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(54) **FLAVOR INHALER AND FLAVOR INHALATION SYSTEM**

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CPC ***A24F 40/46*** (2020.01); ***A24D 1/20*** (2020.01); *A24F 40/20* (2020.01)

(57) **ABSTRACT**

Provided is a flavor inhaler. This flavor inhaler comprises a housing portion that houses at least a portion of a consumable material, and a heating portion that is inserted into the consumable material housed in the housing portion and heats the consumable material from the interior thereof, wherein the heating portion causes the outer shape of the consumable material, when inserted into the housing portion, to deform according to the shape of the heating portion.

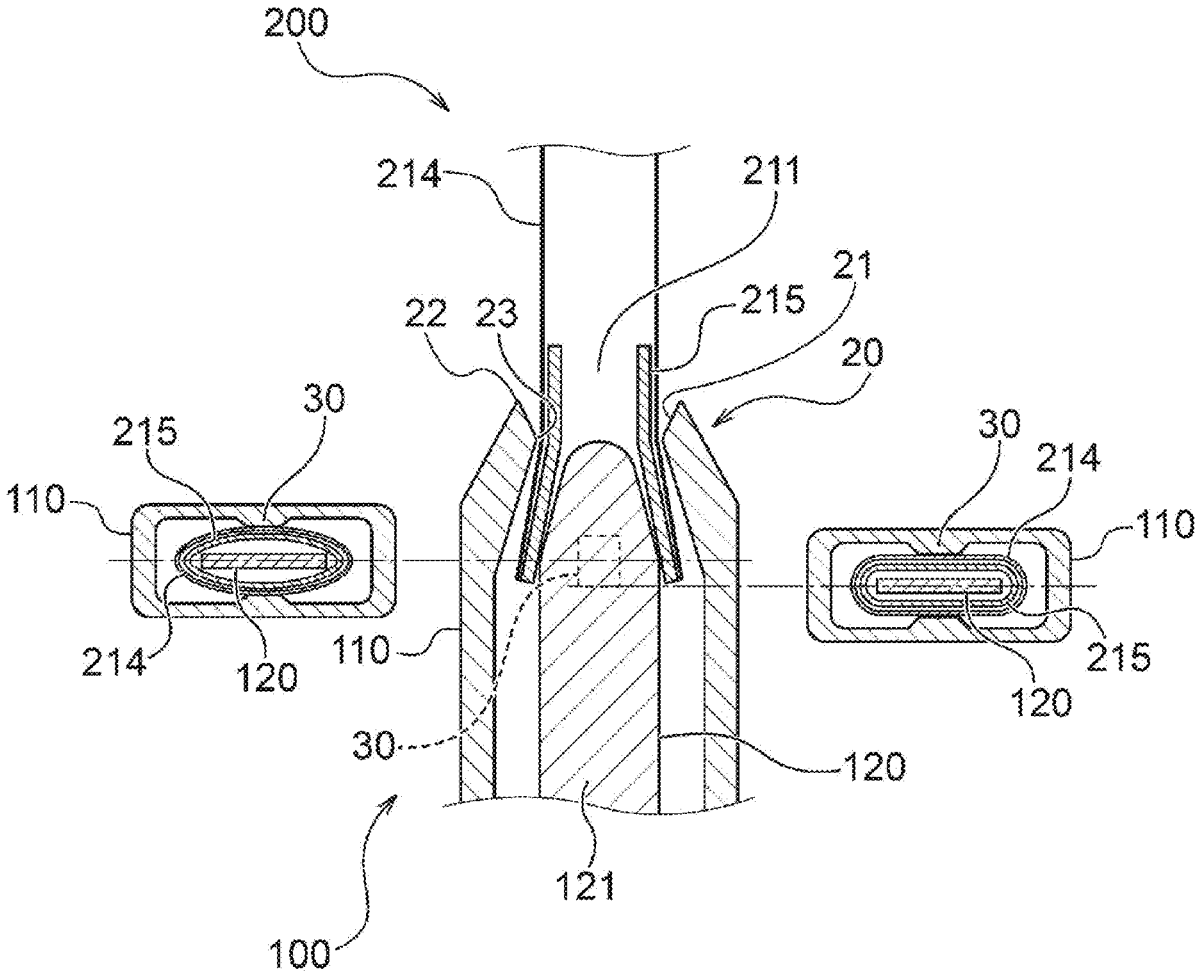


Fig. 1

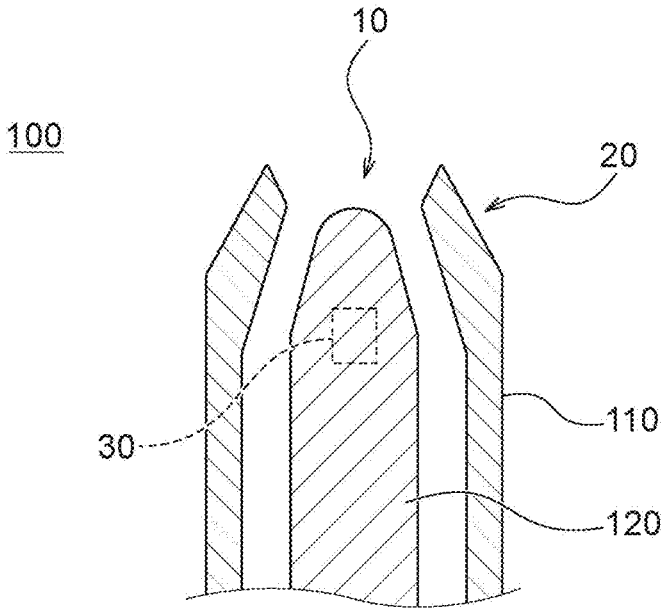


Fig. 2

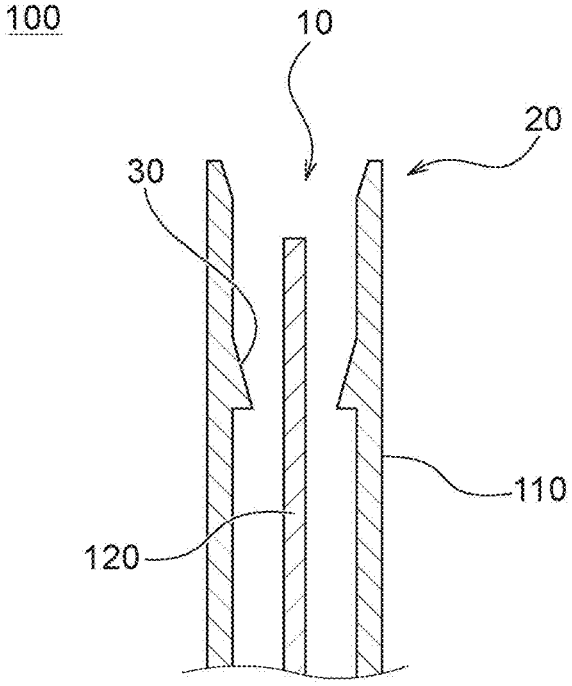


Fig. 3

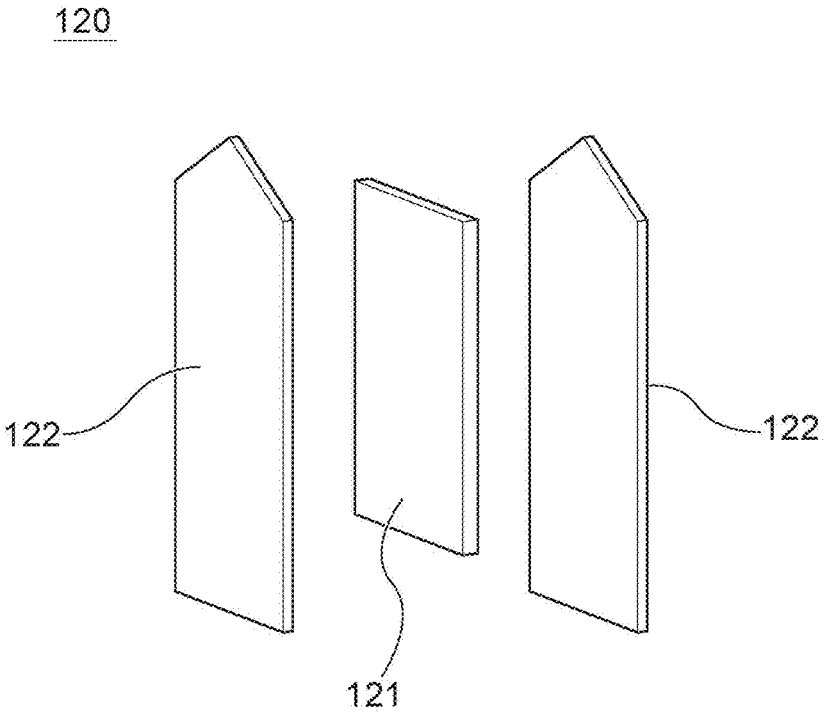


Fig. 4

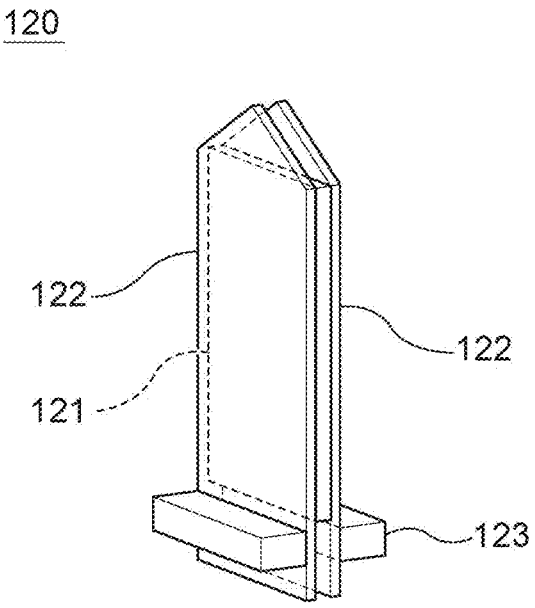


Fig. 5

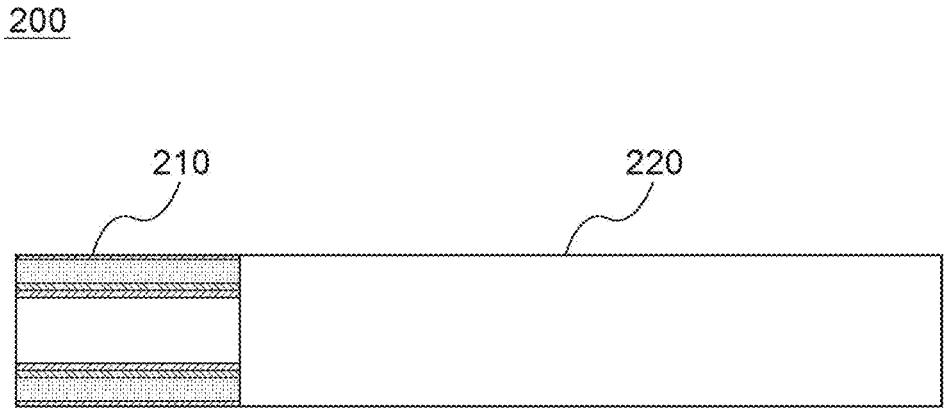


Fig. 6

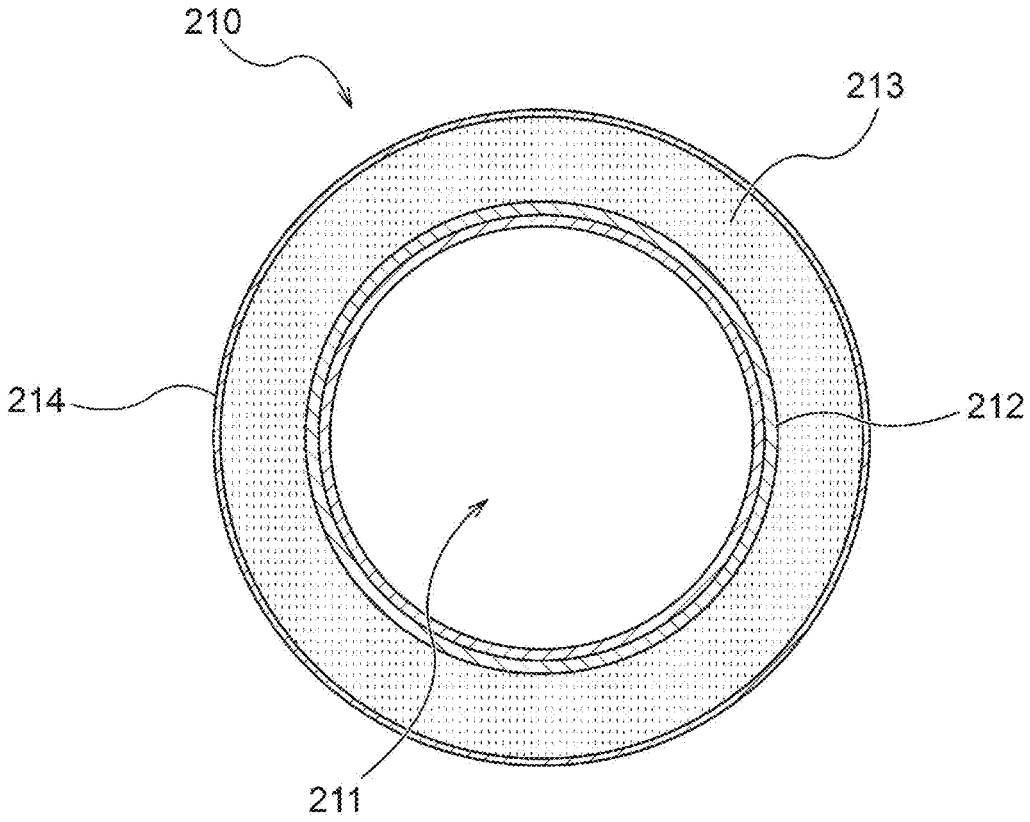
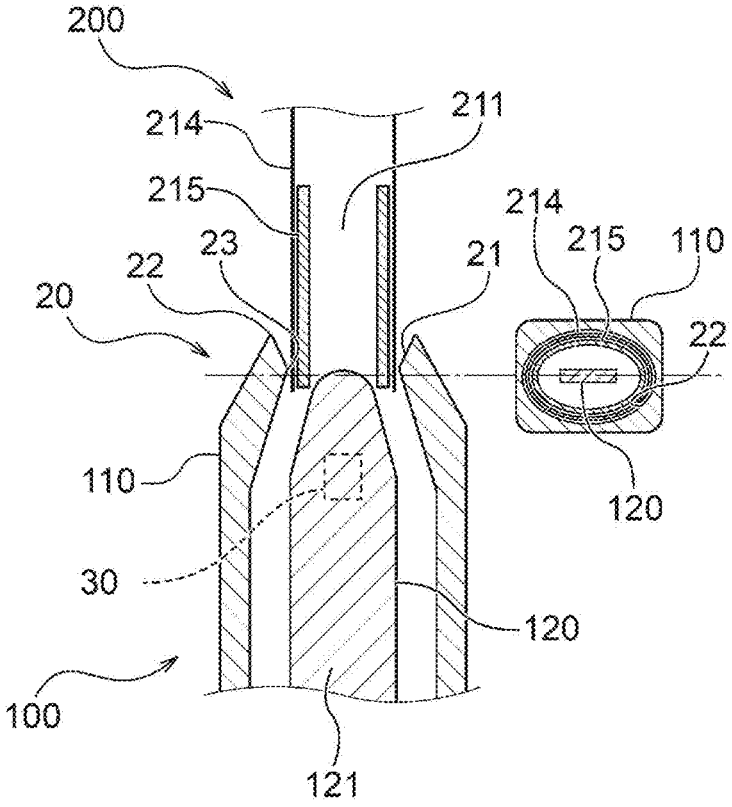


Fig. 7


200
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22
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120
30
120
100
121

