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(54) **AEROSOL-GENERATING DEVICE WITH RESISTANCE-TO-DRAW MODIFYING ELEMENT**

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(57) **ABSTRACT**

An aerosol-generating device is provided, including: a housing; and a resistance-to-draw modifier including: first and second components, and at least one airflow channel, the first and the second components cooperating to form the one airflow channel, at least one of the first and the second components being configured to be moveable with respect to the other of the first and the second components between at least a first position and a second position, an inner surface area of the airflow channel formed by the first and the second components being smaller when the first and the second components are in the first position than the inner surface area of the airflow channel when the first and the second components are in the second position, and a cross-sectional area of the airflow channel in the first position and in the second position remaining unchanged.

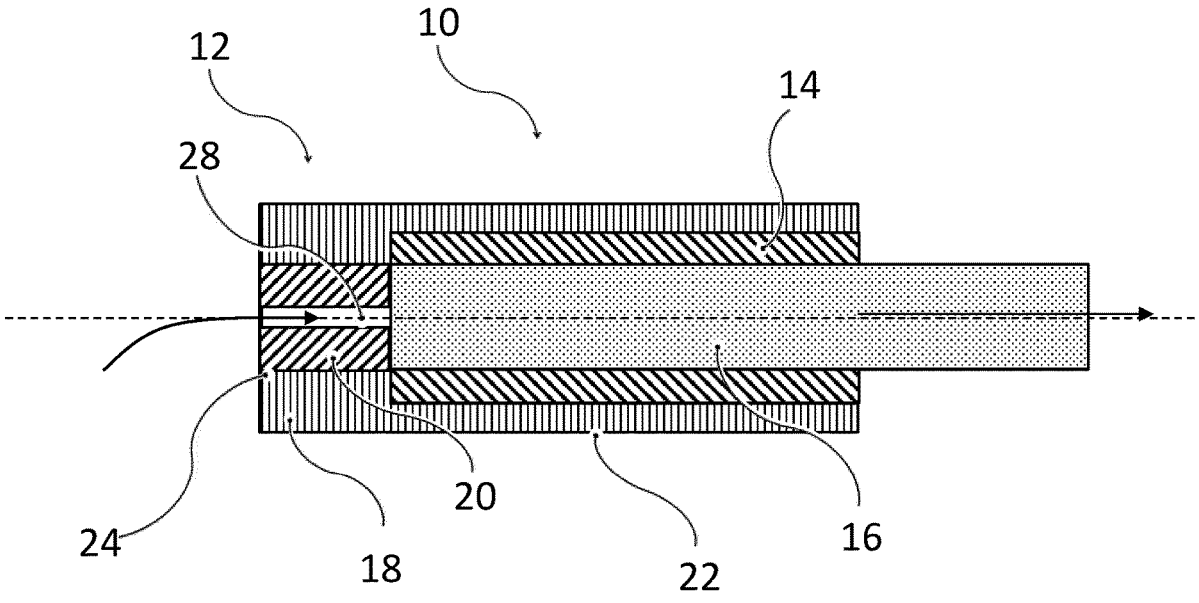


Fig. 1

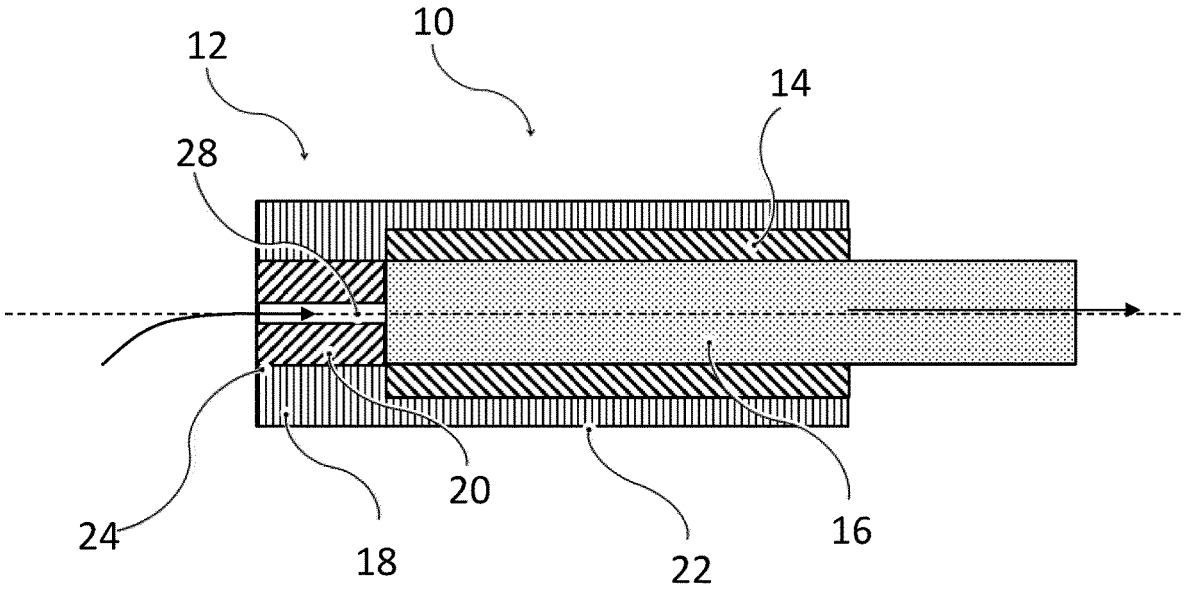


Fig. 2

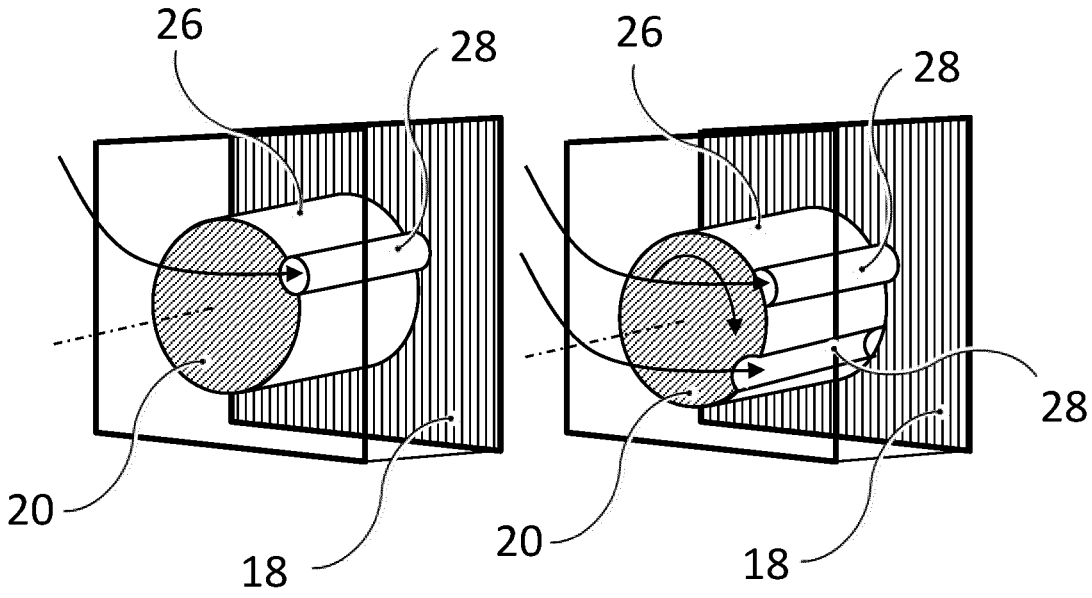


Fig. 2a

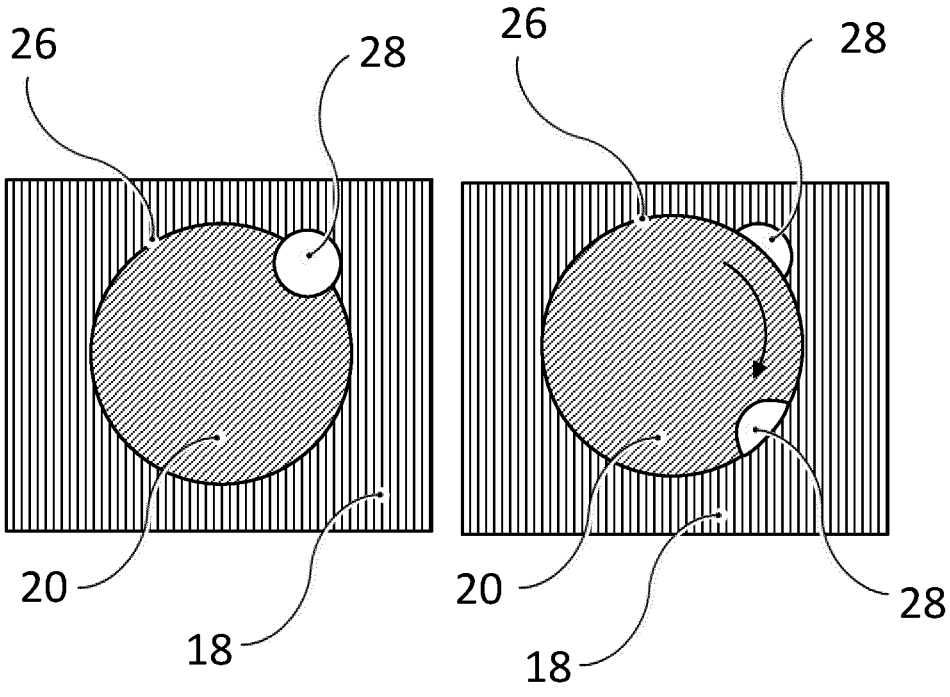


Fig. 2b

Fig. 3

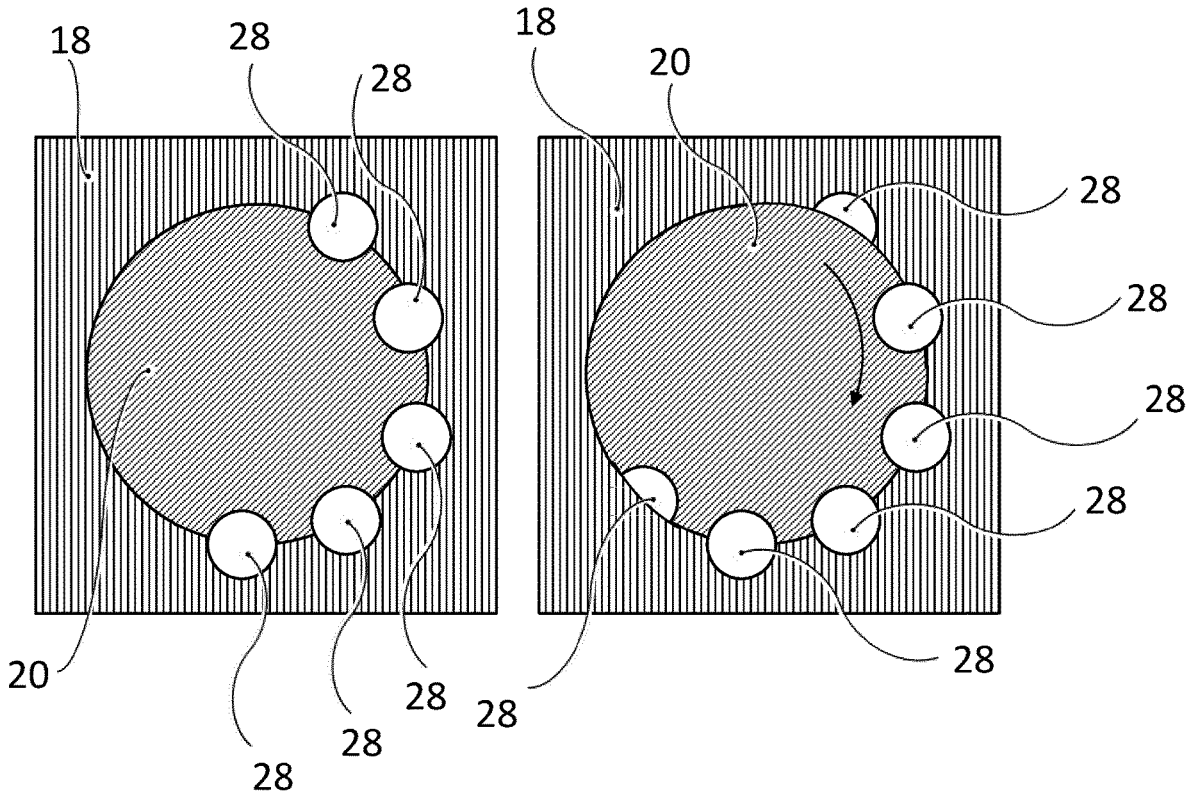


Fig. 4

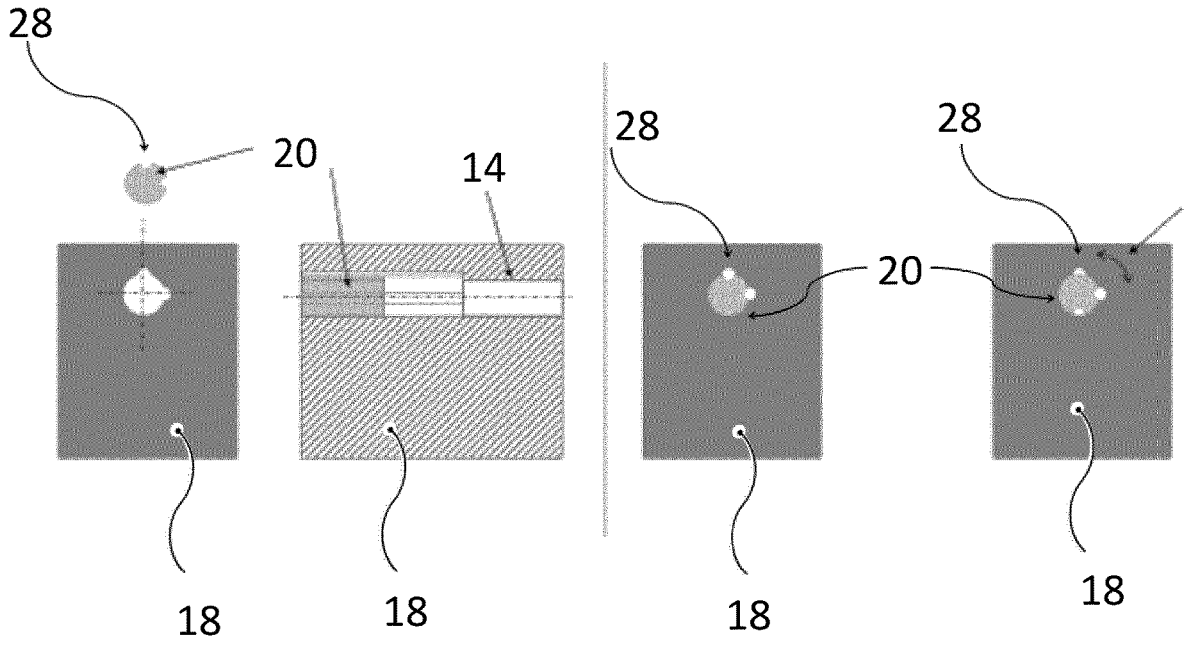


Fig. 5

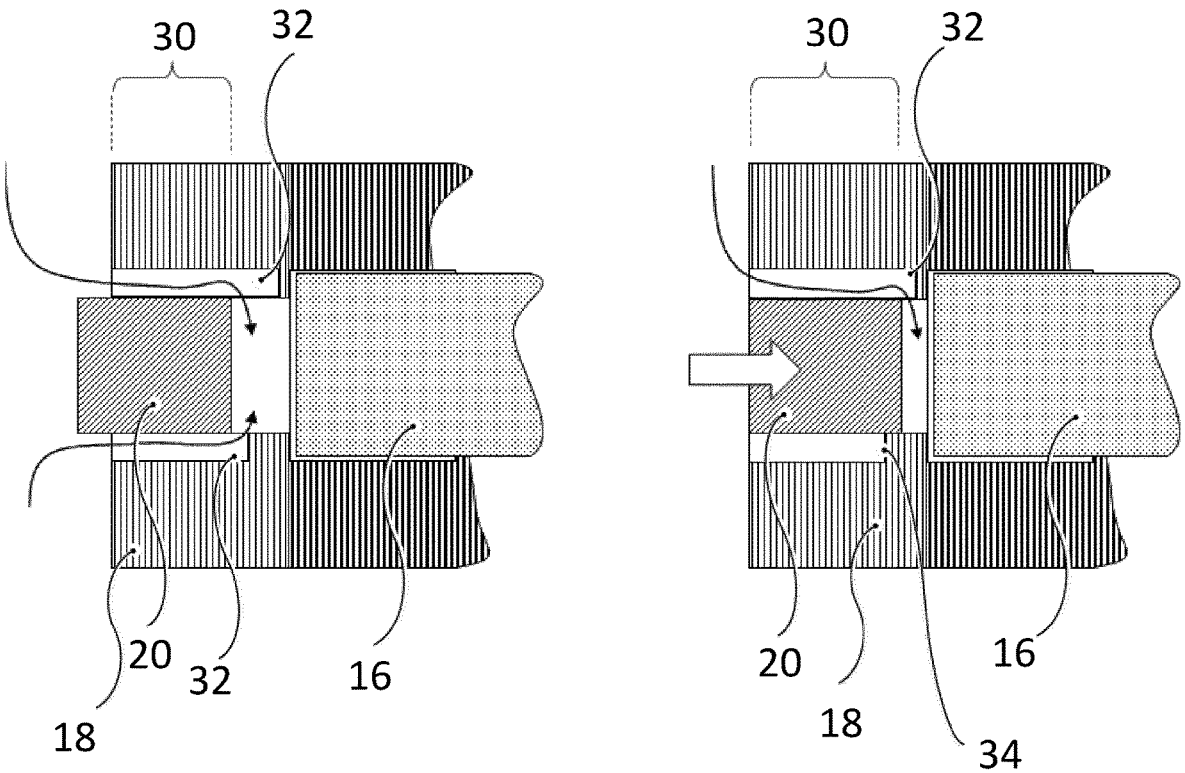


Fig. 6

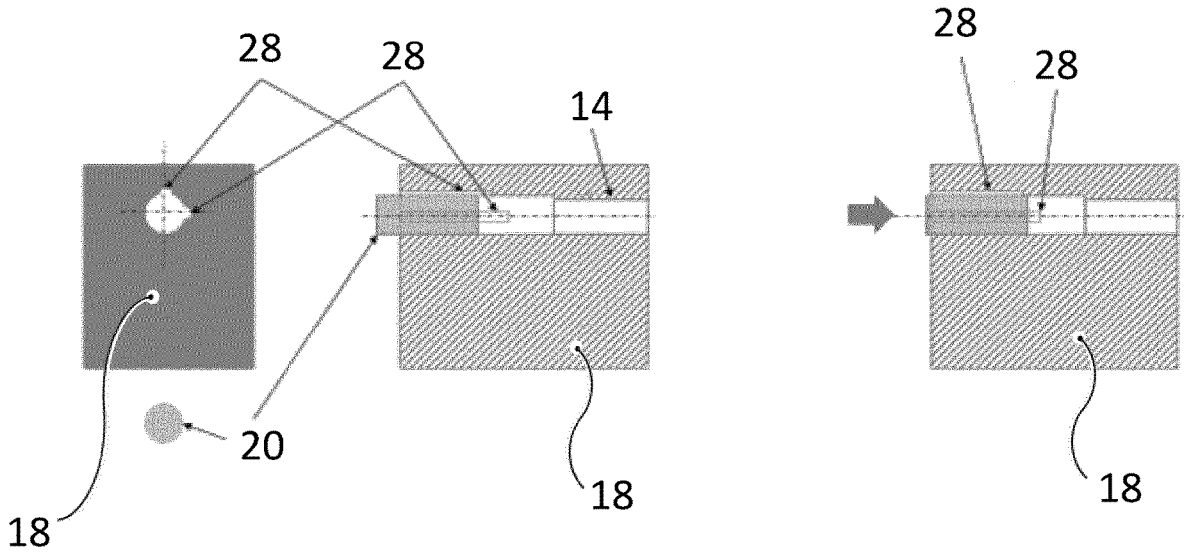
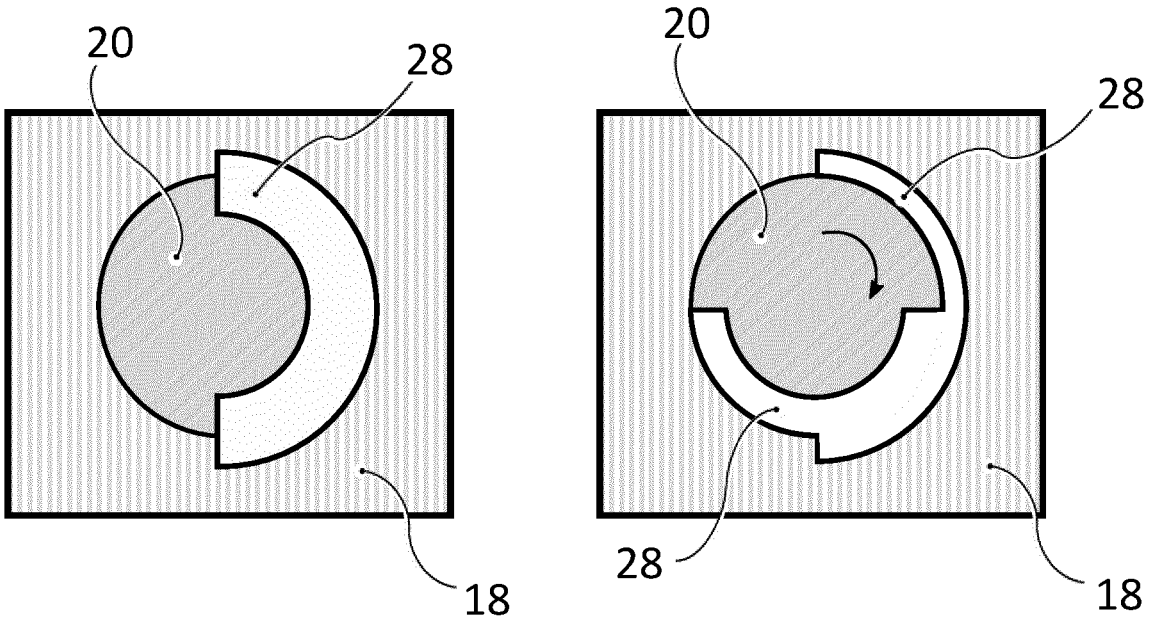


