 1 millimeter to 2 millimeter. The radial dimension of a ring segment may be in range of 0.7 millimeter to 6 millimeter, in particular in range of 1 millimeter to 5 millimeter, preferably in a range of 1 millimeter to 3 millimeter, for example 1.3 millimeter.

[0036] As an example, the receiving chamber may be formed as an elongate cavity comprising a bottom at a distal end of the receiving chamber. In this configuration, the one or more end stops may be arranged within the receiving chamber such as to protrude from the bottom at the distal end in a direction towards a proximal end of the receiving chamber, in particular in a direction opposite to an insertion direction of the article.

[0037] Upon inserting an aerosol-generating article in the receiving chamber, the aerosol-generating device may provide a specific resistance to draw. In general, the resistance to draw is determined - inter alia - by the specific shape and dimensions of the receiving chamber, by the number, the shape and the dimensions of the first and second protrusions and - if present - by the number, the shape and the dimensions of the one or more end stops. Accordingly, the resistance to draw may be in particular adjusted by a proper choice of at least one of the number, shape and dimension of the first protrusion or the number, shape and dimension of the second protrusions or - if present - the number, shape and dimension of the one or more end stops.

[0038] Preferably, an airflow passage defined in between the plurality of first protrusions, the plurality of second protrusions and - if present - the one or more end stops has a dimension such that in use of the device a resistance to draw (RTD) is between 70 mmWG and 120 mmWG. Preferably, a resistance to draw (RTD) may be between 40 mmWG and 70 mmWG, in particular 45 mmWG and 65 mmWG, for example 55 mmWG. As used herein, the resistance to draw relates to the aerosol-generating device in use, that is, to a system comprising the aerosol-generating device and the aerosol-generating article being received in the receiving chamber of the device.

[0039] If present, the one or more end stops may cause a reduction of the airflow passage defined in between the plurality of first protrusions and the plurality of second protrusions, in particular in case an end stop partially or even fully covers or blocks an airflow passage defined between neighboring protrusions. Accordingly, the one or more end stops may cause an increase of the resistance to draw as compared to a device without any end stops. Preferably, the increase of the resistance to draw is at most 50 percent, in particular at most 25 percent, in particular at most 15 percent as compared to a device without any end stops

[0040] Preferably, at least one of the number, the shape and the dimensions of the one or more end stops is chosen such that in use of the device a resistance to draw is at most 150 percent, in particular at most 140 percent, preferably at most 130 percent, even more preferably at most 120 percent of a resistance to draw in absence of the one or more end stops or without taking into account the one or more end stops.

[0041] Accordingly, at least one of the number, the shape and the dimensions of the one or more end stops may be chosen such that in use of the device an airflow passing in between the plurality of first protrusions, the plurality of second protrusions and the one or more end stops is at least 50 percent, in particular at least 60 percent, preferably at least 70 percent, even more preferably at least 80 percent of an airflow passing in between the plurality of first protrusions and the plurality of second protrusions in absence of the one or more end stops.

[0042] Likewise, the one or more end stops may cover at most 50 percent, in particular at most 40 percent, preferably at most 30 percent, even more preferably at most 20 percent of a total cross-sectional area of all interstices (free space) defined in between neighboring first protrusions or in between neighboring second protrusions as seen in a plane perpendicular to the center axis. For this, at least one of the number, the shape and the dimensions of the one or more end stops may be chosen such as to cover at most 50 percent, in particular at most 40 percent, preferably at most 30 percent, even more preferably at most 20 percent of a total cross-sectional area of all interstices (free space) defined in between neighboring first protrusions or in between neighboring second protrusions as seen in a plane perpendicular to the center axis.

[0043] In absence of any end stops or without taking into account a possible reduction of the cross-sectional area due to the presence of the one or more end stops, the (unreduced) total cross-sectional area of all interstices (free space) defined in between neighboring first protrusions or neighboring second protrusions as seen in a plane perpendicular to the center axis may be in a range of 2 square millimeter to 9 square millimeter, in particular in a range of 3 square millimeter to 8 square millimeter, preferably in a range of 3 square millimeter to 6 square millimeter.

[0044] In contrast, when taking into a reduction of the free total cross-sectional area of all interstices, the (reduced free) total cross-sectional area of all interstices defined in between neighboring first protrusions or in between neighboring second protrusions as seen in a plane perpendicular to the center axis may be in a range of 2 square millimeter to 7 square millimeter, in particular in a range of 3 square millimeter to 7 square millimeter, preferably in a range between 4 square millimeter to 6 square millimeter. A minimum free cross-sectional area as mentioned above ensures a minimum airflow and thus a minimum resistance to draw during use of device.

[0045] Preferably, the receiving chamber has a substantially circular cross-section as seen in a plane perpendicular to the center axis. In particular, the intermediate axial portion may have a circular cross-section as seen in a plane perpendicular to the center axis. Likewise, at least one of the first axial portion and the second axial portion may have a substantially circular cross-section as seen in a plane perpendicular to the center axis, without considering the first protrusions or the second protrusions, respectively.

[0046] Alternatively, the receiving chamber may also have a substantially elliptical cross-section or a substantially oval cross-section or a substantially square cross-section or a substantially rectangular cross-section or a substantially triangular cross-section or a substantially polygonal cross-section. As used herein, the above mentioned cross-sectional shapes preferably refer to a cross-sectional shape of the receiving chamber without considering any protrusions.

[0047] Likewise, an envelope curve around the center axis which intersects the peak of each protrusion of the plurality of first protrusions or the plurality of second protrusions, respectively, may have one of a substantially circular or a substantially elliptical shape or a substantially oval shape or a substantially square shape or a substantially rectangular shape or a substantially triangular shape or a substantially polygonal shape. Preferably, the shape of an envelope curve around the center axis which intersects the peak of each protrusion of the plurality of first protrusions or the plurality of second protrusions, respectively, corresponds to the cross-sectional shape of the aerosol-generating article to be received in the receiving chamber.

[0048] Areas of the first axial portion, in particular areas between neighboring first protrusions and areas of the intermediate portion may be arranged on a common shell surface, in particular on a common cylindrical shell surface. Likewise, areas of the second axial portion, in particular areas between neighboring second protrusions and areas of the intermediate portion may be arranged on a common shell surface, in particular on a common cylindrical shell surface. Likewise, areas of the first axial portion, in particular areas between neighboring first protrusions and areas of the second axial portion, in particular areas between neighboring second protrusions may be arranged on a common shell surface, in particular on a common cylindrical shell surface. Preferably, areas of the first axial portion, in particular areas between neighboring first protrusions, and areas of the second axial portion, in particular areas between neighboring second protrusions, and areas of the intermediate portion may be arranged on a common shell surface, in particular on a common cylindrical shell surface.

[0049] Alternatively, the areas of the intermediate portion may be arranged outwardly recessed with respect to areas between neighboring first protrusions or areas between neighboring second protrusions or with respect to both, areas between neighboring first protrusions and areas between neighboring second protrusions.

[0050] At least one, preferably all protrusion of the plurality of first protrusions may have a constant height extension along an extension of the respective protrusion perpendicular to the center axis. Likewise, at least one, preferably all protrusion of the plurality of second protrusions may have a constant height extension along an extension of the respective protrusion perpendicular to the center axis. The height extension is defined as the distance between an area of the respective protrusion having the shortest distance to the center axis and an area of the respective protrusion having the largest distance to the center axis. In particular, the height extension may be defined as the distance between a peak of the respective protrusion and an adjacent valley as seen in a direction towards the center axis, preferably perpendicular to the center axis. Advantageously, this provides a uniform retention of the article in the device.