Fig. 8

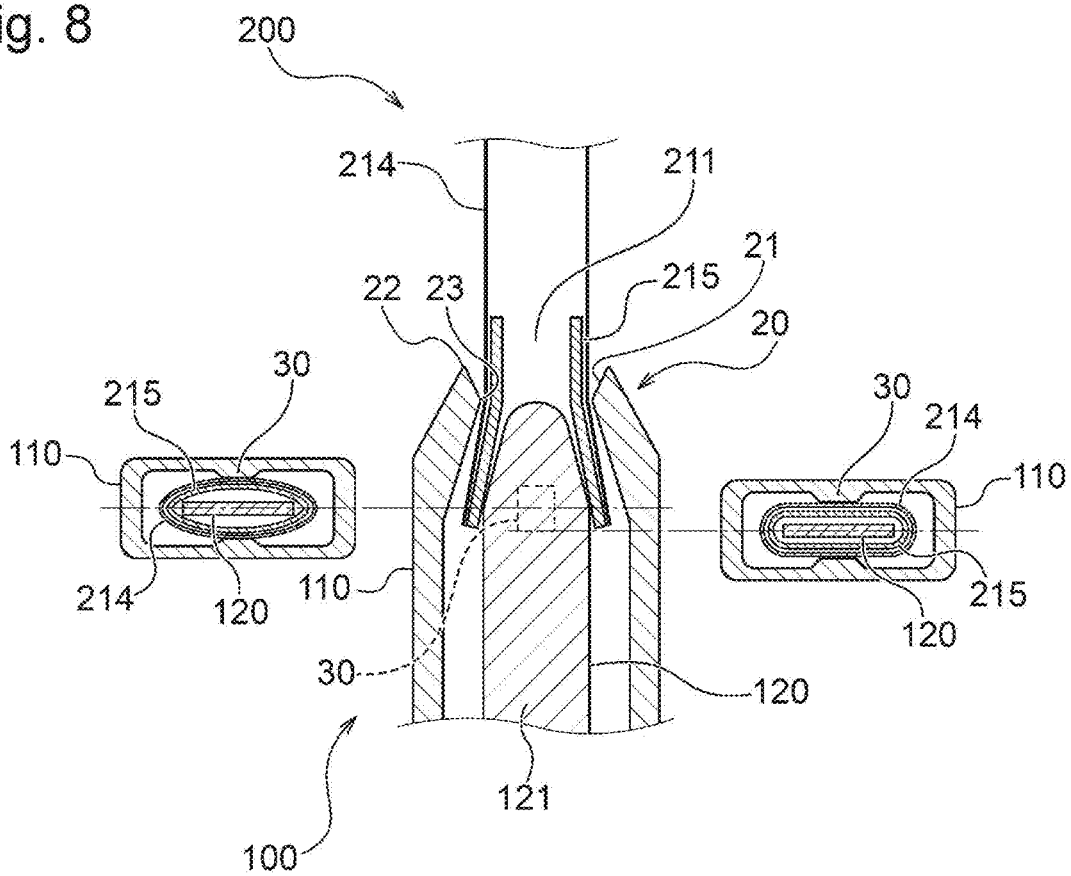
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Fig. 9

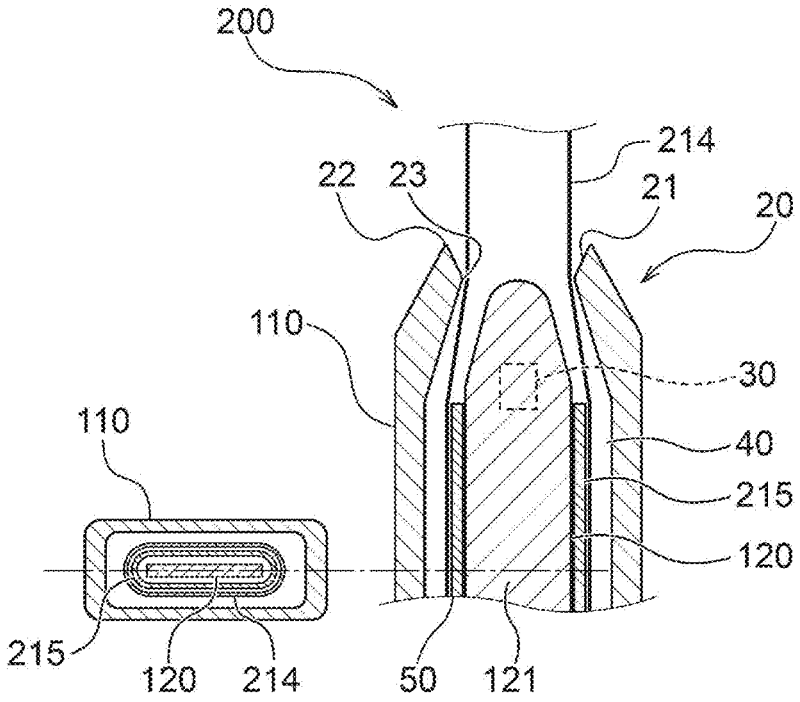
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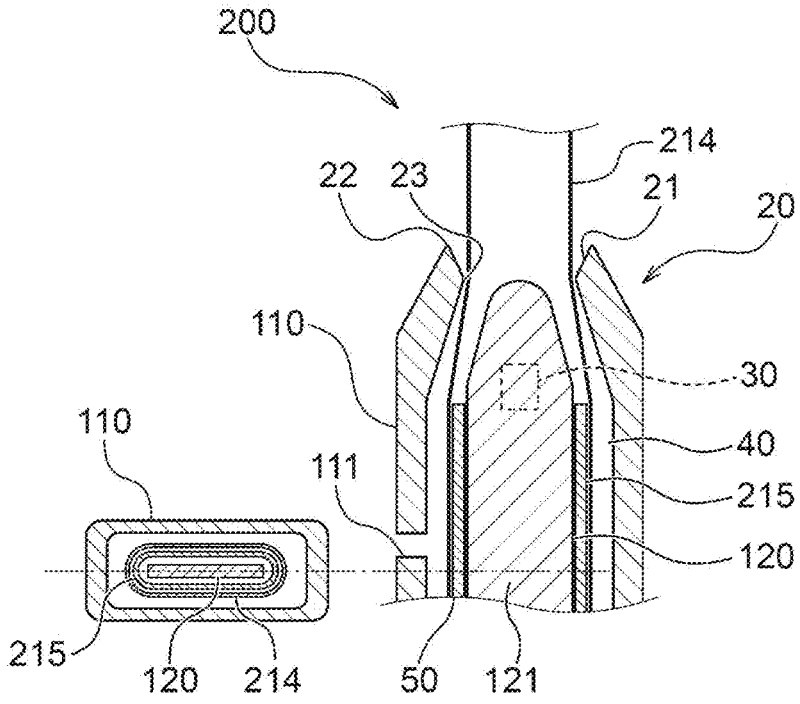
Fig. 10


200
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120
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121

Fig. 11

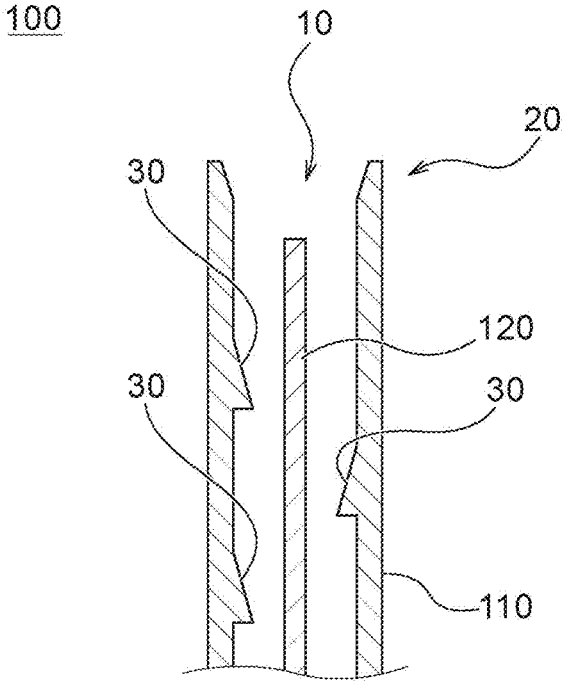


Fig. 12

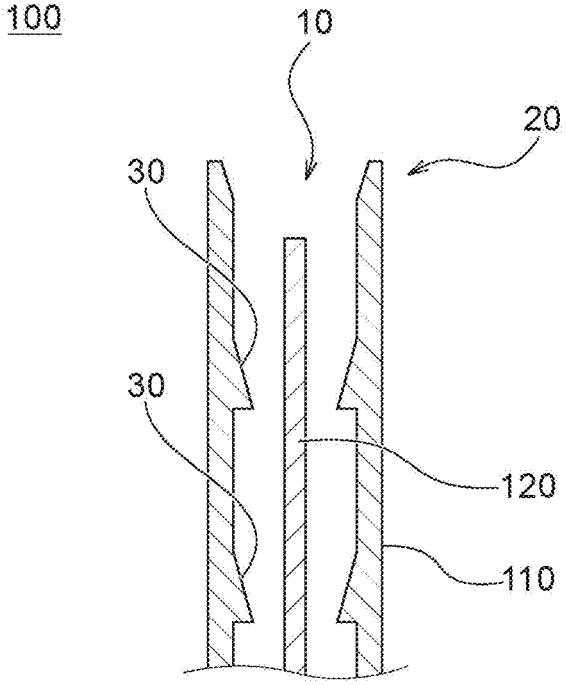
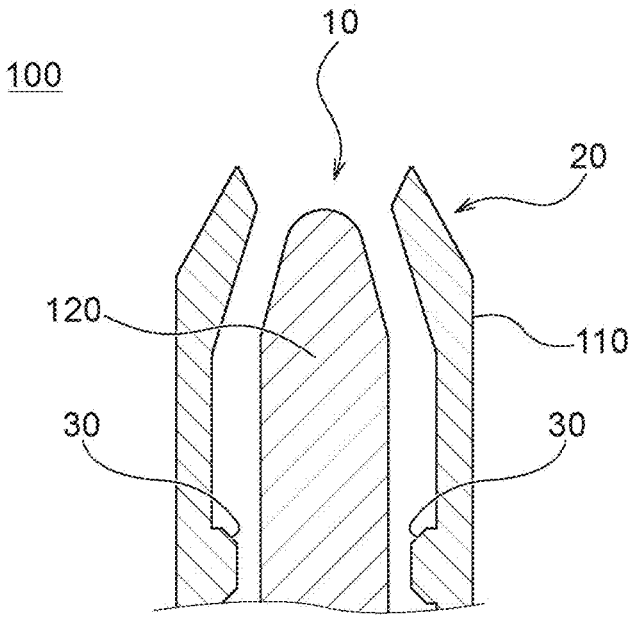


Fig. 13



FLAVOR INHALER AND FLAVOR INHALATION SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present invention contains subject matter related to PCT Application No. PCT/JP2021/042720 filed on Nov. 22, 2021, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a flavor inhaler and a flavor inhalation system.