Fig. 7



AEROSOL-GENERATING DEVICE WITH RESISTANCE-TO-DRAW MODIFYING ELEMENT

[0001] The present invention relates to an aerosol-generating device comprising a resistance-to-draw modifying element. The present disclosure further relates to a method for controlling the resistance-to-draw of an aerosol-generating device.

[0002] It is known to provide an aerosol-generating device for generating an inhalable aerosol. Such devices may heat aerosol-forming substrate to a temperature at which one or more components of the aerosol-forming substrate are volatilised without burning the aerosol-forming substrate. Aerosol-forming substrate may be provided as part of an aerosol-generating article. The aerosol-generating article may have a rod shape for insertion of the aerosol-generating article into a cavity, such as a heating chamber, of the aerosol-generating device. A heating element may be arranged in or around the heating chamber for heating the aerosol-forming substrate once the aerosol-generating article is inserted into the heating chamber of the aerosol-generating device.

[0003] The consumption experience of a user of an aerosol-generating device is largely determined by the resistance-to-draw (RTD) and the delivery level of the active component in the aerosol, such as nicotine. The consumption experience is further influenced by the stability of the RTD and delivery level during the consumption event. The variance of such parameters between different aerosol-generating articles further affects the consumption experience of a user. The delivery level depends on the amount of air entering the aerosol-generating device and is hence related to the RTD of the aerosol-generating device. A stable RTD hence usually induces a stable delivery level. It is usually difficult to achieve an appropriate balance of the discussed parameters.

[0004] Most users prefer to have an RTD comparable to the RTD of conventional cigarettes. However, aerosol-generating articles of aerosol-generating devices usually have a much lower RTD than conventional cigarettes, as in aerosol-generating devices the aerosol-generating article is not burnt but only heated.

[0005] Furthermore, the preferred user experience usually varies widely between different users. A single user may also wish to achieve varying consumption experiences in single or separate consumption events.

[0006] The stability of the RTD and the delivery level is usually determined by the aerosol-generating device and the aerosol-generating article. The RTD of aerosol-generating articles usually varies between aerosol-generating articles due to the manufacturing process. This results in an undesirable variation of the user's consumption experience.

[0007] It would be desirable to provide an aerosol-generating device possessing an RTD comparable to conventional cigarettes. It would be desirable to provide an aerosol-generating device delivering a stable RTD. It would be desirable to provide an aerosol-generating device with an adjustable RTD. It would be desirable to provide an aerosol-generating device which allows balancing the variation of RTD between different aerosol-generating articles. It would be desirable to provide an aerosol-generating article which allows the user to modify the RTD to achieve an individually tailored consumption experience. It would be desirable to provide an aerosol-generating device allowing the adjustment of the RTD and the delivery level. It would be desirable to provide an aerosol-generating device which allows balancing the RTD, delivery level and the stability of such parameters. These beneficial effects are achieved by the invention.

[0008] According to a first aspect of the invention there is provided an aerosol-generating device that may comprise a resistance-to-draw modifying element. The resistance-to-draw modifying element may comprise a first component, a second component and at least one airflow channel. The first component and the second component may cooperate to form the airflow channel. At least one of the first component and the second component may be configured to be moveable with respect to the other of the first component and second component between at least a first position and a second position. The inner surface area of the airflow channel in the first position may be smaller than the inner surface area of the airflow channel in the second position. The cross-sectional area of the airflow channel in the first position and the second position may remain unchanged.

[0009] According to a first aspect of the invention there is provided an aerosol-generating device comprising a resistance-to-draw modifying element. The resistance-to-draw modifying element comprises a first component, a second component and at least one airflow channel. The first component and the second component cooperate to form the airflow channel. At least one of the first component and the second component are configured to be moveable with respect to the other of the first component and second component between at least a first position and a second position. The inner surface area of the airflow channel in the first position is smaller than the inner surface area of the airflow channel in the second position. The cross-sectional area of the airflow channel in the first position and the second position remains unchanged.

[0010] The invention further relates to a method for controlling the RTD of an aerosol-generating device.

[0011] The aerosol-generating device may comprise a longitudinal axis. As used herein, a "longitudinal axis" of a real or imaginary body may be an imaginary line running down the center of the body and running perpendicular to a transverse plane through the body.

[0012] The first component may comprise a longitudinal axis. The first component may be cylindrical. The first component may have a circular cross-section. As used herein, a "cross-section" of a real or imaginary body may be the intersection of a plane with the body perpendicular to the longitudinal axis of the body. The first component may comprise a hollow cylinder. As used herein, a "hollow cylinder" may be the intersection of two cylinders, wherein the two cylinders have different base surfaces and wherein the longitudinal axes of the cylinders are the same. For example, the base sections of both cylinders may be circular, but the base sections of the first cylinder may have a smaller diameter than the base sections of the second cylinder. A hollow cylinder comprises a cavity. As used herein, a "cavity" may be an empty space in a solid body.

[0013] The first component may comprise an outer wall. The outer wall may have a circular cross-section. The outer wall may comprise an outer surface of the first component. The outer wall may enclose the first component. The outer wall may define the contour of the first component. The outer wall may form the exterior of one or both of the first

component and the aerosol-generating device. The outer wall may be arranged on the outside of the aerosol-generating device.

[0014] The first component may comprise an inner wall. The inner wall may have a circular cross-section. The inner wall may have a polygonal cross-section. As used herein, a "polygon" may be a plane figure comprising a finite number points which are connected by straight line segments to form a closed loop. The straight line segments may be also be termed "edges". The inner wall may comprise an inner surface of the first component. The inner surface may have circular or polygonal cross-section. The inner wall may be arranged inside the first component. The inner wall may line a cavity.

[0015] The second component may comprise a longitudinal axis. The second component may be cylindrical. The second component may have a circular cross-section. The second component may have a polygonal cross-section. The second component may be a solid cylinder. The second component may be a solid cylinder with a circular cross-section.

[0016] The second component may comprise an outer wall. The outer wall may have a circular cross-section. The outer wall may comprise an outer surface of the second component. The outer wall may enclose the second component. The outer wall may define the contour of the second component. The outer wall may form the exterior of the second component.

[0017] The first component may hold the second component. The second component may be mounted in the first component. The inner wall of the first component may be arranged opposite to the second component, preferably the outer wall of the second component. The inner wall of the first component may be arranged facing the second component, preferably the outer wall of the second component. The inner wall of the first component may be complementary to the outer wall of the second component. At least a part of the first component, preferably a part of the inner wall of the first component may be arranged in contact with at least a part of second component, preferably a part of the outer wall of the second component. The first and second component may be arranged such that airflow is blocked at locations of contact between the first and second component. The first component and second may be arranged, such that the first and second component are temporarily fixed with respect to each, for example by frictional forces between the first and second component. In this way, the accuracy and stability of the adjustment to a particular RTD value is enhanced.

[0018] The second component may be configured to be rotatable with respect to the first component between at least a first position and a second position. The second component may be configured to be slidable with respect to the first component between at least a first position and a second position.

[0019] One of the first component and the second component may be configured to be manually movable with respect to the other of the first component and second component by the user. The user may rotate the first or second component. The user may slide the second component within the cavity of the first component by pushing and pulling the second component. The second component may comprise one or more of a handle, knob and bar, preferably at an upstream position on the second component. The user may grip the handle, knob or bar to move the second component. The user may move the second component more comfortably and easily by using the handle, knob or bar. Manual movement provides the user with a simple way of adjusting the RTD of the device according to the user's individual preferences.

[0020] The RTD may be adjusted automatically. The device may comprise a controller. The controller may be configured to adjust the RTD automatically, preferably by moving at least one of the first component and the second component with respect to the other of the first component and the second component. The movement may be facilitated by a motor controlled by the controller. The controller may adjust the RTD automatically according to a pre-programmed RTD profile. The device may further comprise a detection means with which characteristics of consumption are detected. The detection means may detect the RTD of the device. The controller may automatically adjust the RTD of the device in response to an input of the detection means. The controller may automatically adjust the RTD according the pre-programmed profile in response to the RTD detected by the detection means. Automatic adjustment of the RTD may increase the comfort with which the user can obtain individually preferred RTD characteristics.

[0021] The first component may comprise a cavity. The cavity may comprise a longitudinal axis. The cavity may be an empty space inside the first component. The cavity may have a circular cross-section. The cavity may be a cylinder with a circular cross-section. The cavity may comprise an upstream opening.

[0022] The cavity may be configured to be complementary to the second component. The second component may be configured to be complementary to the cavity. The cavity may be configured to hold the second component. The cavity of the first component may be configured, such that the second component may be inserted into the cavity, preferably through the opening. The inner wall of the first component may line the cavity. The inner wall of the first component may enclose the cavity. The inner wall of the first component may define the empty space of the cavity. The cavity may be configured such that the second component may at least partially be in contact with the first component. The cavity of the first component may be upstream of a heating chamber. The cavity of the first component may be configured such that at locations at which the first component is in contact with the second component, airflow is blocked.