[0051] A height of at least one of protrusion of the plurality of first protrusion and the plurality of second protrusion may be in a range of 0.2 millimeter to 1.5 millimeter, in particular 0.3 millimeter to 1 millimeter, preferably 0.4 millimeter to 0.8 millimeter, even more preferably 0.4 millimeter to 0.6 millimeter, for example 0.5 millimeter.

[0052] In particular with regard to a cylindrically shaped receiving chamber, a least one, preferably all protrusion of the plurality of first protrusions may have a constant radial distance to the center axis along an extension of the respective protrusion perpendicular to the center axis. Likewise, least one, preferably all protrusion of the plurality of second protrusions may have a constant radial distance to the center axis along an extension of the respective protrusion perpendicular to the center axis. The radial distance extension is defined as the distance between the center axis and an area of the respective protrusion having the shortest distance to the center axis.

[0053] The receiving chamber may be a multi-part component. In particular, the receiving chamber may comprise a first part and a second part, wherein the second part preferably is inserted into the first part. The second part may be formed as a sleeve. The second part may be attached to the first part in a form-fit or positive-fit manner. Alternatively or additionally, the second part may be attached to the first part via a friction-fit or via a snap-fit. Preferably, the second part comprises the first axial portion, whereas the first part comprises the intermediate axial portion and the second axial portion. Such a configuration facilitates manufacturing, in particular manufacturing by injection molding.

[0054] The receiving chamber may be formed as a receiving chamber module, in particular as a tubular sleeve, which may be inserted into a main body of the aerosol-generating device. Advantageously, this allows for a modular assembly of the aerosol-generating device.

[0055] Alternatively, at least a part of the receiving chamber may be integrally formed with the main body. By providing at least a part of the receiving chamber as a part of the main body, the quantity of used parts for the aerosol-generating device may be reduced.

[0056] At least one, in particular each of the plurality of first protrusions may comprise or may be formed as or may be a rib. Likewise, at least one, in particular each of the plurality of second protrusions may comprise or may be formed as or may be a rib. Preferably, the one or more ribs extend along a direction of the center axis. The ribs may be symmetrically arranged around the center axis. In particular, the ribs may be arranged equally spaced around the center axis. Any of these configurations is advantageous with regard to an improved airflow management of the device. As described above, the term "extending along a direction of the center axis includes both, an extension parallel to the center axis as well as an extension in the general direction of the center axis, which may be inclined with regard to the center axis (for example, by 2 degree to 5 degree), but still lying in a respective common plane with the center axis. The latter in particular applies to a substantially tapered, for example conical or frustoconical shape of the receiving chamber.

[0057] The one or more ribs may have a substantially triangular cross-sectional shape. Alternatively, one or more ribs may have a substantially rectangular or substantially trapezoid or a substantially semi-oval or a substantially semi-circular cross-sectional shape.

[0058] The one or more ribs may comprise a contact surface which preferably is adapted to the shape of the respective portion of the aerosol-generating article which the contact surface gets into contact with upon insertion of the article into the receiving chamber

[0059] At least one, in particular each of the plurality of first protrusions and/or at least one, in particular each of the plurality of second protrusions may be chamfered or may comprise at least one chamfer. Preferably, the respective protrusions may be chamfered at a side facing towards an insertion opening of the receiving chamber or may comprise at least one chamfer facing towards an insertion opening of the receiving chamber. Advantageously, this facilitates insertion of the article into the receiving chamber. Likewise, the respective protrusions may be chamfered at a side facing away form an insertion opening of the receiving chamber or may comprise at least one chamfer facing away from an insertion opening of the receiving chamber. Advantageously, this facilitates removal of the article from the receiving chamber.

[0060] The aerosol-generating device may further comprise a heater for heating an aerosol-forming substrate within an aerosol-generating article received in the receiving chamber of the device. The heater may be an inductive heater. The inductive heater may comprise an induction source including an inductor which is configured to generate an alternating, in particular high-frequency electromagnetic field within the receiving chamber. The alternating, in particular high-frequency electromagnetic field may be in the range between 500 kHz to 30 MHz, in particular between 5 MHz to 15 MHz, preferably between 5 MHz and 10 MHz. Upon inserting an article into the receiving chamber, the alternating electromagnetic field is used to inductively heat a susceptor which is in thermal contact with or thermal proximity to an aerosol-forming substrate to be heated. The inductor may be arranged such as to surround at least a portion of the receiving chamber or at least a portion of the inner surface of the receiving chamber, respectively. The inductor may be an inductor coil, for example a helical coil, arranged within a side wall of the receiving chamber. Preferably, the inductor may be arranged such as to surround at least the intermediate axial portion of the inner surface. More preferably, the inductor may be arranged such as to surround only the distal portion of the inner surface. Alternatively, the inductor may be arranged such as to additionally surround at partially the first axial portion or the second axial portion, or both, the first axial portion and the second axial portion.

[0061] Alternatively, the heater may be a resistive heater comprising a resistive heating element. The heating resistive element is configured to heat up when an electrical current is passed therethrough due to an immanent ohm resistance or resistive load of the resistive heating element. For example, the resistive heating element may comprise at least one of a resistive heating wire, a resistive heating track, a resistive heating grid or a resistive heating mesh. In use of the device, the resistive heating element is in thermal contact with or thermal proximity to an aerosol-forming substrate to be heated.

[0062] The device may further comprise a power supply and a controller for powering and controlling the heating process.

[0063] The present invention further relates to an aerosol-generating system comprising an aerosol-generating device according to the invention and as described herein. The system further comprises an aerosol-generating article including at least one aerosol-forming substrate to be heated by the device, wherein at least a portion of the article is removably receivable or removably received in the receiving chamber of the device.

[0064] The device and the article are configured such that upon insertion of the article in the receiving chamber the plurality of first protrusions and the plurality of second protrusions contact at least a portion of the aerosol-generating article for retention of the aerosol-generating article in the receiving chamber. In contrast, the intermediate portion of the inner surface of the receiving chamber is not in contact with the aerosol-generating article.

[0065] Preferably, the shape of an envelope curve around the center axis which intersects the peak of each protrusion of the plurality of first protrusions or the plurality of second protrusions, respectively, corresponds to the cross-sectional shape of the aerosol-generating article to be received in the receiving chamber.

[0066] As described above with regard to the aerosol-generating device, the plurality of first protrusions and the plurality of second protrusions are distanced from each other such that airflow passages are formed in between neighboring first and second protrusions, respectively. Advantageously, the shape and the distance of the plurality of first protrusions and the plurality of second protrusions, respectively, may be chosen such that upon inserting an aerosol-generating article in the receiving chamber of the device a resistance to draw (RTD) is in a desired range. The resistance to draw may be in a range of 70 mmWG to120 mmWG. Preferably, the resistance to draw (RTD) may be between 40 mmWG and 70 mmWG, in particular 45 mmWG and 65 mmWG, for example 55 mmWG.