BACKGROUND ART

[0003] A known flavor inhaler is used to inhale flavor or the like without burning a material. The flavor inhaler includes, for example, protrusions between which a consumable material inserted into the flavor inhaler is disposed and compressed (see, for example, PTL 1).

CITATION LIST

Patent Literature

[0004] PTL 1: Japanese Unexamined Patent Application Publication No. 2019-165751

SUMMARY OF INVENTION

Technical Problem

[0005] In the flavor inhaler disclosed in PTL 1, a sliding mechanism causes the protrusions to compress the consumable material. Therefore, the device may have a complex structure. In addition, insertion or extraction of the consumable material may be difficult at the position at which the consumable material is compressed. One object of the present invention is to provide a flavor inhaler and a flavor inhalation system that allows smooth insertion of the consumable material while the consumable material is urged against the heater.

[0006] Solution to Problem

[0007] A first aspect of the present invention provides a flavor inhaler. This flavor inhaler includes an accommodating unit configured to accommodate at least a portion of a consumable material; a heating unit configured to be inserted into the consumable material accommodated in the accommodating unit and heat the consumable material from inside; and an urging section provided on an inner peripheral surface of the accommodating unit and configured to urge the consumable material inserted into the accommodating unit toward the heating unit.

[0008] According to the first aspect of the present invention, the urging section urges the consumable material inserted into the accommodating unit toward the heating unit. Therefore, the consumable material can be brought into close contact with the heating unit, and the efficiency of heat transmission from the heating unit to the consumable material can be increased.

[0009] According to a second aspect of the present invention, in the first aspect, the urging section includes a plurality of urging sections, at least one of the urging sections being provided at each of positions facing each other.

[0010] According to the second aspect of the present invention, since at least one urging section is provided at each of the positions facing each other, the consumable material inserted into the accommodating unit can be urged toward the heating unit in opposite directions.

[0011] According to a third aspect of the present invention, in the second aspect, a distance between the urging sections that face each other is less than a diameter of the consumable material before being inserted into the accommodating unit.

[0012] According to the third aspect of the present invention, since the distance between the urging sections that face each other is less than the diameter of the consumable material before being inserted into the accommodating unit, the consumable material can be brought into closer contact with the heating unit, and the efficiency of heat transmission from the heating unit to the consumable material can be further increased.

[0013] According to a fourth aspect of the present invention, in the first aspect, the urging section includes a plurality of urging sections arranged in a staggered pattern along a longitudinal direction of the accommodating unit.

[0014] According to the fourth aspect of the present invention, since the urging sections are arranged in the staggered pattern along the longitudinal direction of the accommodating unit, frictional force is more gently applied to a surface of the consumable material upon insertion of the consumable material than when the urging sections are disposed to face each other.

[0015] According to a fifth aspect of the present invention, in any one of the first to fourth aspects, the urging section protrudes from the inner peripheral surface of the accommodating unit toward the heating unit by a distance that gradually increases along a direction from an end adjacent to an opening in the accommodating unit toward an end opposite to the end adjacent to the opening.

[0016] According to the fifth aspect of the present invention, since the distance by which the urging section protrudes gradually increases in the direction from the end adjacent to the opening in the accommodating unit toward the end opposite to the end adjacent to the opening, the consumable material can be gradually deformed, and therefore can be smoothly deformed.

[0017] According to a sixth aspect of the present invention, in the fifth aspect, a perimeter of the heating unit in cross section orthogonal to a longitudinal direction of the accommodating unit gradually increases along the direction from the end adjacent to the opening in the accommodating unit toward the end opposite to the end adjacent to the opening, and the urging section protrudes a maximum distance at a position at which the heating unit has a maximum perimeter in cross section orthogonal to the longitudinal direction of the accommodating unit.

[0018] According to the sixth aspect of the present invention, since the urging section protrudes a maximum distance at the position at which the heating unit has a maximum perimeter in cross section orthogonal to the longitudinal direction of the accommodating unit, the consumable material can be brought into closer contact with the heating unit, and the efficiency of heat transmission from the heating unit to the consumable material can be further increased.

[0019] According to a seventh aspect of the present invention, in any one of the first to sixth aspects, an end portion

of the urging section opposite to an end portion adjacent to an opening in the accommodating unit is stopper-shaped.

[0020] According to the seventh aspect of the present invention, since the end portion of the urging section opposite to the end portion adjacent to the opening in the accommodating unit is stopper-shaped, even if the consumable material receives a force in a pull-out direction, the consumable material can be prevented from falling because the stopper-shaped end portion generates resistance.

[0021] According to an eighth aspect of the present invention, in any one of the first to seventh aspects, the heating unit has an elliptical shape in cross section orthogonal to a longitudinal direction of the accommodating unit.

[0022] According to the eighth aspect of the present invention, since the heating unit has an elliptical shape in cross section, the consumable material occupies a space in the accommodating unit with a smaller dimension in the transverse direction compared to when a heating unit of the same cross-sectional area with a circular shape in cross section is used. Therefore, the thickness of the accommodating unit can be reduced.

[0023] According to a ninth aspect of the present invention, in any one of the first to seventh aspects, the heating unit is flat-plate-shaped.

[0024] According to the ninth aspect of the present invention, since the heating unit is flat-plate-shaped, the contact area between the heating unit and the consumable material can be increased. Therefore, the efficiency of heat transmission from the heating unit to the consumable material can be increased.

[0025] According to a tenth aspect of the present invention, in the eighth or ninth aspect, the urging section includes a plurality of urging sections arranged along a minor axis of the heating unit or in a thickness direction of the heating unit.

[0026] According to the tenth aspect of the present invention, since the urging sections are arranged along the minor axis of the heating unit or the thickness direction of the heating unit, the consumable material inserted into the accommodating unit can be deformed into a flat shape, so that the consumable material can be brought into closer contact with the heating unit.

[0027] According to an eleventh aspect of the present invention, in any one of the eighth to tenth aspect, the urging section includes a plurality of urging sections disposed near an end portion of the heating unit opposite to an end portion adjacent to the opening in the accommodating unit, the urging sections being arranged along a major axis of the heating unit or in a width direction of the heating unit.

[0028] According to the eleventh aspect of the present invention, since the urging sections are disposed near the end portion of the heating unit opposite to the end portion adjacent to the opening in the accommodating unit, the consumable material can be reliably brought into close contact with the heating unit to the tip of the consumable material, and the efficiency of heat transmission from the heating unit to the consumable material can be increased.

[0029] According to a twelfth aspect of the present invention, in any one of the first to eleventh aspects, the heating unit includes a heating element that generates heat and at least two base members that sandwich the heating element.

[0030] According to the twelfth aspect of the present invention, since the heating element is sandwiched between the at least two base members, the base members can support the heating element. When the heating element is a heat-emitting element and the base members are conductive plates, the conductive plates can support the heat-emitting element and serve as electrodes at the same time.

[0031] According to a thirteenth aspect of the present invention, in the twelfth aspect, the urging section does not overlap the heating element in a longitudinal direction of the accommodating unit.

[0032] According to the thirteenth aspect of the present invention, since the urging section does not overlap the heating element in the longitudinal direction of the accommodating unit, the transmission of heat generated by the heating element to the accommodating unit through the urging section can be suppressed.

[0033] A fourteenth aspect of the present invention provides a flavor inhalation system. The flavor inhalation system includes a consumable material and the flavor inhaler according to any one of the first to thirteenth aspects.

[0034] According to the fourteenth aspect of the present invention, a flavor inhalation system including a flavor inhaler can be provided. In the flavor inhaler, the urging section urges the consumable material inserted into the accommodating unit toward the heating unit. Therefore, the consumable material can be brought into close contact with the heating unit, and the efficiency of heat transmission from the heating unit to the consumable material can be increased.