[0023] The second component may be configured to be moveable within the cavity. One or both of the first component and the second component may be configured to be rotatable with respect to each other, preferably within the cavity. At least one of the first component and the second component may be configured to be slidable with respect to the other of the first component and second component, preferably within the cavity. The second component may be configured to be insertable into the cavity through the opening of the cavity.

[0024] In a preferred embodiment, the first component comprises a hollow cylinder and the cavity and the second component may have a cylindrical shape of circular cross-section. This embodiment may provide a smoother transition between consecutive positions. As a result of the cylindrical shape of cavity and second component, the first component and the second component may be rotated more smoothly

with respect to each other. The risk of jamming between the first component and the second component may be reduced.

[0025] In a preferred embodiment, the inner wall of the first component, the cavity and the second component may have a cylindrical shape and a polygonal cross-section. The polygonal cross-section of one or both of inner wall of the first component and the cavity may be complementary to the polygonal cross-section of the second component. One or more of the edges of the polygonal cross-section of the second component may comprise a groove. One or more of the edges of the polygonal cross-section of inner wall of the first component may comprise a groove. In each consecutive position, each edge of the polygonal cross-section of the second component may abut an edge of the polygonal cross-section of the inner wall of the first component, such that the first component and the second component are temporarily locked with respect to each other in each consecutive position. In this preferred embodiment, pairs of abutted grooves may be precisely formed and aligned. In this preferred embodiment, the consumer may precisely and reliably move the first and second components between consecutive positions due to the temporary locking of the first and second component in each consecutive position. In this preferred embodiment, the risk that the first and second component move without intention with respect to each other may be reduced.

[0026] The airflow channel may be formed by at least a part of the first component and at least a part of the second component. The airflow channel may be formed by at least a part of the inner wall of the first component and at least a part of the outer wall of the second component. The airflow channel may be formed between at least a part of the inner wall of the first component and at least a part of the outer wall the second component. At least a part of the first component and at least a part of the second component may enclose at least a part of the airflow channel. The characteristics, such as the extension or mechanical properties, of the airflow channel may be adapted by the moving the first and second component relative to each other. The adaption of the characteristics of the airflow channel may put the user in a position to adjust the RTD of the aerosol-generating device, for example by moving the first component and second component relative to each other. The adjustment of the RTD of the aerosol-generating device may be achieved by providing an airflow channel formed from at least a part of the first component and at least a part of the second component.

[0027] The airflow channel may comprise an inner wall. The inner wall may comprise an inner surface. The inner wall of the airflow channel may enclose the airflow channel.

[0028] The inner wall of the airflow channel may be formed by at least a part of the first component, preferably of the inner wall of the first component and at least a part of the second component, preferably of the outer wall of the second component. The inner wall of the airflow channel may be partially defined by the first component, preferably by at least a part of the inner wall of the first component and partially defined by the second component, preferably by at least a part of the outer wall of the second component.

[0029] At least a part of the first component and at least a part of the second component may cooperate to form the airflow channel, such that the inner wall of the airflow channel has an essentially continuous inner surface. At least a part of the first component and at least a part of the second component may cooperate to form the airflow channel, such that the inner wall of the airflow channel comprises two or more essentially continuous inner surfaces. As used herein, an "essentially continuous surface" includes a surface formed by at least parts of two or more contacting components. An essentially continuous surface of the present application may also include the interface at the points of contact of the two or more contacting components. The airflow channel may be defined by one or more essentially continuous inner surfaces formed by at least a part of the first component, preferably at least a part of the inner wall of the first component and at least a part of the second component, preferably at least a part of the outer wall of the second component.

[0030] The airflow channel may comprise an inner surface. The surface of the inner wall of the airflow channel may correspond to an inner surface of the airflow channel.

[0031] The inner surface of the airflow channel may comprise at least a part of a surface of the first component, preferably a part of the inner wall of the first component and a least a part of a surface of the second component, preferably a part of the outer wall of the second component. The first component and the second component may cooperate to form the inner surface of the airflow channel. The inner surface of the airflow channel may be defined by at least part of the first component, preferably by at least a part of the surface of the inner wall of the first component and by at least part of the second component, preferably by at least a part of the surface of the outer wall of the second component.

[0032] The airflow channel may comprise an inner surface area. The surface area of the inner wall may correspond to the inner surface area of the airflow channel. The inner surface area of the airflow channel may be the combined surface areas of at least a part of the inner wall of the first component and at least a part of the outer wall of the second component.

[0033] The first component may form a first side surface of the airflow channel and the second component may form an opposing second side surface of the airflow channel. The first component and the second component may cooperate to form a lateral surface of the airflow channel. The first component and the second component may cooperate to form the airflow channel over the full length of the airflow channel.

[0034] The airflow channel may comprise an air inlet. The airflow channel may comprise an air outlet. The air inlet of the airflow channel and the air outlet of the airflow channel may be fluidly connected. The air inlet of the airflow channel and the air outlet of the airflow channel may define the endings of the airflow channel. The air inlet of the airflow channel may be upstream of the air outlet of the airflow channel. The air inlet of the airflow channel may be arranged at a location along the longitudinal axis of one or more of the aerosol-generating device, the first component, the second component and the cavity at which a transition to one or more essentially continuous surfaces formed by at least a part of the first and second components is arranged. The air outlet of the airflow channel may be arranged at a location along the longitudinal axis of one or more of the aerosol-generating device, the first component, the second component and the cavity at which a transition from one or more essentially continuous surfaces formed by at least a part of the first and second components is arranged. At least a part

of the first component, preferably at least a part of the inner wall of the first component and at least a part of the second component, preferably at least a part of the outer wall of the second component may cooperate to form one or both of the air inlet of the airflow channel and the air outlet of the airflow channel.

[0035] As used herein, a "length" of a body may be the longest dimension of the body. As used herein, a "length" of a body may be the dimension of the body along its longitudinal axis. The length of the airflow channel may be the spatial dimension of the airflow channel along the longitudinal axis of one more of aerosol-generating device, the first component, the second component and the cavity. The length of the airflow channel may be equal to the distance between the air inlet of the airflow channel and the air outlet of the airflow channel. The length of the airflow channel may the distance between upstream and downstream endings of the airflow channel.

[0036] The airflow channel may comprise one or more airflow conduits. The airflow conduit may be a part of the airflow channel. The airflow conduit may be cylindrical. The airflow conduit may have a circular cross-section. The airflow conduit may have a semi-circular cross-section. The airflow conduit may comprise an inner wall. The inner wall of the airflow conduit may line the airflow conduit. The inner wall of the airflow conduit may enclose the airflow conduit. The airflow conduit may comprise an inner surface. The inner surface of the airflow conduit may correspond to the surface of the inner wall of the airflow conduit. The airflow conduit may comprise an inner surface area. The airflow conduit may be defined by a single essentially continuous surface formed by at least a part of the inner wall of the first component and by at least a part of the outer wall of the second component.

[0037] At least a part of the first component, preferably at least a part of the inner wall of the first component and at least a part of the second component, preferably at least a part of the outer wall of the second component may cooperate to form one or more airflow conduits. The inner wall of the airflow conduit may be formed by at least a part of the first component, preferably at least a part of the inner wall of the first component and at least a part of the second component, preferably at least a part of the outer wall of the second component.

[0038] The inner surface area of the airflow channel may be the combined inner surface areas of one or more airflow conduits. The number of airflow conduits in the first position may be smaller than the number of airflow conduits in the second position. The airflow channel may comprise only a single airflow conduit in the first position. The airflow channel may comprise two or more airflow conduits in the second position. An airflow conduit may have a diameter of up to 1 mm. An airflow conduit may have a diameter of up to 0.5 mm

[0039] The cross-sectional area of the airflow channel may be the area of a cross-section across the airflow channel perpendicular to the longitudinal axis of one or more of the aerosol-generating device, the first component, the second component and the cavity. The cross-sectional area of the airflow channel may be the combined cross-sectional areas of the airflow conduits. The cross-sectional area of the airflow channel may be constant along the length of the airflow channel. The cross-sectional area of the airflow channel may vary along the length of the airflow channel.

[0040] The cross-sectional area of the airflow channel may be the area of a cross-section across the airflow channel perpendicular to the direction of the airflow.

[0041] The aerosol-generating device may comprise one or more air outlets. The air outlet of the aerosol-generating device may be arranged downstream of the airflow channel. Aerosol produced by the aerosol-generating device may exit the device through the air outlet of the device. The user may inhale aerosol produced by the aerosol-generating device through the air outlet.

[0042] The aerosol-generating device may comprise a mouth end. The mouth end may comprise the air outlet of the aerosol-generating device. The user may inhale aerosol produced by the aerosol-generating device at the mouth end.

[0043] The aerosol-generating device may comprise one or more air inlets. The air inlet of the aerosol-generating device may be arranged upstream of the airflow channel. Ambient air may enter the aerosol-generating device through the air inlet of the aerosol-generating device.

[0044] The airflow channel may be fluidly connected to the air outlet of the aerosol-generating device. The airflow channel may be fluidly connected to an air inlet of the aerosol-generating device. The airflow channel may fluidly connect the air inlet of the aerosol-generating device and the air outlet of the aerosol-generating device.

[0045] One or both of the first component and the second component may comprise an airflow-blocking element. The airflow blocking element may comprise a polymeric material. The airflow-blocking element may be arranged on the surface of one or both of the inner wall of the first component and the outer wall of the second component. The airflow-blocking element may be a layer between the inner wall of the first component and the outer wall of the second component. The airflow-blocking element may be layer of polymeric material arranged on the surface of one or both of the inner wall of the first component and the outer wall of the second component. The airflow-blocking element may line one or both of the inner wall of the first component and the outer wall of the second component. The airflow-blocking element may line the cavity. The airflow-blocking element may separate the first component from the second component. The inner wall of the first component and the outer wall of the second component may be in contact with each other by means of the airflow-blocking element.

[0046] The airflow-blocking element may be configured to block the airflow at locations at which the first component and the second component are in contact. The airflow-blocking element may be configured to block fluid communication between the air inlet of the airflow channel and the air outlet of the airflow channel at locations at which the first and second components are in contact. Usage of the airflow-blocking element may enhance the precision with which the RTD can be adjusted. The airflow-blocking element may reduce the risk of undesired airflows between the air inlet of the aerosol-generating device and the air outlet of the aerosol-generating device.

[0047] One or both of the inner wall of the first component and the outer wall of the second component may comprise a surface coating. The surface coating may provide one or both of the first component and the second component with a smooth surface. The surface coating may be fluid impermeable. The surface coating may be friction-reducing. The surface coating may comprise polytetrafluoroethylene (PTFE).