[0067] As used herein, the term "aerosol-forming substrate" relates to a substrate capable of releasing volatile compounds that can form an aerosol when heated. The aerosol-forming substrate may be a solid or a liquid aerosol-forming substrate. The aerosol-forming substrate may comprise a tobacco-containing material containing volatile tobacco flavor compounds, which are released from the substrate upon heating. Alternatively or additionally, the aerosol-forming substrate may comprise a non-tobacco material. The aerosol- forming substrate may further comprise an aerosol former. Examples of suitable aerosol formers are glycerin and propylene glycol. The aerosol-forming substrate may also comprise other additives and ingredients, such as nicotine or flavoring substances. In particular, liquid aerosol-forming substrate may include water, solvents, ethanol, plant extracts and natural or artificial flavors. The aerosol-forming substrate may also be a paste-like material, a sachet of porous material comprising aerosol-forming substrate, or, for example, loose tobacco mixed with a gelling agent or sticky agent, which could include a common aerosol former such as glycerin, and then is compressed or molded into a plug.

[0068] The aerosol-generating article may be a consumable, in particular intended for single use. The aerosol-generating article may be a tobacco article. In particular, the article may be a rod-shaped article, preferably a cylindrical rod-shaped article, which may resemble conventional cigarettes.

[0069] The article may comprise one or more of the following elements: a first support element, a substrate element, a second support element, a cooling element, and a filter element. Preferably, the aerosol-generating article comprises at least a first support element, a second support element and a substrate element located between the first support element and the second support element.

[0070] All of the aforementioned elements may be sequentially arranged along a length axis of the article in the above described order, wherein the first support element preferably is arranged at a distal end of the article and the filter element preferably is arranged at a proximal end of the article. Each of the aforementioned elements may be substantially cylindrical. In particular, all elements may have the same outer cross-sectional shape. In addition, the elements may be circumscribed by an outer wrapper such as to keep the elements together and to maintain the desired cross-sectional shape of the rod-shaped article. Preferably, the wrapper is made of paper.

[0071] The substrate element preferably comprise the at least one aerosol-forming substrate to be heated. In case the aerosol-generating system is based on induction heating, the substrate element may further comprise a susceptor which is in thermal contact with or thermal proximity to the aerosol-forming substrate. As used herein, the term "susceptor" refers to an element comprising a material that is capable of being inductively heated within an alternating electromagnetic field. This may be the result of at least one of hysteresis losses or eddy currents induced in the susceptor, depending on the electrical and magnetic properties of the susceptor material.

[0072] At least one of the first support element and the second support element may comprise a central air passage. Preferably, at least one of the first support element and the second support element may comprise a hollow cellulose acetate tube. Alternatively, the first support element may be used to cover and protect the distal front end of the substrate element.

[0073] The aerosol-cooling element is an element having a large surface area and a low resistance to draw, for example 15 mmWG to 20 mmWG. In use, an aerosol formed by volatile compounds released from the substrate element is drawn through the aerosol-cooling element before being transported to the proximal end of the aerosol-generating article.

[0074] The filter element preferably serves as a mouthpiece, or as part of a mouthpiece together with the aerosol-cooling element. As used herein, the term "mouthpiece" refers to a portion of the article through which the aerosol exits the aerosol-generating article.

[0075] Preferably, the first support element is in contact with or is configured to be in contact with the first axial portion of the inner surface of the receiving chamber, when the article is received the receiving chamber. Likewise, the second support element is in contact with or is configured to be in contact with the second axial portion of the inner surface of the receiving chamber, when the article is received the receiving chamber. In contrast, the substrate element preferably is surrounded by or configured to be surrounded by the intermediate axial portion of the inner surface when the article is received the receiving chamber, however, without being in contact with the intermediate axial portion. In addition, the substrate element may be at least partially in contact with or may be configured to be at least partially in contact with at least one of the first axial portion and the second axial portion. As used herein, the term "in contact with" is to be understood such that the first or second support element gets or is in contact with the first or second axial portion, respectively, regardless of whether or not the respective support element is surrounded by a wrapper.

[0076] Preferably, the first support element may have a length in a direction along a length axis of the rod-shaped article which corresponds to a length of the first axial portion along the center axis of the receiving chamber. Likewise, the second support element may have a length in a direction along a length axis of the rod-shaped article which corresponds to a length of the second axial portion along the center axis of the receiving chamber. Accordingly, the substrate element may have a length in a direction along a length axis of the rod-shaped article which corresponds to a length of the intermediate axial portion along the center axis of the receiving chamber. Alternatively, at least one of the first axial portion and the second axial portion may have a length which is larger than a length of the first support element or the second support element, respectively, such as to get at least partially into touch with the intermediate axial portion.

[0077] Any of the aforementioned configurations is advantageous for several reasons: First, the substrate element is spaced apart from the intermediate axial portion and thus less affected by condensate formation. Furthermore, the first and second protrusions of the first and the second axial portion advantageously engage with those portions of the article which are most rigid and which tend to shrink least during use. Due to this, the article is securely retained within the receiving chamber without the risk to be displaced or to fall out of the device.

[0078] Further features and advantages of the aerosol-generating system and the aerosol-generating article according to the present invention have already been described above with regard to aerosol-generating device and equally apply.

[0079] The invention will be further described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 schematically illustrates an exemplary embodiment of an aerosolgenerating device according to the present invention in a sectional view;

Fig. 2 schematically illustrates a receiving chamber module of the device according to Fig. 1 in a perspective view together with an aerosolgenerating article introduced therein;

Fig. 3 schematically illustrates the receiving chamber module and the aerosolgenerating article according to Fig. 2 in a perspective sectional view;

Fig. 4 schematically illustrates the receiving chamber module according to Fig. 2 without the aerosol-generating article;

Fig. 5 schematically illustrates a sectional view of the receiving chamber according to Fig. 2; and

Fig. 6 schematically illustrates a front view of the receiving chamber according to Fig. 4.

[0080] **Fig. 1** schematically illustrates an exemplary embodiment of an aerosol-generating device 200 according to the present invention. The aerosol-generating device 200 has an elongated shape and comprises a main body 210 and a receiving chamber module 220. The chamber module 220 comprises a receiving chamber 1 for receiving at least a portion of an aerosol-generating article 2. The receiving chamber module 220 is inserted into a cavity 230 formed within a proximal portion 211 of the main body 210. Within a distal portion 212, the main body 210 comprises a power source 250 and a controller 260 for powering and controlling operation of the device 200. Together, the aerosol-generating device 200 and the aerosol-generating article 2 form an aerosol-generating system according to the present invention.

[0081] Within the proximal portion 211 of the main body 210 that forms the cavity 230, the aerosol-generating device 200 comprises an inductor 240. In the present embodiment, the inductor 240 is a helical coil arranged around the receiving chamber 1. The inductor 240 is part of an inductive heater that is powered and operated by the power source 250 and the controller 260. In use of the device, the inductor 240 generates an alternating electromagnetic field within the receiving chamber 1 to inductively heat an aerosol-forming substrate contained in the article 2, when the latter is received in the receiving chamber 1.

[0082] **Fig. 2, Fig. 3** and **Fig. 4** show different aspects of the receiving chamber module 220 with and without the aerosol-generating article 2. As can be seen, the receiving chamber module 220 is an elongated sleeve comprising an insertion opening 15 through which the aerosol-generating article 2 may be inserted at least partially into the receiving chamber 1. The insertion direction of the aerosol-generating article 2 substantially extends along a center axis 201 of the receiving chamber 1. The receiving chamber 1 is made of PEEK (polyether ether ketone). The receiving chamber 1 has a substantially cylindrical shape with a substantially circular cross-section having a diameter of about 15 millimeter.