[0035] According to a fifteenth aspect of the present invention, in the fourteenth aspect, the consumable material includes an insertion portion into which the heating unit configured to heat the consumable material from inside is inserted, and the insertion portion includes an annular sheet disposed to surround the heating unit inserted into the insertion portion.

[0036] According to the fifteenth aspect of the present invention, since the insertion portion includes the annular sheet disposed to surround the heating unit inserted into the insertion portion, the shape of the consumable material can be easily deformed into a shape that follows a shape of the heating unit when the heating unit is inserted into the consumable material.

[0037] According to a sixteenth aspect of the present invention, in the fifteenth aspect, a distance from an inner periphery to an outer periphery of the insertion portion in a radial direction in cross section orthogonal to a longitudinal direction of the consumable material is greater than a minimum distance between the heating unit and the urging section.

[0038] According to the sixteenth aspect of the present invention, since the distance from the inner periphery to the outer periphery of the insertion portion in the radial direction in cross section orthogonal to the longitudinal direction of the consumable material is greater than the minimum distance between the heating unit and the urging section, the consumable material can be reliably urged against the heating unit by the urging section, and the efficiency of heat transmission from the heating unit to the consumable material can be further increased.

BRIEF DESCRIPTION OF DRAWINGS

[0039] FIG. **1** is a sectional view of the main part of a flavor inhaler according to an embodiment of the present invention taken along a width direction of a heater.

[0040] FIG. **2** is a sectional view of the main part of the flavor inhaler according to the embodiment of the present invention taken along a thickness direction of the heater.

[0041] FIG. **3** is an exploded perspective view of the heater illustrated in FIG. **1**.

[0042] FIG. **4** is a perspective view of the heater illustrated in FIG. **1**.

[0043] FIG. **5** is a schematic side-sectional view of a consumable material according to an embodiment of the present invention.

[0044] FIG. **6** is a sectional view illustrating a tobacco portion in cross section orthogonal to a longitudinal direction of the consumable material illustrated in FIG. **5**.

[0045] FIG. **7** shows sectional views of the consumable material accommodated in the flavor inhaler.

[0046] FIG. **8** shows sectional views of the consumable material accommodated in the flavor inhaler.

[0047] FIG. **9** shows sectional views of the consumable material accommodated in the flavor inhaler.

[0048] FIG. **10** shows other sectional views of the consumable material accommodated in the flavor inhaler.

[0049] FIG. **11** is a sectional view illustrating an arrangement of retaining ribs in the width direction of the heater.

[0050] FIG. **12** is a sectional view illustrating an arrangement of retaining ribs in the width direction of the heater.

[0051] FIG. **13** is a sectional view illustrating an arrangement of retaining ribs in the thickness direction of the heater.

DESCRIPTION OF EMBODIMENTS

[0052] Embodiments of the present invention will now be described with reference to the drawings. In the drawings referred to below, the same or corresponding structural elements are denoted by the same reference signs, and redundant description thereof is omitted. In the following embodiments, a tobacco stick will be described as an example of a consumable material. However, the consumable material is not limited to tobacco as long as the consumable material generates flavor when heated.

[0053] FIG. **1** is a sectional view of the main part of a flavor inhaler **100** according to an embodiment of the present invention taken along a width direction of a heater **120**. FIG. **2** is a sectional view of the main part of the flavor inhaler **100** according to the embodiment of the present invention taken along a thickness direction of the heater **120**.

[0054] As illustrated in FIGS. **1** and **2**, the flavor inhaler **100** includes a housing (accommodating unit) **110** and a heater (heating unit) **120**. The housing **110** has an opening **10** at one end, and receives at least a portion of a consumable material **200** (described below) inserted into the opening **10** through the opening **10**. The housing **110** is made of, for example, a resin. In particular, the housing **110** may be made of polycarbonate (PC), acrylonitrile-butadiene-styrene (ABS) resin, polyetheretherketone (PEEK), a polymer alloy containing a plurality of types of polymers, or a metal, such as aluminum. The housing **110** is formed such that the cross-sectional area of the housing **110** in cross section orthogonal to the longitudinal direction thereof is smallest at a location near the opening **10**.

[0055] The housing **110** includes a shaping guide (guide section) **20** and retaining ribs (urging section) **30**. The shaping guide **20** defines the opening **10**, and deforms the cross-sectional shape of the consumable material **200** inserted into the housing **110** to a shape corresponding to the shape of the heater **120**. The retaining ribs **30** are provided on an inner peripheral surface of the housing **110** and urge the consumable material **200** inserted into the housing **110** toward the heater **120**, thereby deforming the shape of the consumable material **200**. The detailed structures of the shaping guide **20** and the retaining ribs **30** and the function of deforming the consumable material **200** will be described below.

[0056] The housing **110** has an air inlet (not illustrated) at an end opposite to the end at which the opening **10** is provided, that is, at the bottom of the housing **110**. This air inlet allows air to be supplied to the consumable material **200** inserted in the housing **110**. Thus, the flavor inhaler **100** is structured as a bottom-flow flavor inhaler. The air inlet may be formed in a member constituting the bottom of the housing **110** and communicate with the consumable material **200** through the inside of the member. When the air inlet is provided at the end of the housing **110** opposite to the end at which the opening **10** is provided, the structure of the housing **110** can be simplified in the region around the opening **10**. In addition, convection in the air layer **40** (described below) can be suppressed, and the thermal insulation performance of the air layer **40** can be maintained.

[0057] The heater **120** is a flat-plate-shaped positive temperature coefficient (PTC) heater that is inserted into the consumable material **200** accommodated in the housing **110** and that heats the consumable material **200** from the inside. The heater **120** deforms the outer shape of the consumable material **200** inserted into the housing **110** to a shape that follows the shape of the heater **120**. The function of deforming the consumable material **200** with the heater **120** will be described below. The shaping guide **20**, the retaining ribs **30**, and the heater **120** deform the shape of the consumable material **200** so that the shape of the consumable material **200** after being accommodated in the housing **110** differs from the shape of the consumable material **200** before being accommodated in the housing **110**.

[0058] FIG. **3** is an exploded perspective view of the heater illustrated in FIG. **1**. FIG. **4** is a perspective view of the heater illustrated in FIG. **1**. As illustrated in FIGS. **3** and **4**, the heater **120** includes a PTC element (heating element) **121**, at least two metal plates (base members) **122**, and a holding member **123**. The PTC element **121** is sandwiched between the metal plates **122** and bonded to the metal plates **122** by, for example, a conductive adhesive paste. The conductive adhesive paste may be, for example, an anisotropic conductive adhesive obtained by uniformly dispersing conductive particles in an epoxy-based adhesive.

[0059] The metal plates **122** may be made of an iron alloy containing nickel (Ni), such as Invar (registered trademark), having a low coefficient of thermal expansion. In such a case, separation of the metal plates **122** from the PTC element **121** due to thermal expansion caused when the PTC element **121** is heated can be suppressed. In addition, since the PTC element **121** is sandwiched between the at least two metal plates **122**, the metal plates **122** can support the PTC element **121** and serve as electrodes at the same time.

[0060] The holding member **123** is joined to the housing **110** when the heater **120** is attached to the housing **110**. The holding member **123** may be made of an engineering plastic. Engineering plastics have high heat resistance and mechanical strength, and can be formed into a desired shape at low cost by, for example, injection molding. Therefore, engineering plastics are suitable for use as the material of a structural member. For example, the holding member **123**

may be formed of PEEK, which is an example of engineering plastic. PEEK is a thermoplastic resin having significantly high heat resistance and high dimensional stability. Therefore, when the holding member **123** is made of PEEK, the influence of heat generated by the heater **120** on the holding member **123** can be reduced.

[0061] The PTC heater is a heater including a resistor having characteristics (PTC characteristics) such that the electrical resistance suddenly increases and the current stops flowing when a certain temperature (referred to as the Curie temperature) is reached. By utilizing the PTC characteristics, the PTC heater is capable of maintaining the temperature at or below a predetermined temperature without using a control device or the like. The heater **120** may be a PTC heater including a resistor made of barium titanate ($BaTiO_3$) having the PTC characteristics. In this case, the Curie temperature of the barium titanate that forms the heater **120** can be set to 350° C., and therefore the consumable material **200** can be heated at a temperature of less than 350° C.

[0062] FIG. **5** is a schematic side sectional view of the consumable material **200** according to an embodiment of the present invention. FIG. **6** is a sectional view illustrating a tobacco portion **210** in cross section orthogonal to the longitudinal direction of the consumable material **200** illustrated in FIG. **5**. As illustrated in FIGS. **5** and **6**, the consumable material **200** includes the tobacco portion (insertion portion) **210** and a paper tube **220**. The tobacco portion **210** has a through hole **211** in which the heater **120** is to be inserted at the center thereof. The tobacco portion **210** includes a flavor-releasing layer (annular sheet) **212**, which has a two-layer structure and is disposed to surround the inserted heater **120**, and an elastic deformation layer (annular sheet) **213**. The outer periphery of the elastic deformation layer **213** is wrapped with a wrapper **214**.