[0048] The surface coating may be configured to decrease friction, preferably kinetic friction between the inner wall of first component and the outer wall of the second component. Due to the surface coating, at least one of the first component and the second component may be moved more easily and more smoothly with respect to the other of the first component and the second component between different positions. Due to the surface coating, the risk that the first component and the second component get undesirably locked with respect to each other may be reduced.

[0049] One or both of the first component and the second component may be configured to be moveable with respect to the other of the first component and the second component between at least the first position, the second position and a third position. The inner surface area of the airflow channel in the first position may be smaller than the inner surface area of the airflow channel in the second position. The inner surface area of the airflow channel in the second position may be smaller than the inner surface area of the airflow channel in the third position. The cross-sectional area of the airflow channel in the first position, second position and third position may remain unchanged.

[0050] The number of airflow conduits in the second position may be smaller than the number of airflow conduits in the third position. The airflow channel may comprise four or more airflow conduits in the third position. All airflow conduits may have a semi-circular cross-section in the third position.

[0051] The first component, preferably the inner wall of the first component may comprise at least one groove, such as to form a first part of the airflow channel. The second component, preferably the outer wall of the second component may comprise at least one groove, such as to form a second part of the airflow channel. The groove of first component may be a depression of the surface of the inner wall of the first component. The groove of second component may be a depression of the surface of the outer wall of the second component. The depression of the surface may be approximately 0.5 mm deep. The groove of the first component may comprise an end wall. The end wall may be arranged at a downstream end of the groove. The end wall of the groove of the first component may be formed by a part of the first component. The groove of the first component may run parallel to the longitudinal axis of the first component. The groove of the second component may run parallel to the longitudinal axis of the second component. The groove of the second component may extend along the entire length of the second component. The groove of the first component may extend along at least a part of the length of the first component. The groove of one or both of the first component and second component may have a semi-circular cross-section.

[0052] The groove of the first component and the groove of the second component may each form an airflow conduit. The groove of the first component and the groove of the second component may cooperate to form a single airflow conduit in the first position. The groove of the first component and the groove of the second component may cooperate to form a pair of grooves. The groove of the first component and the groove of the second component may form two separate airflow conduits in the second position.

[0053] The first component may comprise multiple grooves, such that each groove forms a part of the airflow channel. The second component may comprise multiple grooves, such that each groove forms a part of the airflow channel. The first component and the second component may each comprise the same number of grooves. The first component and the second component may each comprise at least two grooves. Preferably, the first component and the second component may each comprise at least three grooves. More preferably, the first component and the second component may each comprise at least five grooves. Each pair of grooves may form a separate airflow conduit. Each groove may form an airflow conduit.

[0054] In the first position, each groove of the first component may abut one groove of the second component to form a pair of abutted, fluidly communicating grooves. In each consecutive position the number of pairs of grooves may be consecutively reduced by one pair of grooves. An abutted pair of grooves may form a single airflow conduit. An abutted pair of grooves may form a cylindrical airflow conduit, preferably having a circular cross section. The abutted pair of grooves may have a diameter of up to 1 mm. The number of airflow conduits in the first position may be equal to the number of pairs of abutted grooves. In each consecutive position, the number of airflow conduits may be increased by two. In an abutted pair of grooves, the two pair-forming grooves may be arranged adjacent to each other. To form an abutted pair of grooves, the first component and the second component may be arranged such that the pair-forming grooves face each other. The grooves of an abutted pair of grooves form an essentially continuous surface.

[0055] The provision of multiple grooves and airflow conduits, respectively, allows the user to adjust the RTD consistently and in easily reproducible increments. The provision of multiple grooves and airflow conduits allows the user to adjust the RTD in well defined, discrete steps. The provision of multiple grooves and airflow conduits allows the user to accurately adjust the RTD.

[0056] The aerosol-generating device may comprise a heating chamber. The heating chamber may be arranged downstream of the RTD modifying element. The heating chamber may abut the RTD modifying element. The heating chamber may be in fluid communication with the RTD modifying element. The heating chamber may be in fluid communication with the air outlet of the aerosol-generating device. The heating chamber may comprise a heating element. The heating element may be arranged in or around the heating chamber. An aerosol-generating article may be inserted by the heating chamber. An aerosol-generating article inserted into heating chamber may be heated by the heating element. An aerosol-generating article may comprise an aerosol-forming substrate.

[0057] One or both of the first component and the second component may be configured to be moveable, preferably slidable, with respect to the other of the first component and the second component along a longitudinal axis of one or more of the aerosol-generating device, the first component and the second component.

[0058] The length of the airflow channel in each consecutive position may be larger than the length of the airflow channel in the previous position. In other words, the length of the airflow channel in one of the first position and the second position may be larger than the length of the airflow channel in the other of the first position and the second position. The length of the airflow channel may be changed by sliding the second component relative to the first com-

ponent. The length of the airflow channel may be reduced when the second component is slid upstream or downstream relative to the first component. The second component may be slid downstream relative to the first component to move from the first position to the second position.

[0059] In an embodiment, first and second component may be slidable, but not rotatable with respect to each other. In this embodiment, only the first component, but not the second component may comprise the at least one groove.

[0060] The aerosol-generating device may comprise at least one air outlet channel. The first component and the second component may cooperate to at least partially form the air outlet channel. The air outlet channel may be arranged downstream of the airflow channel. The airflow channel and the air outlet channel may be in fluid communication with each other. The size of the air outlet channel in the first position may be larger than the size of the air outlet channel in the second position.

[0061] The air outlet channel may abut the air outlet of the airflow channel. The air outlet channel may be downstream of the air outlet of the airflow channel. The size of the air outlet channel may refer to the spatial dimensions of the air outlet channel. The size of the air outlet channel may refer to the distance between a part of the first component and a part of the second component. The size of the air outlet channel may refer to the spatial extent of the most restricted part of the air outlet channel. Each airflow conduit may abut an air outlet channel. Each groove of one or both of the first component and the second component may abut an air outlet channel. In embodiments comprising multiple airflow conduits, the size of each air outlet channel may be reduced in consecutive positions.

[0062] The first component and the second component may be configured to be movable with respect to each other, such that in consecutive positions, a part of the airflow channel is blocked. The airflow channel may be blocked by a part of the first component. The airflow channel may be blocked by an end wall of a groove of the first component. The grooves of the first component may be of different lengths. The end wall of each of a multitude of grooves of the first component may positioned at different locations along the longitudinal axis of the first component.

[0063] At least one of the first component and the second component may be configured to be movable with respect to the other of the first component and the second position to an ultimate position, such that in the ultimate position the airflow channel is fully blocked. The first component may be configured to fully block the airflow channel in the ultimate position. The airflow channel may be blocked by the end walls of the one or more grooves of the first component. In the ultimate position the airflow through all airflow conduits may be blocked. A fully blocked airflow channel may prevent fluid communication between the air inlet of the device and the air outlet of the device and a controller.

[0064] In an embodiment there is provided an aerosol-generating device comprising the above-described resistance-to-draw modifying element and a housing.

[0065] In another aspect of the invention, there is provided an aerosol-generating system comprising an aerosol-generating device according to the description herein and one or more aerosol-generating articles configured to be received in the cavity of the aerosol-generating device. During operation, an aerosol-generating article containing aerosol-forming substrate may be partially received within the aerosol-generating device. The aerosol-generating system may include additional components, such as for example a charging unit for recharging an on-board electric power supply in an electrically operated or electric aerosol-generating device.

[0066] In another aspect, the invention relates to a method for controlling the RTD of an aerosol-generating device as described herein. The method comprises the step of moving one or more of the first component and the second component between a first position and a second position.

[0067] Resistance to draw is also known as draft resistance, draw resistance, puff resistance or puffability, and is the pressure required to force air through the full length of the object under test at the rate of 17.5 ml/see at 22° C. and 760 Torr (101 kPa). It is typically expressed in units of mmH20 and is measured in accordance with ISO 6565: 2015. The aerosol-forming article and the aerosol-generating device advantageously together provide an RTD of between 80 and 120 mmH20 through the first and second airflow channels. This approximates the RTD of a conventional cigarette. The aerosol-generating device, without an aerosol-forming article coupled to it, may advantageously have an RTD of between 5 and 20 mmH20. The aerosol-forming article in isolation may have an RTD of between 40 and 80 mmH20.

[0068] The modification of the RTD of the present invention is based on a modification of the inner surface area of the airflow channel. Enlarging the surface area of the airflow channel may increase the RTD. Without being bound to any theory, enlarging the surface area of the airflow channel may increase the friction air experiences while flowing through the airflow channel thereby increasing the RTD. The principle behind such modification of the RTD may be rationalized by the Darcy-Weisbach equation. The Darcy-Weisbach equation provides a relation between the pressure drop (dp) per unit length (I) of a fluid flowing in the airflow channel and the wetted perimeter (P) of the airflow channel. The pressure drop reflects the energy losses due to friction between the flowing fluid and the walls of the airflow channel:

$$\frac{dp}{dl} = \frac{1}{8} f_D \mu v^2 \frac{P}{A}$$

[0069] Herein, f_D is the Darcy friction factor, μ is the density of the fluid, v is the mean flow velocity of the fluid, A is the cross section of the airflow channel and P is the wetted perimeter. In the context of aerosol-generating devices and aerosol-generating systems, it may be approximated that f_D, μ and v are constant for a particular aerosol-generating device or system. As outlined above, the cross-sectional area of the airflow channel remains unchanged when moving between the different positions. Hence, in the context of the present invention, A may be also be assumed to be constant. Accordingly, above equation may be rewritten as

$$\frac{dp}{dl} = CP$$

[0070] Herein, C is equal to foμv^2/8A and hence approximately constant. Accordingly, the pressure drop dp is

directly proportional to the wetted perimeter P. The pressure drop dp is approximately equal to the RTD of the aerosol-generating device. An increase in the wetted perimeter hence results in an increase of dp and in an increase of the RTD of the device. Furthermore, an increase of the length di of the airflow channel results in an increased pressure drop dp and hence an increase RTD.

[0071] In the invention, a change of the wetted perimeter and hence of dp may be achieved by rotating the second component within the first component between the first, second and further positions. Furthermore, a change of the length of the airflow channel and hence of dp may be achieved by sliding the second component within the first component between the first, second and further positions. The RTD is further increased by blocking one or all of the grooves and air conduits of the device. This may be a result of the higher airflow velocity induced by the blockage of the grooves and air conduits.