[0083] Corresponding to the shape of the receiving chamber 1, the aerosol-generating article 2 also has a substantially cylindrical rod-shape. As shown in Fig. 1 and Fig. 3, the article 2 comprises five elements sequentially arranged along a length axis of the article 2: a first support element 25, a substrate element 24, a second support element 23 comprising a central air passage 26, a cooling element 22 and a filter element 21. The first support element 25 is arranged at a distal end of the article 2 and the filter element 21 is arranged at a proximal end of the article 2. Each of the aforementioned elements 21, 22, 23, 24, 25 is substantially cylindrical, all of them having the same outer cross-sectional shape. In addition, the elements are circumscribed by an outer wrapper such as to keep the elements together and to maintain the desired circular cross-sectional shape of the rod-shaped article 2. Preferably, the wrapper is made of paper. The first support element 25 is used to cover and protect the distal front end of the substrate element 24. The substrate element 24 comprise the at least one aerosol-forming substrate to be heated. In addition, the substrate element 24 further comprises a susceptor (not shown) which is in thermal contact with the aerosol-forming substrate. Upon activating the inductor 240, the susceptor is heated due to at least one of eddy currents or hysteresis losses induced by the electromagnetic field, depending on the electrical and magnetic properties of the susceptor material. The susceptor heats up until reaching a temperature sufficient to vaporize material from the aerosol-forming substrate. The released material may be entrained in an airflow passing through the article 2 from the first support element 25 through the substrate element 24, the second support element 23 and the cooling element 22 towards the filter element 21. Along this way, the vaporized material cools to form an aerosol before escaping through the filter element 21 at the proximal end of the article 2.

[0084] **Fig. 5** illustrates further details of the receiving chamber module 220 and the receiving chamber 1, respectively. The receiving chamber 1 comprises an inner surface 16 which extends over the entire axial length of the receiving chamber 1. In the present embodiment, the axial length of the receiving chamber 1 is in range of 25 millimeter to 28 mm. Along the center axis 201 of the receiving chamber 1, the inner surface 16 comprises a first axial portion 11, a second axial 13 portion and an intermediate axial portion 12 located between the first axial portion 11 and the second axial portion 13. The length of the intermediate axial portion 12 is of about 33 percent (about one third) of the axial length of the receiving chamber 1. As can be further seen in Fig. 5, the receiving chamber module 220 or the receiving chamber 1, respectively, is a multi-part component comprising a first part 221 and a second part 222. The second part 222 is formed as a sleeve and inserted into the first part 221. The second part 222 may be attached to the first part 221 via a form-fit or in a positive-fit manner or a friction-fit or a snap-fit. The second part 221 comprises the second axial portion 13, whereas the first part comprises the intermediate axial portion 12 and the second axial portion 13. Such a modular configuration facilitates manufacturing, in particular manufacturing by injection molding.

[0085] The first axial portion 11 comprises a plurality of first protrusions 10, for example twelve first protrusions 10. Likewise, the second axial portion 13 comprises a plurality of second protrusions 17, for example twelve second protrusions 17. In contrast, the intermediate axial portion 12 does not comprise any protrusions, but is even. Accordingly, the plurality of first protrusions 10 and the plurality of second protrusions 17 extend beyond the intermediate axial portion 12 in a radial inward direction towards the center axis 201. Hence, when the article 2 is inserted into the receiving cavity 1, the article 2 is only in contact with the plurality of first protrusions 10 and the plurality of second protrusions 17. In contrast, as can be in particular seen in Fig. 1, the article 2 is not in contact with the intermediate axial portion 12 of the inner surface 16. As a result, the overall contact area between the article 2 and the inner surface 16 of the receiving chamber 1 is significantly reduced. Advantageously, this leads to an overall reduction of heat losses due to direct thermal conduction from the aerosol-generating article 2 to the inner surface 16. Furthermore, adverse moistening effects on the article due to condensate formation in the chamber 1 are reduced as well.

[0086] Notwithstanding the reduced contact area between the article 2 and the inner surface 16, the article 2 is still securely retained in the receiving chamber 1 by the first and second protrusions 10, 17. In the present embodiment, this applies all the more since, on the one hand, the arrangement and the dimensions of the first, the second and the intermediate axial portions 11, 12, 13 and, on the other hand, the arrangement and the dimensions of the first support element 25, the substrate element 24 and the second support element 23 are adapted to each other. As can be seen in Fig. 1 and Fig. 3, when the article 2 is received in the chamber 1, the first support element 25 is in contact with the first protrusions 10 of the first axial portion 11 and the second support element 23 is in contact with the second protrusions 17 of the second axial portion 13. In contrast, the substrate element 24 substantially is surrounded by the intermediate axial portion 12, however, without any contact thereto. Only at its very axial ends, the substrate element 24 is partially in contact with the first protrusions 10 of the first axial portion 11 and the second protrusions 17 of the second axial portion 13. Due to this specific configuration, the first and second protrusions 10, 17 of the first and the second axial portion 11, 13 substantially only engage with those portions of the article 2 which are most rigid and which tend to shrink least during use, that is, with the first and second support element 23, 25.

[0087] As mentioned above, the receiving chamber 1 has a substantially cylindrical shape which refers to a shape of the receiving chamber 1 when masking out the first and second protrusions 10 and 17. Hence, areas of the first axial portion 11, in particular areas between neighboring first protrusions 10, and areas of the second axial portion 13, in particular areas between neighboring second protrusions 17, as well as areas of the intermediate portion are arranged on a common cylindrical shell surface.

[0088] In the present embodiment, the first and the second protrusions are formed as ribs extending along a direction parallel to the center axis 201. The twelve ribs of each one of the first and second axial portions 11, 13 are symmetrically arranged around the center axis 201 and equally spaced to each other. The spacing between neighboring ribs is in a range of 1.3 millimeter to 1.5 millimeter. With regard to its length extension, each rib is chamfered or comprises a respective chamfer at both ends, that is, at a side facing the insertion opening 15 and at an opposite side facing away from the insertion opening 15. Advantageously, the chamfers facilitate insertion and removal of the aerosol-generating article 2 into and from the receiving chamber 1. Apart from that, each rib has a constant height extension along its length extension. In the present embodiment, the height is in range of 0.4 millimeter to 0.5 millimeter as measured in a radial direction towards the center axis 201.

[0089] As shown in **Fig. 6,** each rib has a substantially rectangular cross-sectional shape as seen in a plane perpendicular to the center axis 201. The edges 31 of each rib along its length extension are rounded in order to avoid slitting the wrapper of the aerosol-generating article 2 during insertion and removal of the article 2.

[0090] As can be further seen in Fig. 5, the first protrusions 10 of first axial portion 11 and the second protrusions 17 of the second axial portion 13 fall in line, that is, each of the first protrusions 10 is aligned with a respective one of the second protrusions 17 as seen in a direction parallel to the center axis 201. Due to this, the interstices

32 in between neighboring first protrusions 10 and in between neighboring second protrusions 17 advantageously form a multi-channel airflow passage (see dashed dotted arrows in Fig. 5) which extends form the insertion opening 15 at the proximal end 4 of the receiving chamber 1 to the bottom of the receiving chamber 1 at its distal end 5.