[0063] The flavor-releasing layer **212** includes, for example, a tobacco sheet and a non-tobacco sheet disposed on the outer periphery of the tobacco sheet and carrying glycerine. The flavor-releasing layer **212** releases a volatile compound containing flavor when heated by the heater **120**. The flavor-releasing layer **212** may include only one of the tobacco sheet and the non-tobacco sheet. The elastic deformation layer **213** may be composed of, for example, a nonwoven fabric sheet, a corrugated sheet, or a non-tobacco sheet, and is elastically deformable in the thickness direction (that is, in the radial direction of the cylindrical elastic deformation layer **213**). Upon insertion of the heater **120**, the elastic deformation layer **213** contributes to the deformation of the consumable material **200** into a shape that follows the shape of the heater **120**.

[0064] Thus, when the heater **120** is inserted into the through hole **211**, the elastic deformation layer **213** is elastically deformed in the thickness direction relative to the heater **120** and easily approaches or comes into contact with the heater **120**. Therefore, the flavor-releasing layer **212** can further approach or come into contact with the heater **120**, so that the consumable material **200** can be efficiently heated.

[0065] The paper tube **220** cools the volatile compound released from the flavor-releasing layer **212**. Since the tobacco portion **210** includes the flavor-releasing layer **212** and the elastic deformation layer **213** disposed to surround the inserted heater **120**, the shape of the consumable material **200** can be easily deformed when the heater **120** is inserted into the consumable material **200**. The consumable material **200** may have a circular or elliptical shape in cross section.

[0066] The non-tobacco sheet may contain a flavor-generating base material. The flavor-generating base material is a material that generates smoke scent and taste, and is preferably a tobacco material. The flavor-generating base material may include a flavoring agent. The flavoring agent is a substance that provides scent and taste. The flavoring agent may be a natural flavoring agent or a synthetic flavoring agent. The flavoring agent may be a single type of flavoring agent or a mixture of multiple types of flavoring agents. The flavoring agent may be any commonly used flavoring agent, such as essential oil, a natural flavoring agent, or a synthetic flavoring agent. The flavoring agent may be liquid or solid, and may have any properties. The flavor-generating base material may include a refreshing agent or a seasoning.

[0067] The tobacco sheet may contain, for example, tobacco and a polyhydric alcohol. The polyhydric alcohol contained in the tobacco sheet may be a single type of polyhydric alcohol or a combination of two or more types of polyhydric alcohol. The polyhydric alcohol may also be added to the above-described elastic deformation layer **213**. The tobacco sheet is formed in a sheet shape by mixing a binder with powdered tobacco and the polyhydric alcohol.

[0068] The relationship between the consumable material **200**, the housing **110**, and the heater **120** when the consumable material **200** is accommodated in the flavor inhaler **100**, that is, when the consumable material **200** is inserted from one end of the housing **110** toward the other end, will now be described. FIGS. **7** to **9** are sectional views illustrating the consumable material **200** accommodated in the flavor inhaler **100**. A flavor inhalation system is formed by applying the consumable material **200** to the flavor inhaler **100**. In FIGS. **7** to **9**, the flavor-releasing layer **212** and the elastic deformation layer **213** of the consumable material **200** are shown as a single annular sheet **215**.

[0069] FIG. **7** illustrates the consumable material **200** passing the shaping guide **20** in a cross section taken along the width direction of the heater **120** and a cross section orthogonal to the longitudinal direction of the housing **110** at an inlet portion **22** of the shaping guide **20**. FIG. **8** illustrates the consumable material **200** passing the retaining ribs **30** in a cross section taken along the width direction of the heater **120** and cross sections orthogonal to the longitudinal direction of the housing **110** at intermediate portions of the retaining ribs **30** and end portions of the retaining ribs **30** adjacent to the other end. FIG. **9** illustrates the consumable material **200** accommodated at a predetermined accommodation position in the housing **110** in a cross section taken along the width direction of the heater **120** and a cross section orthogonal to the longitudinal direction of the housing **110** at a position close to an end portion of the heater **120** adjacent to the other end.

[0070] As illustrated in FIG. **7**, the shaping guide **20** includes a tapered portion **21**, the inlet portion **22**, and a contact portion **23**. The tapered portion **21** is formed to expand toward the one end of the housing **110**, and guides the insertion of the consumable material **200** into the flavor inhaler **100**. In other words, the shaping guide **20** guides the consumable material **200** to a tip of the heater **120** so that the consumable material **200** can be reliably inserted into the heater **120**. More specifically, since the shaping guide **20** has a tapered shape that expands toward the outside of the

housing **110**, the insertion of the consumable material **200** is guided so that the consumable material **200** can be easily accommodated in the housing **110**.

[0071] The inlet portion **22** is provided at an end portion of the housing **110** and has an elliptical shape in cross section. The inlet portion **22** has a major axis longer than or as long as the major axis of the consumable material **200** after being accommodated in the housing **110**, and a minor axis substantially as long as the diameter of the consumable material **200** before being accommodated in the housing **110**. Since the shaping guide **20** has an elliptical shape in cross section at the end thereof, the cross-sectional shape of the consumable material **200** can be deformed into an elliptical shape that follows the shape of the shaping guide **20** during the insertion of the consumable material **200**. In addition, since the minor axis of the inlet portion **22** is substantially as long as the diameter of the consumable material **200** before being accommodated in the housing **110**, the consumable material **200** can be restrained from wobbling in the direction of the minor axis of the shaping guide **20**. Even when the dimensions of the end surface of consumable material **200** vary, the consumable material **200** can be shaped into a constant shape by the shaping guide **20**, and can be smoothly attached to the housing **110**.

[0072] The heater **120** and the inlet portion **22** are arranged such that the width direction of the heater **120** coincides with the direction of the major axis of the inlet portion **22**. This allows the consumable material **200** inserted into the housing **110** to be deformed into a shape that follows the shape of the heater **120**. Therefore, the consumable material **200** can be brought into close contact with the heater **120**, and the efficiency of heat transmission from the heater **120** to the consumable material **200** can be increased.

[0073] The contact portion **23** is provided on the inner peripheral surface of the housing **110** and has an elliptical shape in cross section. The contact portion **23** has a minimum inner perimeter that is less than or equal to the outer perimeter of the consumable material **200**. Accordingly, when the consumable material **200** passes the shaping guide **20**, the entire perimeter of the consumable material **200** comes into contact with the contact portion **23**, so that the cross-sectional shape of the consumable material **200** can be more reliably deformed into a shape that follows the shape of the inlet portion **22**. Therefore, even when the cross-sectional shape of the consumable material **200** varies, the consumable material **200** can be deformed to have a desired cross-sectional shape by the shaping guide **20**, and smoothly inserted into the housing **110**. In addition, since the entire perimeter of the consumable material **200** comes into contact with the contact portion **23**, the consumable material **200** can be prevented from falling.

[0074] The contact portion **23** is formed such that the contact portion **23** comes into point-contact with the consumable material **200** accommodated in the housing **110** in cross section taken along the longitudinal axis of the housing **110**. When the contact portion **23** is in point-contact with the consumable material **200**, heat transmission from the consumable material **200** to the housing **110** is reduced. Accordingly, the thermal insulation performance of the flavor inhaler **100** is increased.

[0075] The heater **120** has a sharp shape with a pointed tip. Therefore, the heater **120** can be easily inserted into the consumable material **200**. An end portion of the heater **120** adjacent to the opening **10** protrudes toward the opening **10** beyond an end portion of the shaping guide **20** opposite to an end portion adjacent to the opening **10**. More specifically, the end portion of the heater **120** adjacent to the opening **10** slightly protrudes from the contact portion **23** toward the one end of the housing **110** in the longitudinal direction of the housing **110**. Therefore, the end portion of the heater **120** adjacent to the opening **10** is inserted into the through hole **211** in the consumable material **200** at the time when the consumable material **200** passes the shaping guide **20**, and therefore the heater **120** can reliably start deforming the consumable material **200**.

[0076] A maximum width of the heater **120** relative to the length of the major axis of the contact portion **23** of the shaping guide **20** is greater than that in a flavor inhaler including a heater of an insertion type according to the related art. For example, the major axis of the contact portion **23** is 7 mm long, and the maximum width of the heater **120** is 6 mm. The heater **120** has a maximum width of greater than 30%, preferably greater than 40%, of the length of the major axis of the consumable material **200** after being accommodated in the housing **110**. Thus, the consumable material **200** inserted into the housing **110** can be deformed into a flat shape and brought into closer contact with the heater **120**.