[0072] The contribution of the device to the overall RTD of the system may be greater than the contribution by the aerosol-generating article. Hence, the resistance-draw of the system may mainly be determined by the RTD of the device. The RTD modifying element may hence put the user in a position to effectively adjust the RTD of the device and system.

[0073] The RTD obtained by using the RTD modifying element is stable and consistent from one aerosol-generating article to the other because it is directly related to the mechanically determined configuration of the airflow channel of the device.

[0074] The device of the present invention may achieve an increase of the RTD of up to 64% in increments.

[0075] The stable RTD obtained by using the RTD modifying element may also improve the stability of the delivery level.

[0076] The RTD modifying element allows the user to adapt the RTD and the delivery level according to the user's individual needs.

[0077] The aerosol-generating device of the present invention is configured to heat the aerosol-forming substrate to a temperature below a combustion temperature of the aerosol-forming substrate, but at or above a temperature at which one or more volatile compounds of the aerosol-forming substrate are released to form an inhalable aerosol.

[0078] The heating element may be in contact with the aerosol-gorming substrate. The portion of the heating element, which is in contact with the aerosol-forming substrate is heated as a result of the electrical current passing through the heating element. The current is supplied by a battery. In one embodiment, this portion of the heating element is configured to reach a temperature of between about 200° C. and about 350° C. in use. Preferably, the heating element is configured to reach a temperature of between about 250° C. and about 300° C.

[0079] As used herein, an 'aerosol-generating device' relates to a device that interacts with an aerosol-forming substrate to generate an aerosol. The aerosol-forming substrate may be part of an aerosol-generating article. An aerosol-generating device may interact with an aerosol-forming substrate of an aerosol-generating article to generate an aerosol that is directly inhalable into a user's lungs thorough the user's mouth. An aerosol-generating device may be a holder. The device may be electrically heated. The aerosol-generating device may comprise a housing, electric circuitry, a power supply, a heating chamber and a heating element. The housing may comprise the air inlet of the aerosol-generating device.

[0080] The device is preferably a portable or handheld device that is comfortable to hold between the fingers of a single hand. The device may be substantially cylindrical in shape and has a length of between 70 and 120 mm. The maximum diameter of the device is preferably between 10 and 20 mm. In one embodiment the device has a polygonal cross section and has a protruding button formed on one face. In this embodiment, the diameter of the device is between 12.7 and 13.65 mm taken from a flat face to an opposing flat face; between 13.4 and 14.2 taken from an edge to an opposing edge (i.e., from the intersection of two faces on one side of the device to a corresponding intersection on the other side), and between 14.2 and 15 mm taken from a top of the button to an opposing bottom flat face.

[0081] As used herein, the terms 'upstream', 'downstream', 'proximal', 'distal', 'front' and 'rear', are used to describe the relative positions of components, or portions of components, of the aerosol-generating device in relation to the direction in which a user draws on the aerosol-generating device during use thereof.

[0082] The aerosol-generating system may comprise a mouth end through which in use an aerosol exits the aerosol-generating system and is delivered to a user. The mouth end may also be referred to as the proximal end. In use, a user draws on the proximal or mouth end of the aerosol-generating system in order to inhale an aerosol generated by the aerosol-generating system. The aerosol-generating system comprises a distal end opposed to the proximal or mouth end. The proximal or mouth end of the aerosol-generating system may also be referred to as the downstream end and the distal end of the aerosol-generating system may also be referred to as the upstream end. Components, or portions of components, of the aerosol-generating system may be described as being upstream or downstream of one another based on their relative positions between the proximal, downstream or mouth end and the distal or upstream end of the aerosol-generating system.

[0083] As used herein, the term 'aerosol-generating article' refers to an article comprising an aerosol-forming substrate that is capable of releasing volatile compounds that can form an aerosol. For example, an aerosol-generating article may be an article that generates an aerosol that is directly inhalable into a user's lungs through the user's mouth. An aerosol-generating article may be disposable.

[0084] The aerosol-generating article may be substantially cylindrical in shape. The aerosol-generating article may be substantially elongate. The aerosol-generating article may have a length and a circumference substantially perpendicular to the length. The aerosol-generating article may be substantially rod shaped. The aerosol-forming substrate may be substantially cylindrical in shape. The aerosol-forming substrate may be substantially elongate. The aerosol-forming substrate may also have a length and a circumference substantially perpendicular to the length. The aerosol-forming substrate may be substantially rod shaped.

[0085] The aerosol-generating article may have a total length between approximately 30 mm and approximately 100 mm. The aerosol-generating article may have an external diameter between approximately 5 mm and approximately 12 mm. The aerosol-generating article may comprise a filter plug. The filter plug may be located at a downstream

end of the aerosol-generating article. The filter plug may be a cellulose acetate filter plug. The filter plug is approximately 7 mm in length in one embodiment, but may have a length of between approximately 5 mm to approximately 10 mm.

[0086] In one embodiment, the aerosol-generating article has a total length of approximately 45 mm. The aerosol-generating article may have an external diameter of approximately 7.2 mm. Further, the aerosol-forming substrate may have a length of approximately 10 mm. Alternatively, the aerosol-forming substrate may have a length of approximately 12 mm. Further, the diameter of the aerosol-forming substrate may be between approximately 5 mm and approximately 12 mm. The aerosol-generating article may comprise an outer paper wrapper. Further, the aerosol-generating article may comprise a separation between the aerosol-forming substrate and the filter plug. The separation may be approximately 18 mm, but may be in the range of approximately 5 mm to approximately 25 mm.

[0087] As used herein, the term 'aerosol-forming substrate' relates to a substrate capable of releasing volatile compounds that can form an aerosol. Such volatile compounds may be released by heating the aerosol-forming substrate. An aerosol-forming substrate may conveniently be part of an aerosol-generating article.

[0088] The aerosol-forming substrate may be a solid aerosol-forming substrate. Alternatively, the aerosol-forming substrate may comprise both solid and liquid components. The aerosol-forming substrate may comprise a tobacco-containing material containing volatile tobacco flavour compounds which are released from the substrate upon heating. Alternatively, the aerosol-forming substrate may comprise a non-tobacco material. The aerosol-forming substrate may further comprise an aerosol former that facilitates the formation of a dense and stable aerosol. Examples of suitable aerosol formers are glycerine and propylene glycol.

[0089] In any of the aspects of the disclosure, the heating element may comprise an electrically resistive material. Suitable electrically resistive materials include but are not limited to: semiconductors such as doped ceramics, electrically "conductive" ceramics (such as, for example, molybdenum disilicide), carbon, graphite, metals, metal alloys and composite materials made of a ceramic material and a metallic material. Such composite materials may comprise doped or undoped ceramics. Examples of suitable doped ceramics include doped silicon carbides. Examples of suitable metals include titanium, zirconium, tantalum platinum, gold and silver. Examples of suitable metal alloys include stainless steel, nickel-, cobalt-, chromium-, aluminium-titanium-zirconium-, hafnium-, niobium-, molybdenum-, tantalum-, tungsten-, tin-, gallium-, manganese-, gold- and iron-containing alloys, and super-alloys based on nickel, iron, cobalt, stainless steel, Timetal® and iron-manganese-aluminium based alloys. In composite materials, the electrically resistive material may optionally be embedded in, encapsulated or coated with an insulating material or vice-versa, depending on the kinetics of energy transfer and the external physicochemical properties required.

[0090] As described, in any of the aspects of the disclosure, the heating element may be part of the aerosol-generating device. The aerosol-generating device may comprise an internal heating element or an external heating element, or both internal and external heating elements, where "internal" and "external" refer to the aerosol-forming substrate. An internal heating element may take any suitable form. For example, an internal heating element may take the form of a heating blade. Alternatively, the internal heater may take the form of a casing or substrate having different electro-conductive portions, or an electrically resistive metallic tube. Alternatively, the internal heating element may be one or more heating needles or rods that run through the center of the aerosol-forming substrate. Other alternatives include a heating wire or filament, for example a Ni—Cr (Nickel-Chromium), platinum, tungsten or alloy wire or a heating plate. Optionally, the internal heating element may be deposited in or on a rigid carrier material. In one such embodiment, the electrically resistive heating element may be formed using a metal having a defined relationship between temperature and resistivity. In such an exemplary device, the metal may be formed as a track on a suitable insulating material, such as ceramic material, and then sandwiched in another insulating material, such as a glass. Heaters formed in this manner may be used to both heat and monitor the temperature of the heating elements during operation.

[0091] An external heating element may take any suitable form. For example, an external heating element may take the form of one or more flexible heating foils on a dielectric substrate, such as polyimide. The flexible heating foils can be shaped to conform to the perimeter of the substrate receiving cavity. Alternatively, an external heating element may take the form of a metallic grid or grids, a flexible printed circuit board, a molded interconnect device (MID), ceramic heater, flexible carbon fibre heater or may be formed using a coating technique, such as plasma vapour deposition, on a suitable shaped substrate. An external heating element may also be formed using a metal having a defined relationship between temperature and resistivity. In such an exemplary device, the metal may be formed as a track between two layers of suitable insulating materials. An external heating element formed in this manner may be used to both heat and monitor the temperature of the external heating element during operation.

[0092] The heating element advantageously heats the aerosol-forming substrate by means of conduction. The heating element may be at least partially in contact with the substrate, or the carrier on which the substrate is deposited. Alternatively, the heat from either an internal or external heating element may be conducted to the substrate by means of a heat conductive element.

[0093] As an alternative to an electrically resistive heating element, the heating element may be configured as an induction heating element. The induction heating element may comprise an induction coil and a susceptor. In general, a susceptor is a material that is capable of generating heat, when penetrated by an alternating magnetic field. When located in an alternating magnetic field.

[0094] When an induction heating element is employed, the induction heating element may be configured as an internal heating element as described herein or as an external heater as described herein. If the induction heating element is configured as an internal heating element, the susceptor element is preferably configured as a pin or blade for penetrating the aerosol-generating article. If the induction heating element is configured as an external heating element, the susceptor element is preferably configured as a cylindrical susceptor at least partly surrounding the cavity or forming the sidewall of the cavity.

[0095] During operation, the aerosol-forming substrate may be completely contained within the aerosol-generating device. In that case, a user may puff on a mouth end of the aerosol-generating device. Alternatively, during operation a aerosol-generating article containing the aerosol-forming substrate may be partially contained within the aerosol-generating device. In that case, the user may puff directly on the aerosol-generating article.

[0096] Features described in relation to one embodiment may equally be applied to other embodiments of the invention.

[0097] The invention will be further described, by way of example only, with reference to the accompanying drawings in which:

[0098] FIG. **1** shows a part of an embodiment of an aerosol-generating device of the invention.