[0091] Accordingly, when a negative pressure is applied at the filter element 21 of an aerosol-generating article 2 received in the receiving chamber 1, for example, when a user takes a puff, air is drawn into the receiving chamber 1 at the rim of the insertion opening 15 and further along the multi-channel airflow passage into the bottom portion at the distal end 4 of the receiving chamber 1. There, the airflow enters the aerosol-generating article 2 through the first support element 25 and further passes through the substrate element 24, the second support element 23, the aerosol cooling element 22 and the filter element 21 where it finally exits the article 2. In the substrate element 24A, vaporized material from the aerosol-forming substrate is entrained into the airflow and subsequently cooled down on its further way through the second support element 23, the aerosol cooling element 22 and the filter element 21 such as to form an aerosol.

[0092] In order to enable a proper redirection of the airflow into the aerosol-generating article 2 at the bottom portion of the receiving chamber 1, the aerosol-generating device 200 according to the present embodiment comprises three end stops 14 which are arranged at the distal end 5 of the receiving chamber 1. The end stops 14 are configured to limit the insertion depth of the article 2 into the receiving chamber 1 and, thus, to prevent the article 2 from abutting the bottom surface of the receiving chamber 1. This is shown in Fig. 1.

[0093] As can be seen in Fig, 5, the three end stops 14 are formed as ring-segments which are symmetrically and equally spaced arranged around the center axis 201 at the inner circumference of the receiving chamber 1. Each ring segment 14 has a height dimension in the direction of the center axis 201 in a range of 1 millimeter to 3 millimeter, for example 1.4 millimeter, and a radial dimension in a range of 1 millimeter to 2 millimeter, for example 1.3 millimeter as measured in a radial direction towards the center axis 201.

[0094] As can be further seen in Fig. 5, the end stops 14 covers or blocks some of the channels of the airflow passage that is defined by the interstices 32 in between neighboring first protrusions 10 and neighboring second protrusions 17. As a result, the airflow passing in between the article 1, the plurality of first protrusions 10, the plurality of second protrusions 17 and the end stops 14 is reduced as compared to an airflow passing in between the article 2, the plurality of first protrusions 10 and the plurality of second protrusions 17 in absence of the end stops 14. As a consequence, the resistance to draw of the system is also increased as compared to a system without end stops. In use of the device, a resistance to draw may be in range of 70 mmWG to 120 mmWG. Preferably, a resistance to draw (RTD) may be between 40 mmWG and 70 mmWG, in particular 45 mmWG and 65 mmWG, for example 55 mmWG. To ensure a reasonable minimum airflow and a reasonable resistance to draw, the number, the shape and the dimensions of the end stops preferably is chosen such that the (reduced) airflow is at least 50 percent, in particular at least 60 percent, preferably at least 70 percent, even more preferably at least 80 percent of the airflow in absence of the end stops. This may be achieved by choosing the number, the shape and the dimensions of the end stops such that the end stops cover at most 50 percent, in particular at most 40 percent, preferably at most 30 percent, even more preferably at most 20 percent of a total cross-sectional area of all interstices 32 defined in between neighboring first protrusions 10 or in between neighboring second protrusions 17 as seen in a plane perpendicular to the center axis. In the present embodiment, the total cross-sectional area of all interstices 32 defined in between neighboring first protrusions 10 or in between neighboring second protrusions 17 is about 4.5 square millimeter when taking into account a coverage by the end stops 14, and about 7.2 square millimeter in absence of the end stops 14.

Claims

1. An aerosol-generating device (200) for use with an aerosol-generating article (2), the device (200) comprising a receiving chamber (1) for removably receiving at least a portion of the aerosol-generating article (2), the receiving chamber (1) having an inner surface (16) and a center axis (201), wherein along the center axis (201) the inner surface (16) comprises a first axial portion (11), a second axial portion (13) and an intermediate axial portion (12) located between the first axial portion (11) and the second axial portion (13), wherein the first axial portion (11) comprises a plurality of first protrusions (10) and the second axial portion (13) comprises a plurality of second protrusions (17), wherein the plurality of first protrusions (10) and the plurality of second protrusions (17) are configured to contact a first support element (25) and a second support element (23) of the aerosol-generating article (2), respectively, for retention of the aerosol-generating article (2) in the receiving chamber (1), wherein the plurality of first protrusions (10) and the plurality of second protrusions (17) extend in a direction towards the center axis (201) beyond the intermediate axial portion (12), **characterized in that** the intermediate axial portion (12) has a length of at least 20% of the overall length of the inner surface (16) or of the receiving chamber (1) in the direction of the center axis (201) and is configured to surround a substrate element (24) of the aerosol-generating article (2) when the article (2) is received in the receiving chamber (1).

2. The aerosol-generating device (200) according to claim 1, wherein the intermediate axial portion (12) is without any protrusions.

3. The aerosol-generating device (200) according to any one of the preceding claims, wherein at least one of the protrusions of the plurality of first protrusions (10) or at least one of the protrusions of the plurality of second protrusions (17) extends in a direction substantially along the center axis (201) of the receiving chamber (1).

4. The aerosol-generating device (200) according to any one of the preceding claims, further comprising one or more end stops (14) arranged at a distal end of the receiving chamber (1).

5. The aerosol-generating device (200) according to any one of claim 4, wherein the one or more end stops (14) cover at most 50 percent of a total cross-sectional area of all interstices (32) defined in between neighboring first protrusions (10) or in between neighboring second protrusions (17) as seen in a plane perpendicular to the center axis (201).

6. The aerosol-generating device (200) according to any one of claims 4 to 5, wherein the one or more end stops (14) are formed as ring segments.

7. The aerosol-generating device (200) according to any one of the preceding claims, wherein at least one protrusion of the plurality of first protrusions (10) or at least one protrusion of the plurality of second protrusions (17) has a constant radial distance to the center axis (201) over a respective length of the respective protrusion.

8. The aerosol-generating device (200) according to any one of the preceding claims, wherein the receiving chamber (1) comprises a first part (221) and a second part (222), wherein said second part (222) is inserted into the first part (221), and wherein the second part (222) is formed as a sleeve comprising the second axial portion (13), whereas the first part (221) comprises the first axial portion (11).

9. The aerosol-generating device (200) according to any one of the preceding claims, wherein the receiving chamber (1) is formed as a sleeve and inserted into a main body (210) of the aerosol-generating device (200).

10. The aerosol-generating device (200) according to any one of the preceding claims, wherein at least one of the plurality of first protrusions (10) and the plurality of second protrusions (17) is formed as a rib extending in an axial direction with respect to the center axis (201).

11. The aerosol-generating device (200) according to any one of the preceding claims, wherein at least one of the plurality of first protrusions (10) and the plurality of second protrusions (17) is chamfered at a side facing an insertion opening (15) of the receiving chamber (1) and/or at an opposite side facing away from an insertion opening (15) of the receiving chamber (1).

12. An aerosol-generating system comprising an aerosol-generating device (200) according to any one of the preceding claims and an aerosol-generating article (2) comprising an aerosol-forming substrate, wherein at least a portion of the aerosol-generating article (2) is removably received or removably receivable in the receiving chamber (1) of the aerosol-generating device (200).

13. The aerosol-generating system according to claim 12, wherein the aerosol-generating article (2) comprises at least a first support element (25), a second support element (23) and a substrate element (24) comprising the aerosol-forming substrate and being located between the first support element (25) and the second support element (23), and wherein upon receiving the article (2) in the receiving chamber (1) the first support element (25) is in contact with the first axial portion (11) and the second support element (23) is in contact with the second axial portion (13) and the substrate element (24) is surrounded by the intermediate axial portion (12) without being in contact with the intermediate axial portion (12).