[0077] As illustrated in FIG. **8**, the heater **120** has a sharp shape, and the width thereof increases toward the other end. Accordingly, as the consumable material **200** is inserted beyond the shaping guide **20**, the outer shape of the consumable material **200** is deformed into a shape that follows the shape of the heater **120**. More specifically, the consumable material **200** is expanded in the width direction of the heater **120**. Thus, the consumable material **200** can be brought into close contact with the heater **120**, and the efficiency of heat transmission from the heater **120** to the consumable material **200** can be increased. In addition, since the consumable material **200** is expanded by the heater **120**, the consumable material **200** can be prevented from falling.

[0078] More specifically, the heater **120** is flat-plate-shaped, and deforms the outer shape of the consumable material **200** inserted into the housing **110** to an elliptical shape in cross section. At this time, the major axis of the consumable material **200** after being accommodated in the housing **110** is longer than the diameter of the consumable material **200** before being accommodated in the housing **110**, and the minor axis of the consumable material **200** after being accommodated in the housing **110** is shorter than the diameter of the consumable material **200** before being accommodated in the housing **110**. Since the heater **120** deforms the outer shape of the consumable material **200** inserted into the housing **110** to an elliptical shape in cross section, the space occupied by the consumable material **200** in the housing **110** can have a reduced dimension in the transverse direction. Therefore, the thickness of the housing **110** can be reduced. In addition, since the heater **120** deforms the outer shape of the consumable material **200** inserted into the housing **110** to an elliptical shape in cross section, the contact area between the heater **120** and the consumable material **200** can be increased. Therefore, the efficiency of heat transmission from the heater **120** to the consumable material **200** can be increased.

[0079] The perimeter of the heater **120** in cross section orthogonal to the longitudinal direction of the housing **110** gradually increases from the end adjacent to the opening **10**

toward the end opposite to the end adjacent to the opening **10**, that is, from one end toward the other end. Since the perimeter of the heater **120** gradually increases from one end toward the other end, the contact length between the consumable material and the heating unit gradually increases from one end toward the other end, and therefore the consumable material can be prevented from falling.

[0080] The retaining ribs **30** are provided to protrude from the inner peripheral surface of the housing **110** toward the heater **120** in the thickness direction of the heater **120**, and include a pair of tapered surfaces facing each other (see FIG. **2**). The retaining ribs **30** are not limited to this as long as at least one retaining rib **30** is provided at each of positions facing each other. The retaining ribs **30** are disposed to overlap a region in which the width of the heater **120** gradually increases in the longitudinal direction of the housing **110**. Any protruding shape may be selected as the shape of the retaining ribs **30**.

[0081] The retaining ribs **30** maybe formed to protrude by a distance that gradually increases toward the other end of the housing **110** and by a maximum distance at the position at which the heater **120** has a maximum width, that is, at which the heater **120** has a maximum perimeter in cross section orthogonal to the longitudinal direction of the housing **110**. In this case, the distance between the tapered surfaces of the retaining ribs **30** is less than the diameter of the consumable material **200** before being inserted into the housing **110**. Each retaining rib **30** has a stopper-shaped end portion with an end surface substantially orthogonal to the inner peripheral surface of the housing **110** at the other end, and is disposed so as not to overlap with the PTC element **121** of the heater **120** in the longitudinal direction of the housing **110**.

[0082] Accordingly, when the consumable material **200** passes the retaining ribs **30**, the consumable material **200** expanded in the width direction of the heater **120** is urged by the retaining ribs **30** in the thickness direction of the heater **120**, so that the consumable material **200** is deformed into a flat shape. In intermediate regions of the retaining ribs **30**, the distance by which the retaining ribs **30** protrude increases as the width of the heater **120** increases, so that the consumable material **200** is gradually deformed into the flat shape.

[0083] In contrast, the width of the heater **120** and the distance by which the retaining ribs **30** protrude are both at a maximum at the end portions of the retaining ribs **30** at the other end, and the consumable material **200** is in a final shape in which the consumable material **200** is in close contact with the heater **120**. Thus, the consumable material **200** inserted into the housing **110** is urged toward the heater **120** by the retaining ribs **30**, so that the consumable material **200** can be brought into closer contact with the heater **120** and that the efficiency of heat transmission from the heater **120** to the consumable material **200** can be further increased. In addition, since the consumable material **200** is urged by the retaining ribs **30**, the consumable material **200** can be prevented from falling.

[0084] The consumable material **200** illustrated in FIGS. **5** and **6** maybe formed such that the distance from an inner periphery to an outer periphery of the tobacco portion **210** in a radial direction in cross section orthogonal to the longitudinal direction of the consumable material **200** is greater than the minimum distance between the heater **120** and each retaining rib **30**. In such a case, the consumable material **200** can be reliably urged against the heater **120** by the retaining ribs **30**, and the efficiency of heat transmission from the heater **120** to the consumable material **200** can be further increased.

[0085] When the retaining ribs **30** are arranged in the thickness direction of the heater **120** as described above, the consumable material **200** inserted into the housing **110** can be deformed into a flat shape to bring the consumable material **200** into closer contact with the heater **120**. Since at least one retaining rib **30** is provided at each of positions facing each other, the consumable material **200** inserted into the housing **110** can be urged toward the heater **120** in the opposite directions. When the distance between the tapered surfaces of the retaining ribs **30** is less than the diameter of the consumable material **200**, the consumable material **200** can be brought into closer contact with the heater **120**, and the efficiency of heat transmission from the heater **120** to the consumable material **200** can be further increased.

[0086] In addition, when the retaining ribs **30** are formed to protrude by a distance that gradually increases toward the other end of the housing **110**, the consumable material **200** can be gradually deformed, and therefore can be smoothly deformed. In addition, when the end portions of the retaining ribs **30** at the other end are stopper-shaped, even if the consumable material **200** receives a force in a pull-out direction, the consumable material **200** can be prevented from falling because the stopper-shaped end portions generate resistance. In addition, when the retaining ribs **30** are disposed so as not to overlap with the PTC element **121** of the heater **120** in the longitudinal direction of the housing **110**, the transmission of heat generated by the PTC element **121** to the housing **110** through the retaining ribs **30** can be suppressed.

[0087] As illustrated in FIG. **9**, when the consumable material **200** is at the predetermined accommodation position in the housing **110**, the consumable material **200** is maintained in the final shape illustrated in FIG. **8**. In this state, an accommodation space **50** accommodating the consumable material **200** deformed by the heater **120** is formed in the housing **110**. In addition, an air layer **40** is formed along the entire perimeter of the consumable material **200** between the accommodation space **50** and the housing **110**. The air layer **40** has a low thermal conductivity, and is therefore capable of providing thermal insulation between the consumable material **200** (accommodation space **50**) and the housing **110**, thereby reducing the energy required to heat the consumable material **200**. The inlet portion **22** is in contact with the consumable material **200** over the entire perimeter of the outer periphery of the consumable material **200**, and seals the air layer **40**. Thus, the convection of air in the air layer **40** is suppressed.

[0088] The housing **110** is formed such that the cross-sectional area thereof in cross section orthogonal to the longitudinal direction of the housing **110** is smallest at a location close to the opening **10**. Accordingly, the occurrence of convection in the air layer **40** due to the inward and outward airflows around the opening **10** can be suppressed, and the thermal insulation performance of the flavor inhaler **100** can be further increased. In addition, the housing **110** is formed such that the ratio of the cross-sectional area of the air layer **40** to the cross-sectional area of the consumable material **200** is in the range of 5:1 to 1:1 at a location at which the housing **110** has a maximum cross-sectional area

in cross section orthogonal to the longitudinal direction of the housing **110**. Thus, the air layer **40** has sufficient thermal insulation performance.

[0089] As described above, the shaping guide **20** deforms the cross-sectional shape of the consumable material **200**, the heater **120** deforms the shape of the consumable material **200** into a shape that follows the shape of the heater **120**, and the retaining ribs **30** urge the consumable material **200** toward the heater **120**. Thus, the consumable material **200** inserted into the housing **110** can be deformed into a flat shape and brought into close contact with the heater **120**. Therefore, the efficiency of heat transmission from the heater **120** to the consumable material **200** can be increased.

[0090] According to the flavor inhaler **100** having the above-described structure, the shaping guide **20** deforms the cross-sectional shape of the consumable material **200** inserted into the housing **110** to a shape corresponding to the shape of the heater **120**. Therefore, even when the cross-sectional shape of the consumable material **200** inserted into the housing **110** varies, the cross-sectional shape of the consumable material **200** can be deformed into the desired shape corresponding to the shape of the heater **120** by the shaping guide **20**.

[0091] In addition, according to the flavor inhaler **100** having the above-described structure, the heater **120** deforms the outer shape of the consumable material **200** inserted into the housing **110** to a shape that follows the shape of the heater **120**. Therefore, the consumable material **200** can be brought into close contact with the heater **120**, and the efficiency of heat transmission from the heater **120** to the consumable material **200** can be increased.