[0099] FIG. **2** shows an embodiment of a resistance-to-draw modifying element of the invention. FIG. **2***a* shows a 2/3 view of the element, while FIG. **2***b* shows a cross-section through the element perpendicular to the longitudinal axis of the second component.

[0100] FIG. **3** shows a cross-section through an embodiment of a resistance-to-draw modifying element of the invention comprising an airflow channel with multiple airflow conduits in a first and a second position.

[0101] FIG. **4** shows a part of an embodiment of an aerosol-generating device of the invention in a first and second position.

[0102] FIG. **5** shows an embodiment of a resistance-to-draw modifying element of the invention comprising a slidable second component in two positions.

[0103] FIG. **6** shows a part of an embodiment of the aerosol-generating device of the invention comprising a slidable second component in a first and an ultimate position.

[0104] FIG. **7** shows cross-section through an embodiment of a resistance-to-draw modifying element of the invention comprising two large grooves in different positions.

[0105] FIG. **1** shows an embodiment of the aerosol-generating device **10** of the invention. The device **10** comprises a resistance-to-draw modifying element **12**. The device comprises a heating chamber **14**. The heating chamber **14** is configured to receive an aerosol-generating article **16**. An aerosol-generating article **16** comprising an aerosol-forming substrate is shown inserted into the heating chamber **14**. The aerosol-generating device **10** comprises a longitudinal axis (dotted line).

[0106] The RTD modifying element **12** comprises a first component **18** and a second component **20**. The first component **18** holds the heating chamber **14**. The first component **18** is configured cylindrical. The first component **18** comprises a hollow cylinder. The first component **18** comprises an outer wall **22** and an inner wall **24**. The first component **18** comprises at least one groove (not shown). The outer wall **22** is the outer layer of the device **10**. The outer wall **22** forms the exterior of the device **10**. The inner wall **24** encloses a cavity. The cavity holds the second component **20**.

[0107] The second component **20** is configured as a cylindrical rod. The second component **20** comprises at least one groove **28**. The groove **28** extends along the longitudinal axis of the aerosol-generating device **10**. The groove **28** extends along the entire length of the second component **20**. The second component **20** abuts the heating chamber **14**. The second component **20** is configured to be rotatable with respect to the first component **18**.

[0108] The first and second components **18**, **20** cooperate to form an airflow channel. The groove of the first component **18** and the groove **28** of the second component **20** form the airflow channel. The airflow channel is fluidly connected to the heating chamber **14**.

[0109] The groove **28** of the second component **20** can be moved relative to the first component **18** by rotating the second component **20** between a first and a second position. By moving of the groove **28** of the second component **20** relative to the first component **18** from the first position to the second position, the inner surface area of the airflow channel is increased, while the cross-sectional area of the airflow channel remains unchanged. In this way the RTD is increased by moving from the first position to the second position.

[0110] In use, the consumer draws on the device **10** at a downstream end of the article **16**. The arrows in FIG. **1** show the direction of the airflow through the device **10**. Air entering the device **10** is drawn through the grooves **28** of the first and second components **18**, **20** into the heating chamber **14** and through the aerosol-generating article **16** into the mouth of the consumer at the downstream end of the article **16**.

[0111] FIG. **2** shows a part of the RTD modifying element **12** of the invention. FIG. **2***a* shows a 2/3 view of the element **12**. The element **12** comprises the first component **18** and the second component **20**. A part of the first component **18** surrounding the second component **20** has been removed in order to provide an unrestricted view of the second component **20**. The second component comprises an outer wall **26**. Both, the first and the second components **18**, **20** are shown with a single groove **28**. The arrow indicates the direction of flow of the airflow through the airflow channel. The grooves **28** are both of cylindrical shape and have a semi-circular cross section.

[0112] The element **12** illustrated on the left-hand side of FIG. **2***a* shows a configuration in which the groove **28** of the first component **18** abuts the groove **28** of the second component **20**. This configuration corresponds to a first position. The two grooves **28** together form a single airflow conduit. The two grooves **28** form an airflow conduit with an essentially continuous inner surface. The inner surface of the airflow conduit corresponds to the inner surface of the airflow channel. The surface area of the inner surface of the airflow channel corresponds to the inner surface area of the airflow channel. The element **12** shown on the left-hand side of FIG. **2***b* shows the same configuration of the element **12** in a cross-sectional view.

[0113] The element **12** illustrated on the right-hand side of FIG. **2***a* shows a configuration in which the groove **28** of the second component **20** is offset from the groove **28** of the first component **18**. This corresponds to a second position. The configuration shown on the right-hand side of FIG. **2***a* can be obtained, starting from the configuration shown on the left-hand side of FIG. **2***a*, by rotating the second component **20** relative to the first component **18** in a clockwise direction (indicated by the curved arrow on the second component).

[0114] The groove **28** of the first component **18** is part of a first airflow conduit. The groove **28** of the second component **20** is part of a second airflow conduit. The inner surface of the first airflow conduit is formed from the surface area of the groove **28** of the first component **18** and the

surface area of a part of the outer wall of the second component **20** abutting the groove **28** of the first component **18**. The inner surface of the second airflow conduit is formed from the surface area of the groove **28** of the second component **20** and the surface area of a part of the inner wall of the first component **18** abutting the groove **28** of the first component **18**. The airflow channel is formed by both the first and second airflow conduit. As indicated by the arrows at the grooves, air can flow through both airflow conduits. The inner surface area of the airflow channel is the combined surface area of the first and second airflow conduits.

[0115] In the configuration shown on the right-hand side of FIG. **2***a*, the surface area of the airflow channel is greater than in the configuration shown on the left-hand side of FIG. **2***a*. The increase in the surface area is equal to the surface area of the part of the second component **20** abutting the groove **28** of the first component **18** and the surface area of the part of the first component **18** abutting the groove **28** of the second component **20**. The right-hand side of FIG. **2***b* shows the same configuration of the element **12** in the second position in a cross-sectional view. Due to the increase of the surface area of the airflow channel, the RTD is increased in the second position in comparison with the first position.

[0116] FIG. **3** shows an embodiment of the RTD modifying element **12** in which the first component **18** and the second component **20** each comprise a multitude of grooves **28**. More precisely, the first component **18** and second component **20** are each shown to have five grooves **28**. The element **12** shown on the left-hand side of FIG. **3** shows the element **12** in an initial configuration corresponding to the first position. In the first position, each groove **28** of the first component **18** abuts a groove **28** of the second component **20**. Hence, five pairs of abutted grooves **28** are formed. The airflow channel is formed by the five pairs of abutted grooves **28**. The five pairs of abutted grooves **28** each form an airflow conduit. In this configuration, the inner surface area of the airflow channel is the sum of the surface areas of the five grooves **28** of the first component **18** and the surface areas of the five grooves **28** of the second component **20**.

[0117] In use, the second component **20** may be rotated relative to the first component **18**. In the present embodiment, the second component **20** is rotated clockwise as indicated by the curved arrow on the second component **20**.

[0118] The element **12** shown on the right-hand side of FIG. **3** shows the configuration of the element **12** in the second position resulting from the rotation. In this configuration, four grooves **28** of the first component **18** abut four grooves **28** of the second component **20** to form four pairs of abutted grooves **28**. This configuration comprises two unpaired grooves **28**. The four pair of abutted grooves **28** and two unpaired grooves **28** together form the airflow channel. The four pair of abutted grooves **28** and two unpaired grooves **28** form six airflow conduits. In this configuration, the inner surface area of the airflow channel is the combined surface area of the five grooves **28** of the first component **18**, the five grooves **28** of the second component **20**, the surface area of the part of the first component **18** abutting the unpaired groove **28** of the second component **20** and the surface area of the part of the second component **20** abutting the unpaired groove **28** of the first component **18**. The inner surface area of the airflow channel in the second position is hence increased relative to the inner surface area of the airflow channel in the first position by the surface area of the part of the first component **18** abutting the unpaired groove **28** of the second component **20** and the surface area of the part of the second component **20** abutting the unpaired groove **28** of the first component **18**. The increase surface area leads to an increase in the frictional force exerted by the surface of the airflow channel on the airflow through the airflow channel. The increased frictional force results in a higher pressure drop across the length of the airflow channel. Hence, the RTD of the airflow channel and hence of the aerosol-generating device **10** is increased by the augmentation of the inner surface area of the airflow channel.

[0119] Although not shown in FIG. **3**, the second component **20** can be further rotated clockwise to a third position. In the third position, the number of abutted pairs of grooves **28** is reduced to three pairs. By the same token, a further unpaired groove **28** of the first component **18** and a further unpaired groove **28** of the second component **20** are formed, giving a total of four unpaired grooves **28**. Accordingly, by rotating the second component **20** to a third position, the inner surface area of the airflow channel is further increased by the surface area of the part of the first component **18** abutting the second unpaired groove **28** of the second component **20** and the surface area of the part of the second component **20** abutting the second unpaired groove **28** of the first component **18**. The increase in the inner surface area of the airflow channel further increases the energetic losses resulting from frictional forces exerted by the inner surface of the airflow channel on the airflow through the airflow channel. This results in an increased pressure drop across the length of the airflow channel. Hence, the RTD of the device **10** is further increased in third position relative to the second position.

[0120] The second component **20** can further be rotated stepwise until in an ultimate position all five grooves **28** of the first component **18** and all five grooves **28** of the second component **20** are unpaired. In the ultimate position, the inner surface area of the airflow channel is maximised (corresponding to the surface area of ten grooves **28** and the corresponding part of the first and second components **18**, **20** abutting the respective unpaired groove **28**). In the ultimate position, the RTD of the aerosol-generating device **10** is maximised. In the ultimate position, the RTD is increased by approximately 64% compared to the first position. Each rotating step may increase the RTD by approximately 13%. The number of pairs of grooves **28** and the number of positions can be chosen appropriately depending upon the desired options of adjusting the RTD of the device.

[0121] FIG. **4** shows a part of an aerosol-generating device **10** of the invention. The left-hand side of FIG. **4** shows a transverse cross-section of the aerosol-generating device **10** through the RTD modifying element **12** and a cross-section through the aerosol-generating device **10** parallel to the longitudinal axis of the aerosol-generating device **10**. The first and second components **18**, **20** each have two grooves **28**. The grooves **28** extend along the whole length of the first and second components **18**, **20**, respectively. The RTD modifying element **12** is shown in a first position, in which both grooves **28** on the first component **18** are paired with a groove **28** of the second component **20**. The two pairs of abutted grooves **28** from the airflow channel.