Patentansprüche

1. Aerosolerzeugungsvorrichtung (200) zum Gebrauch mit einem aerosolerzeugenden Artikel (2), wobei die Vorrichtung (200) eine Aufnahmekammer (1) zur entfernbaren Aufnahme wenigstens eines Abschnitts des aerosolerzeugenden Artikels (2) umfasst, wobei die Aufnahmekammer (1) eine Innenfläche (16) und eine Mittelachse (201) aufweist, wobei die Innenfläche (16) entlang der Mittelachse (201) einen ersten axialen Abschnitt (11), einen zweiten axialen Abschnitt (13) und einen zwischen dem ersten axialen Abschnitt (11) und dem zweiten axialen Abschnitt (13) liegenden mittleren axialen Abschnitt (12) aufweist, wobei der erste axiale Abschnitt (11) eine Vielzahl von ersten Vorsprüngen (10) aufweist und der zweite axiale Abschnitt (13) eine Vielzahl von zweiten Vorsprüngen (17) aufweist, wobei die Vielzahl von ersten Vorsprüngen (10) und die Vielzahl von zweiten Vorsprüngen (17) ausgelegt sind, ein erstes Stützelement (25) bzw. ein zweites Stützelement (23) des aerosolerzeugenden Artikels (2) zu berühren, um den aerosolerzeugenden Artikel (2) in der Aufnahmekammer (1) zu

halten, wobei sich die Vielzahl der ersten Vorsprünge (10) und die Vielzahl der zweiten Vorsprünge (17) in Richtung der Mittelachse (201) über den mittleren axialen Abschnitt (12) hinaus erstrecken, **dadurch gekennzeichnet, dass** der mittlere axiale Abschnitt (12) eine Länge von wenigstens 20 % der Gesamtlänge der Innenfläche (16) oder der Aufnahmekammer (1) in Richtung der Mittelachse (201) aufweist und ausgelegt ist, ein Substratelement (24) des aerosolerzeugenden Artikels (2) zu umgeben, wenn der Artikel (2) in der Aufnahmekammer (1) aufgenommen ist.

2. Aerosolerzeugungsvorrichtung (200) nach Anspruch 1, wobei der mittlere axiale Abschnitt (12) keine Vorsprünge aufweist.

3. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, wobei sich wenigstens einer der Vorsprünge der Vielzahl von ersten Vorsprüngen (10) oder wenigstens einer der Vorsprünge der Vielzahl von zweiten Vorsprüngen (17) in einer Richtung im Wesentlichen entlang der Mittelachse (201) der Aufnahmekammer (1) erstreckt.

4. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, ferner umfassend einen oder mehrere Endanschläge (14), die an einem distalen Ende der Aufnahmekammer (1) angeordnet sind.

5. Aerosolerzeugungsvorrichtung (200) nach einem von Anspruch 4, wobei der eine oder die mehreren Endanschläge (14) höchstens 50 Prozent eines Gesamtquerschnittsbereichs aller zwischen benachbarten ersten Vorsprüngen (10) oder zwischen benachbarten zweiten Vorsprüngen (17) definierten Zwischenräume (32) abdecken, wie in einer Ebene senkrecht zu der Mittelachse (201) gesehen.

6. Aerosolerzeugungsvorrichtung (200) nach einem der Ansprüche 4 bis 5, wobei der eine oder die mehreren Endanschläge (14) als Ringsegmente ausgebildet sind.

7. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, wobei wenigstens ein Vorsprung der Vielzahl von ersten Vorsprüngen (10) oder wenigstens ein Vorsprung der Vielzahl von zweiten Vorsprüngen (17) einen konstanten radialen Abstand zu der Mittelachse (201) über eine jeweilige Länge des jeweiligen Vorsprungs aufweist.

8. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, wobei die Aufnahmekammer (1) einen ersten Teil (221) und einen zweiten Teil (222) aufweist, wobei der zweite Teil (222) in den ersten Teil (221) eingesetzt ist, und wobei der zweite Teil (222) als eine den zweiten axialen Abschnitt (13) umfassende Hülse gebildet ist, während der erste Teil (221) den ersten axialen Abschnitt (11) umfasst.

9. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, wobei die Aufnahmekammer (1) als Hülse ausgebildet und in einen Hauptkörper (210) der Aerosolerzeugungsvorrichtung (200) eingesetzt ist.

10. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, wobei wenigstens einer der Vielzahl von ersten Vorsprüngen (10) und der Vielzahl von zweiten Vorsprüngen (17) als eine sich in axialer Richtung in Bezug auf die Mittelachse (201) erstreckende Rippe ausgebildet ist.

11. Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche, wobei wenigstens einer der Vielzahl von ersten Vorsprüngen (10) und der Vielzahl von zweiten Vorsprüngen (17) an einer, einer Einsetzöffnung (15) der Aufnahmekammer (1) zugewandten Seite und/oder einer gegenüberliegenden, von einer Einsetzöffnung (15) der Aufnahmekammer (1) abgewandten Seite abgeschrägt ist.

12. Aerosolerzeugungssystem, umfassend eine Aerosolerzeugungsvorrichtung (200) nach einem der vorhergehenden Ansprüche und einen ein aerosolerzeugendes Substrat aufweisenden aerosolerzeugenden Artikel (2), wobei wenigstens ein Abschnitt des aerosolerzeugenden Artikels (2) entfernbar in der Aufnahmekammer (1) der Aerosolerzeugungsvorrichtung (200) aufgenommen ist oder entfernbar aufgenommen werden kann.

13. Aerosolerzeugungssystem nach Anspruch 12, wobei der aerosolerzeugende Artikel (2) wenigstens ein erstes Stützelement (25), ein zweites Stützelement (23) und ein das aerosolerzeugende Substrat aufweisendes Substratelement (24) umfasst, das zwischen dem ersten Stützelement (25) und dem zweiten Stützelement (23) angeordnet ist, und wobei nach Aufnehmen des Artikels (2) in der Aufnahmekammer (1) das erste Stützelement (25) in Kontakt mit dem ersten axialen Abschnitt (11) und das zweite Stützelement (23) in Kontakt mit dem zweiten axialen Abschnitt (13) steht und das Substratelement (24) von dem mittleren axialen Abschnitt (12) umgeben ist, ohne in Kontakt mit dem mittleren axialen Abschnitt (12) zu stehen.

Revendications

1. Dispositif de génération d'aérosol (200) destiné à être utilisé avec un article de génération d'aérosol

(2), le dispositif (200) comprenant une chambre de réception (1) destinée à recevoir de manière amovible au moins une partie de l'article de génération d'aérosol (2), la chambre de réception (1) ayant une surface intérieure (16) et un axe central (201), dans lequel, le long de l'axe central (201), la surface intérieure (16) comprend une première partie axiale (11), une deuxième partie axiale (13) et une partie axiale intermédiaire (12) située entre la première partie axiale (11) et la deuxième partie axiale (13), dans lequel la première partie axiale (11) comprend une pluralité de premières saillies (10) et la deuxième partie axiale (13) comprend une pluralité de deuxièmes saillies (17), dans lequel la pluralité de premières saillies (10) et la pluralité de secondes saillies (17) sont configurées pour venir en contact avec un premier élément de support (25) et un deuxième élément de support (23) de l'article de génération d'aérosol (2), respectivement, pour la rétention de l'article de génération d'aérosol (2) dans la chambre de réception (1), dans lequel la pluralité de premières saillies (10) et la pluralité de secondes saillies (17) s'étendent dans une direction vers l'axe central (201) au-delà de la partie axiale intermédiaire (12), **caractérisé en ce que** la partie axiale intermédiaire (12) a une longueur d'au moins 20 % de la longueur totale de la surface intérieure (16) ou de la chambre de réception (1) dans la direction de l'axe central (201) et est configurée pour entourer un élément de substrat (24) de l'article de génération d'aérosol (2) lorsque l'article (2) est reçu dans la chambre de réception (1).