[0092] Even when the shaping guide **20**, the retaining ribs **30**, and the heater **120** deform the consumable material **200** such that the shape of the consumable material **200** after being accommodated in the housing **110** differs from the shape of the consumable material **200** before being accommodated in the housing **110**, the air layer **40** is formed between the accommodation space **50** accommodating the deformed consumable material **200** and the housing **110**. Therefore, the air layer **40**, which has a low thermal conductivity, serves to improve the thermal insulation performance of the flavor inhaler **100**.

[0093] When the consumable material **200** is accommodated in the housing **110**, the contact portion **23** seals the air layer **40** formed between the accommodation space **50** accommodating the deformed consumable material **200** and the housing **110**, so that the convection of air in the air layer **40** can be suppressed and good thermal insulation can be achieved. In addition, since the contact portion **23** is close to the opening **10**, the volume of the sealed air layer **40** can be increased, thereby improving the thermal insulation performance of the flavor inhaler **100**.

[0094] Since the heater **120** is inserted into the consumable material **200** and heats the consumable material **200** from the inside, the heater **120**, which is the heat source, does not come into contact with the air layer **40**. Therefore, the thermal insulation performance of the flavor inhaler **100** can be further increased. In addition, since the air layer **40** is formed over the entire perimeter of the outer periphery of the consumable material **200**, the thermal insulation performance of the flavor inhaler **100** can be still further increased.

[0095] Although the heater **120** is a PTC heater in the above-described embodiment, the heater is not limited to this. For example, the heater may be a flexible polyimide heater in which a heating resistor (heating element) made of, for example, stainless steel is sandwiched between two films (base members) made of, for example, polyimide (PI). Alternatively, the heater may be a pin heater having an elliptical shape in cross section orthogonal to the longitudinal direction of the housing **110**. When the pin heater is used, the consumable material **200** inserted into the housing **110** occupies a space in the housing **110** with a smaller dimension in the transverse direction compared to when a pin heater of the same cross-sectional area with a circular cross section is used. Therefore, the thickness of the housing **110** can be reduced. In addition, when the retaining ribs **30** are arranged along the minor axis of the pin heater, the consumable material **200** inserted into the housing **110** can be deformed into a flat shape and brought into closer contact with the heater.

[0096] In the above-described embodiment, the housing **110** has an air inlet at an end opposite to the end at which the opening **10** is provided, that is, at the bottom of the housing **110**. However, the air inlet is not limited to this, and an air inlet that directly communicates with the air layer **40** maybe provided at the opening **10** of the housing **110** or in the housing **110**. When the air inlet is provided in the housing **110**, as illustrated in FIG. **10**, an air inlet **111** may be formed near an end portion of the housing **110** at the other end. Also in this case, the air layer **40** is sealed by the contact portion **23**, so that the occurrence of convection can be suppressed in the air layer **40** around the contact portion **23**, and air can be introduced without causing a reduction in the heat insulation efficiency or changing the size of the flavor inhaler **100**.

[0097] Although the retaining ribs **30** include a pair of tapered surfaces that face each other in the above-described embodiment, the retaining ribs **30** are not limited to this. FIGS. **11** and **12** are sectional views illustrating arrangements of the retaining ribs **30** in the width direction of the heater **120**. FIG. **13** is a sectional view illustrating an arrangement of the retaining ribs **30** in the thickness direction of the heater **120**.

[0098] In FIG. **11**, the retaining ribs **30** are arranged in a staggered pattern along the longitudinal direction of the housing **110**. When the retaining ribs **30** are arranged in this manner, frictional force is more gently applied to the consumable material **200** upon insertion of the consumable material **200** than when the retaining ribs **30** are disposed to face each other.

[0099] In FIG. **12**, the retaining ribs **30** are disposed not only at the positions illustrated in FIG. **2** but also at positions near the end portion of the heater **120** at the other end so as to face each other in the thickness direction of the heater **120**. In FIG. **13**, the retaining ribs **30** are arranged at positions near the end portion of the heater **120** at the other end so as to face each other in the width direction of the heater **120**. When the retaining ribs **30** are disposed near the end portion of the heater **120** at the other end as described above, the consumable material **200** can be reliably brought into close contact with the heater **120** to the tip of the consumable material **200**, and the efficiency of heat transmission from the heater **120** to the consumable material **200** can be increased.

[0100] Although embodiments of the present invention have been described above, the above-described embodiments of the invention are intended to facilitate understanding of the present invention, and not to limit the present

invention. The present invention can be modified or improved without departing from the spirit thereof, and includes equivalents thereto. Further, the structural elements described in the claims and the specification can be combined or omitted within a scope in which at least one of the above-described problems can be solved or a scope in which at least one of the above-described advantages can be obtained.

Reference Signs List

[0101] **10** opening
[0102] **20** shaping guide
[0103] **21** tapered portion
[0104] **22** inlet portion
[0105] **23** contact portion
[0106] **30** retaining rib
[0107] **40** air layer
[0108] **50** accommodation space
[0109] **100** flavor inhaler
[0110] **110** housing
[0111] **111** air inlet
[0112] **120** heater
[0113] **121** PTC element
[0114] **122** metal plate
[0115] **123** holding member
[0116] **200** consumable material
[0117] **210** tobacco portion
[0118] **211** through hole
[0119] **212** flavor-releasing layer
[0120] **213** elastic deformation layer
[0121] **214** wrapper
[0122] **215** annular sheet
[0123] **220** paper tube

1. A flavor inhaler comprising:
an accommodating unit configured to accommodate at least a portion of a consumable material;
a heating unit configured to be inserted into the consumable material accommodated in the accommodating unit and heat the consumable material from inside; and
an urging section provided on an inner peripheral surface of the accommodating unit and configured to urge the consumable material inserted into the accommodating unit toward the heating unit.

2. The flavor inhaler according to claim **1**,
wherein the urging section comprises a plurality of urging sections, at least one of the urging sections being provided at each of positions facing each other.

3. The flavor inhaler according to claim **2**,
wherein a distance between the urging sections that face each other is less than a diameter of the consumable material before being inserted into the accommodating unit.

4. The flavor inhaler according to claim **1**,
wherein the urging section comprises a plurality of urging sections arranged in a staggered pattern along a longitudinal direction of the accommodating unit.

5. The flavor inhaler according to claim **1**,
wherein the urging section protrudes from the inner peripheral surface of the accommodating unit toward the heating unit by a distance that gradually increases along a direction from an end adjacent to an opening in the accommodating unit toward an end opposite to the end adjacent to the opening.

6. The flavor inhaler according to claim **5**,
wherein a perimeter of the heating unit in cross section orthogonal to a longitudinal direction of the accommodating unit gradually increases along the direction from the end adjacent to the opening in the accommodating unit toward the end opposite to the end adjacent to the opening, and wherein the urging section protrudes a maximum distance at a position at which the heating unit has a maximum perimeter in cross section orthogonal to the longitudinal direction of the accommodating unit.

7. The flavor inhaler according to claim **1**,
wherein an end portion of the urging section opposite to an end portion adjacent to an opening in the accommodating unit is stopper-shaped.

8. The flavor inhaler according to claim **1**,
wherein the heating unit has an elliptical shape in cross section orthogonal to a longitudinal direction of the accommodating unit.

9. The flavor inhaler according to claim **1**,
wherein the heating unit is flat-plate-shaped.

10. The flavor inhaler according to claim **8**,
wherein the urging section comprises a plurality of urging sections arranged along a minor axis of the heating unit or in a thickness direction of the heating unit.

11. The flavor inhaler according to claim **8**,
wherein the urging section comprises a plurality of urging sections disposed near an end portion of the heating unit opposite to an end portion adjacent to the opening in the accommodating unit, the urging sections being arranged along a major axis of the heating unit or in a width direction of the heating unit.

12. The flavor inhaler according to claim **1**,
wherein the heating unit includes
a heating element that generates heat, and
at least two base members that sandwich the heating element.

13. The flavor inhaler according to claim **12**,
wherein the urging section does not overlap the heating element in a longitudinal direction of the accommodating unit.

14. A flavor inhalation system comprising:
a consumable material; and
the flavor inhaler according to claim **1**.

15. The flavor inhalation system according to claim **14**,
wherein the consumable material includes an insertion portion into which the heating unit configured to heat the consumable material from inside is inserted, and
wherein the insertion portion includes an annular sheet disposed to surround the heating unit inserted into the insertion portion.

16. The flavor inhalation system according to claim **15**,
wherein a distance from an inner periphery to an outer periphery of the insertion portion in a radial direction in cross section orthogonal to a longitudinal direction of the consumable material is greater than a minimum distance between the heating unit and the urging section.

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