[0122] The right-hand side of FIG. **4** shows a cross-section of the RTD modifying element **12** in a first position and a second position. In the first position, the element **12** com-

prises two pairs of abutted grooves **28**. In the second position, the element **12** comprises one pair of abutted grooves **28** and two unpaired grooves **28**. The second position is obtained by rotating the second component **20** relative to the first component **18**. As indicated by the curved, double-headed arrow, the element **12** can be moved back and forth between the first position and the second position.

[0123] FIG. **5** shows a part of an embodiment of the aerosol-generating device **10**. The second component **20** may be slid relative to the first component **18** along the longitudinal axis of the aerosol-generating device **10**. The left-hand side of FIG. **5** shows a configuration corresponding to a first position. The second component **20** is offset relative to the first component **18** in an upstream direction. The airflow channel is formed by a part of the inner wall **24** of the first component **18** and a part of the outer wall of the second component **20**. The airflow channel has a certain length **30**. The first component **18** comprises two grooves **28**. The two grooves **28** are arranged opposite each other on the inner wall **24** of the first component **18**. A part of the two grooves **28** of the first component **18** define the airflow channel of the aerosol-generating device **10** together with the groove-abutting part of the second component. The airflow channel begins at the location along the longitudinal axis of the aerosol-generating device **10** at which at the upstream end of the first component **18** is arranged. The airflow channel ends at the location along the longitudinal axis of the aerosol-generating device **10** at which the downstream end of second component **20** is arranged.

[0124] The aerosol-generating device **10** comprises an air outlet channel **32**. The air outlet channel **32** abuts the heating chamber **14**.

[0125] An aerosol-generating article **16** is shown inside the heating chamber **14**. In use, the user draws air into device **10**. The air flows through the airflow channel and then through the air outlet channel **32** into the heating chamber **14** with the aerosol-generating article **16**. The direction of airflow is indicated by the arrows. Aerosol formed from an aerosol-generating substrate of the aerosol-generating article **16** then enters the users mouth through the mouth end of the aerosol-generating device **10**.

[0126] Both grooves **28** only extend partially along the length of the inner wall of first component **18**. The grooves **28** on the first component **18** are of different lengths. The upper groove **28** is longer than the lower groove **28**. The lower groove **28** ends at a location along the longitudinal axis of the second component **20** which is further upstream than the upper groove **28**.

[0127] The second component **20** may be slid relative to the first component **18** to a second position, such that the length **30** of the airflow channel is increased. By increasing the length **30** of the airflow channel, the inner surface area of the airflow channel is increased. Due to the larger inner surface area of the airflow channel, the frictional losses of the airflow due to interactions with the surface of the airflow channel are increased thereby leading to a higher RTD.

[0128] The right-hand side of FIG. **5** shows a configuration corresponding to a further position. This further position is obtained by sliding the second component **20** further downstream relative to the first component **18**, such that airflow through the lower groove **28** is blocked. The airflow through the lower groove **28** is blocked by the second component **20** and the end wall **34** of the lower groove **28**. The downstream end of the second component **20** is arranged at a location along the longitudinal axis of the device **10** which is further downstream than the end wall **34** of the lower groove **28** of the first component **18**, but is upstream of the end wall of the upper groove **28**. In this further position, air can still flow through the upper groove **28**. In this further position, the size of the air outlet channel is smaller than in the first position. In this further position, the resistance to draw is increased relative to the first position by increasing the length **30** of the airflow channel and by blocking the lower groove **28**.

[0129] In an ultimate position (not shown), the second component **20** is further slid downstream relative to the first component **18** until the first component **18** blocks the airflow through the upper groove **28** of the first component **18**. In this position, the second component **20** extends to a position along the longitudinal axis of the aerosol-generating device **10** which is further downstream than the end wall of the upper groove **28** of the first component **18**. In this ultimate position, airflow through the airflow channel is fully blocked.

[0130] FIG. **6** shows a part of an embodiment of the aerosol-generating device **10**. The device comprises a RTD modifying element **12** comprising a first component **18** with two grooves **28** on the inner wall **24** of the first component **18**. The second component **20** does not comprise grooves **28**. The left-hand side of FIG. **6** shows a transverse cross-section through the RTD modifying element **12**. The central part and right-hand side of FIG. **6** show a cross-section of **10** the aerosol-generating device **10** parallel to the longitudinal axis of the device **10**. The central part of FIG. **6** shows a configuration corresponding to the first position. The right-hand side of FIG. **6** shows a configuration corresponding to further position. The further position is obtained by sliding downstream the second component **20** relative to the first component **18**. In the further position, the airflow through the upper grooves **28** is blocked by the second component **20** and the end wall of the groove of first component **18**. In the further position, air can still exit the lower groove through a restricted air outlet channel.

[0131] FIG. **7** shows transverse cross-sections through an embodiment of the RTD modifying element **12** of the invention. The RTD modifying element **12** comprises a single groove **28** on the inner wall **24** of the first component **18** and a single groove **28** on the outer wall of the second component **20**. The groove **28** of the first component **18** extends across half of the surface of the inner wall **24** of the first component **18**. The groove **28** of the second component **20** extends across half of the surface of the outer wall of the second component **20**.

[0132] The left-hand part of FIG. **7** shows a configuration corresponding to the first position. In this position the grooves **28** of the first and second components **18**, **20** are aligned. The aligned pair of grooves **28** forms the airflow channel. The inner surface area of the airflow channel is equal to the surface areas of the grooves **28**

[0133] The right-hand part of FIG. **7** shows a configuration corresponding a further position. This position is obtained by rotating the second component **20** relative to the first component **18**. In this further position, the inner surface area of the airflow channel is increased by the surface area of the part of the inner wall **24** of the first component **18** that does not abut a part of the groove **28** of the second component **20** and the part of the outer wall of the second

component **20** that does not abut a part of the groove **28** of the first component **18**. The embodiment allows a stepless RTD modification by rotating the second component **20** in small increments.

1.-**16**. (canceled)

17. An aerosol-generating device, comprising:

a housing; and

a resistance-to-draw modifying element, the resistance-to-draw modifying element comprising:

a first component,

a second component, and

at least one airflow channel, wherein the first component and the second component cooperate to form the at least one airflow channel,

wherein at least one of the first component and the second component are configured to be moveable with respect to the other of the first component and second component between at least a first position and a second position,

wherein an inner surface area of the at least one airflow channel formed by the first component and the second component is smaller when the first component and the second component are in the first position than the inner surface area of the at least one airflow channel when the first component and the second component are in the second position, and

wherein a cross-sectional area of the at least one airflow channel in the first position and in the second position remains unchanged.

18. The aerosol-generating device according to claim **17**,

wherein the first component comprises a cavity, and

wherein the second component is configured to be moveable within the cavity.

19. The aerosol-generating device according to claim **17**, wherein one or both of the first component and the second component are configured to be rotatable with respect to each other.

20. The aerosol-generating device according to claim **17**,

wherein one or both of the first component and the second component are configured to be moveable with respect to the other of the first component and the second component between at least the first position, the second position, and a third position,

wherein the inner surface area of the at least one airflow channel in the first position is smaller than the inner surface area of the at least one airflow channel in the second position,

wherein the inner surface area of the at least one airflow channel in the second position is smaller than the inner surface area of the at least one airflow channel in the third position, and

wherein the cross-sectional area of the at least one airflow channel in the first position, second position and third position remains unchanged.

21. The aerosol-generating device according to claim **17**,

wherein the first component comprises at least one groove to form a first part of the at least one airflow channel, and

wherein the second component comprises at least one groove to form a second part of the at least one airflow channel.

22. The aerosol-generating device according to claim **17**,

wherein the first component comprises multiple grooves, such that each groove forms a part of the at least one airflow channel, and

wherein the second component comprises multiple grooves, such that each groove forms a part of the at least one airflow channel.

23. The aerosol-generating device according to claim **22**, wherein the first component and the second component each comprise the same number of grooves.

24. The aerosol-generating device according to claim **21**,

wherein in the first position, each groove of the first component abuts one groove of the second component to form a pair of abutted, fluidly communicating grooves, and

wherein in each consecutive position the number of pairs of grooves is consecutively reduced by one pair of grooves.

25. The aerosol-generating device according to claim **22**,

wherein in the first position, each groove of the first component abuts one groove of the second component to form a pair of abutted, fluidly communicating grooves, and

wherein in each consecutive position the number of pairs of grooves is consecutively reduced by one pair of grooves.

26. The aerosol-generating device according to claim **17**, wherein one or more of the first component, the cavity, and the second component have a cylindrical shape.

27. The aerosol-generating device according to claim **17**,

wherein the aerosol-generating device comprises a heating chamber,

wherein the heating chamber is arranged downstream of the resistance-to-draw modifying element, and

wherein the heating chamber abuts the resistance-to-draw modifying element.

28. The aerosol-generating device according to claim **17**, wherein one or both of the first component and the second component are configured to be moveable with respect to the other of the first component and the second component along a longitudinal axis of one or more of the aerosol-generating device, the first component, and the second component.

29. The aerosol-generating device according to claim **17**, wherein one or both of the first component and the second component are configured to be slidable with respect to the other of the first component and the second component along a longitudinal axis of one or more of the aerosol-generating device, the first component, and the second component.

30. The aerosol-generating device according to claim **28**, wherein a length of the at least one airflow channel in one of the first position and the second position is larger than a length of the at least one airflow channel in the other of the first position and the second position.

31. The aerosol-generating device according to claim **29**, wherein a length of the at least one airflow channel in one of the first position and the second position is larger than a length of the at least one airflow channel in the other of the first position and the second position.

32. The aerosol-generating device according to claim **28**,

wherein the aerosol-generating device comprises at least one air outlet channel,

wherein the first component and the second component cooperate to at least partially form the air outlet channel,

wherein the air outlet channel is arranged downstream of the at least one airflow channel, and

wherein a size of the air outlet channel in the first position is larger than a size of the air outlet channel in the second position.

33. The aerosol-generating device according to claim **32**, wherein the at least one airflow channel and the air outlet channel are in fluid communication with each other.

34. The aerosol-generating device according to claim **28**, wherein the first component and the second component are further configured to be movable with respect to each other, such that in consecutive positions, a part of the at least one airflow channel is blocked.

35. The aerosol-generating device according to claim **28**, wherein at least one of the first component and the second component are configured to be movable with respect to the other of the first component and the second position to an ultimate position, such that in an ultimate position the at least one airflow channel is fully blocked.

36. A method for controlling the resistance-to-draw of an aerosol-generating device according to claim **17**, the method comprising:

moving one or more of the first component and the second component between a first position and a second position.

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