2. Dispositif de génération d'aérosol (200) selon la revendication 1, dans lequel la partie axiale intermédiaire (12) est dépourvue de saillies.

3. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, dans lequel au moins une des saillies de la pluralité de premières saillies (10) ou au moins une des saillies de la pluralité de deuxièmes saillies (17) s'étend dans une direction sensiblement le long de l'axe central (201) de la chambre de réception (1).

4. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, comprenant en outre une ou plusieurs butées d'extrémité (14) agencées au niveau d'une extrémité distale de la chambre de réception (1).

5. Dispositif de génération d'aérosol (200) selon la revendication 4, dans lequel les une ou plusieurs butées d'extrémité (14) couvrent au plus 50 pour cent d'une superficie de coupe transversale totale de tous les interstices (32) définis entre des premières saillies (10) voisines ou entre des deuxièmes saillies (17) voisines comme vu dans un plan perpendiculaire à l'axe central (201).

6. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications 4 et 5, dans lequel les une ou plusieurs butées d'extrémité (14) sont formées comme des segments annulaires.

7. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, dans lequel au moins une saillie de la pluralité de premières saillies (10) ou au moins une saillie de la pluralité de deuxièmes saillies (17) a une distance radiale constante par rapport à l'axe central (201) sur une longueur respective de la saillie respective.

8. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, dans lequel la chambre de réception (1) comprend une première partie (221) et une deuxième partie (222), dans lequel ladite deuxième partie (222) est insérée dans la première partie (221), et dans lequel la deuxième partie (222) est formée comme un manchon comprenant la deuxième partie axiale (13), tandis que la première partie (221) comprend la première partie axiale (11).

9. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, dans lequel la chambre de réception (1) est formée comme un manchon et insérée dans un corps principal (210) du dispositif de génération d'aérosol (200).

10. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, dans lequel au moins l'une de la pluralité de premières saillies (10) et de la pluralité de deuxièmes saillies (17) est formée comme une nervure s'étendant dans une direction axiale par rapport à l'axe central (201).

11. Dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes, dans lequel au moins l'une de la pluralité de premières saillies (10) et de la pluralité de deuxièmes saillies (17) est chanfreinée au niveau d'un côté faisant face à une ouverture d'insertion (15) de la chambre de réception (1) et/ou au niveau d'un côté opposé faisant face à une ouverture d'insertion (15) de la chambre de réception (1).

12. Système de génération d'aérosol comprenant un dispositif de génération d'aérosol (200) selon l'une quelconque des revendications précédentes et un article de génération d'aérosol (2) comprenant un substrat formant aérosol, dans lequel au moins une partie de l'article de génération d'aérosol (2) est reçue de manière amovible ou peut être reçue de manière amovible dans la chambre de réception (1) du dispositif de génération d'aérosol (200).

13. Système de génération d'aérosol selon la revendication 12, dans lequel l'article de génération d'aérosol (2) comprend au moins un premier élément de support (25), un deuxième élément de support (23) et un élément de substrat (24) comprenant le substrat formant aérosol et étant situé entre le premier élément de support (25) et le deuxième élément de support (23), et dans lequel, lors de la réception de l'article (2) dans la chambre de réception (1), le premier élément de support (25) est en contact avec la première partie axiale (11) et le deuxième élément de support (23) est en contact avec la deuxième partie axiale (13) et l'élément de substrat (24) est entouré par la partie axiale intermédiaire (12) sans être en contact avec la partie axiale intermédiaire (12).

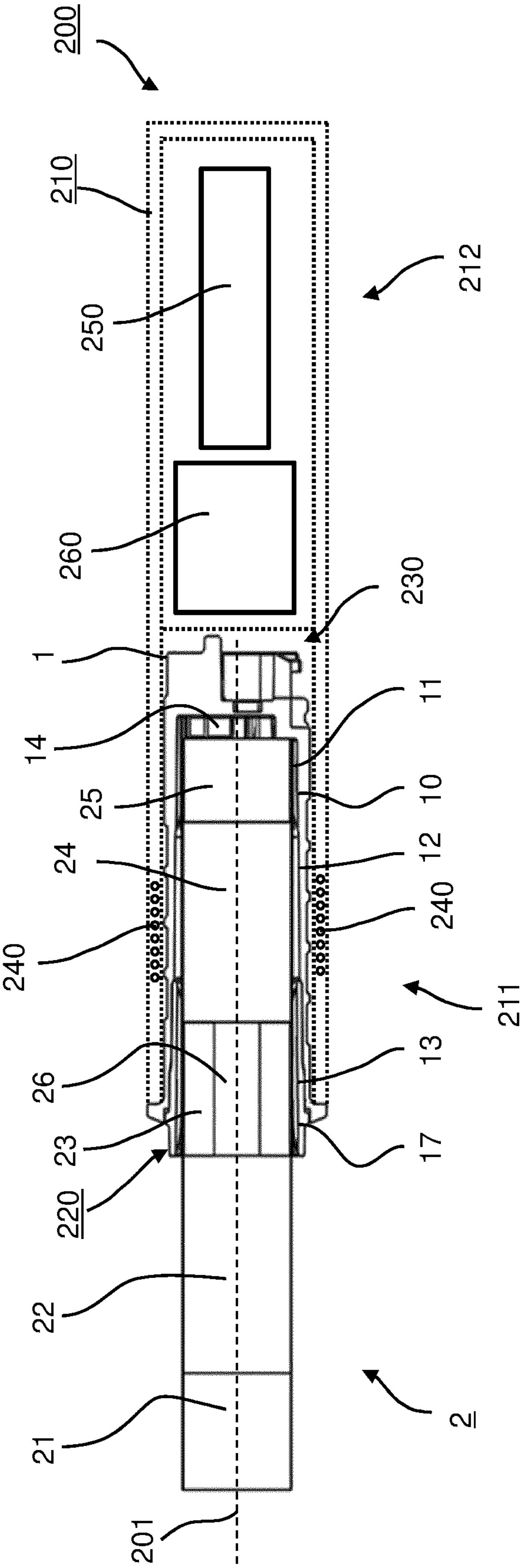
200
210
212
250
260
230
1
14
11
25
10
24
12
240
240
211
26
13
23
17
220
22
21
2
201

Fig. 1

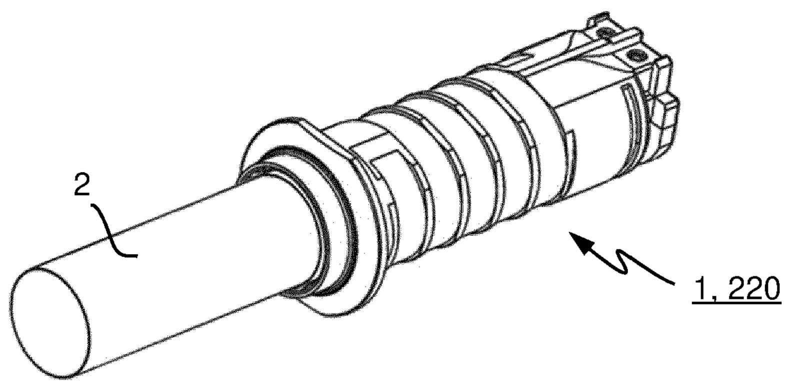

Fig. 2

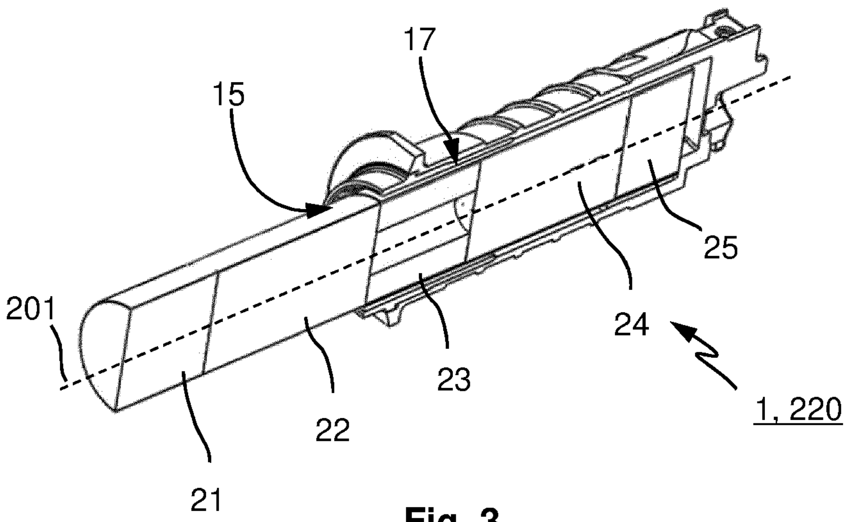

Fig. 3

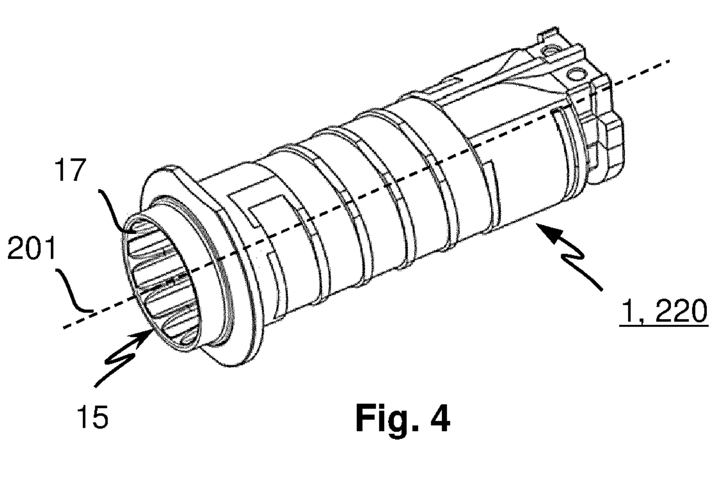

Fig. 4

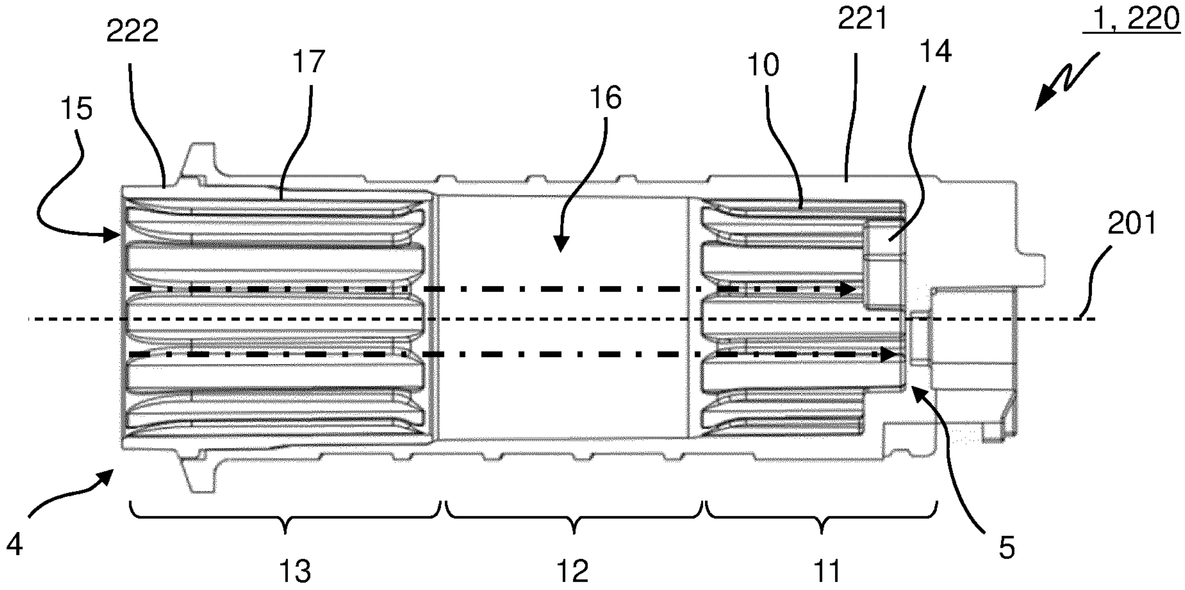

Fig. 5

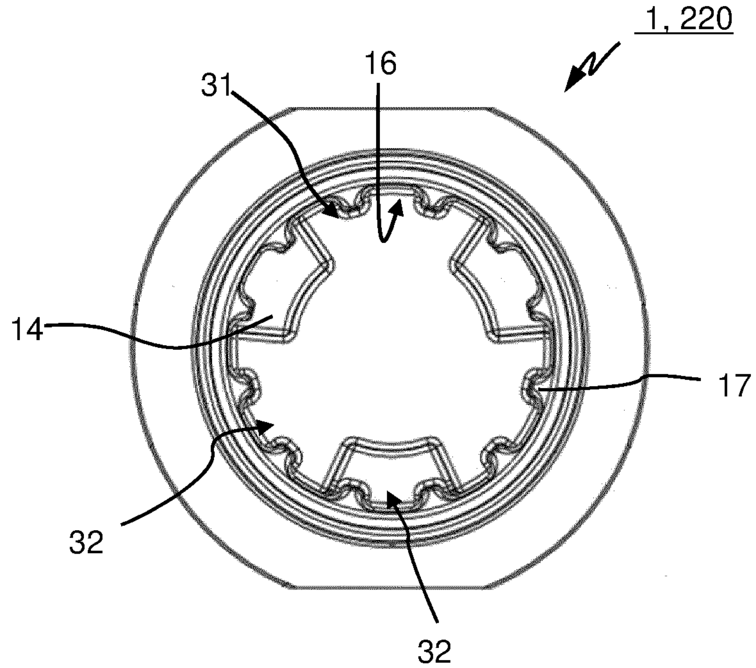

Fig. 6

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- WO 2017194763 A2 **[0002]**