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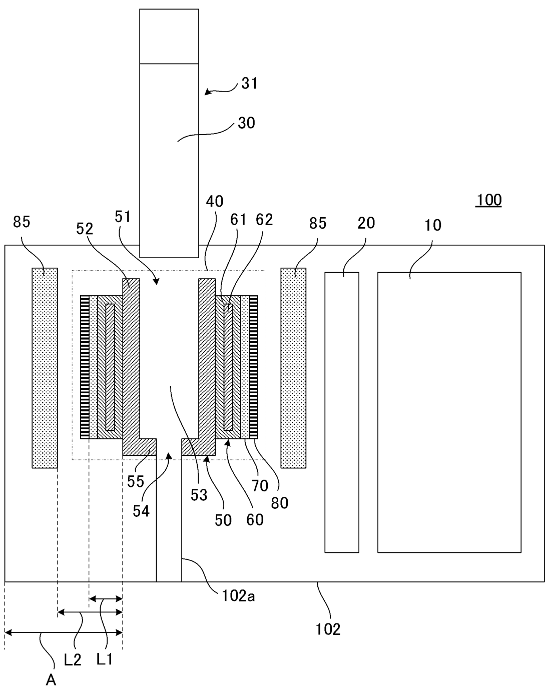
(54) **HEATING UNIT FOR FLAVOR INHALER AND FLAVOR INHALER**

(57) Provided is a heating unit for a flavor inhaler which includes smokable material and is configured to heat solid smokable material and atomize the smokable material. The heating unit for a flavor inhaler comprises a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material, a heating portion that heats the partitioning portion, a fixing portion that fixes the heating portion to the partitioning portion, and a first thermal insulating portion arranged between the heating portion and the fixing portion.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The invention relates to heating units for flavor inhalers and flavor inhalers.

BACKGROUND ART

[0002] Flavor inhalers for inhaling flavors or the like without burning materials have conventionally been known. A flavor inhaler includes, for example, a chamber that receives a flavor generating article and a heater that heats the flavor generating article received in the chamber (see, for example, Patent Literatures 1 to 3).

CITATION LIST

PATENT LITERATURE

[0003]

PTL 1: Japanese Unexamined Patent Application Publication (Kohyo) No. 2001-521123
PTL 2: Japanese Patent No. 5963375
PTL 3: International Publication No. 2016/207407

SUMMARY OF INVENTION

[0004] A first mode provides a heating unit for a flavor inhaler which heats smokable material and atomizes the smokable material. The heating unit for a flavor inhaler includes a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material; a heating portion configured to heat the partitioning portion; a fixing portion configured to fix the heating portion to the partitioning portion; and a first thermal insulating portion arranged between the heating portion and the fixing portion. The smokable material may be solid smokable material.

[0005] According to the first mode, since the heating portion is fixed to the partitioning portion by the fixing portion, the partitioning portion and the heating portion are substantially integrated together. In such a configuration, the first thermal insulating portion diminishes an impact of heat that is transmitted from the heating portion to the fixing portion, so that the fixing portion can be used under a high-temperature heating condition. As described above, the first mode provides the integrated heating unit for a flavor inhaler which resists the high-temperature heating. Such an integrated unit is highly stable against shock and oscillations. The integrated configuration is sometimes advantageous for mass production of the unit and for mass production of a flavor inhaler in which the unit is installed.

[0006] The heating portion may be arranged on an outer surface of the partitioning portion (opposite side from the receiving portion). The heating portion is, for example, a resistive heating portion and capable of heating the partitioning portion through heat transmission. The resistive heating portion includes, for example, a heating element. The heating element may be a heating track. The heating portion may be a film heater. The film heater may have, for example, a structure in which a layer of electric insulating material and a layer of a heating track are stacked. Alternatively, for example, the heating portion may have a structure in which a layer of a heating track is arranged between two layers of electric insulating material. The electric insulating material may be, for example, polyimide, PEEK (polyetheretherketone) or Teflon (registered trademark)-based fluorine resin. The heating track may be made, for example, of metal, such as stainless steel and copper. The electric insulating material and the heating track made of the aforementioned materials provide a flexible heating structure that is easy to manufacture and highly reliable.

[0007] The heating portion may include a first part located on an opposite side from the opening and a second part located on the opening side. It is preferable that the second part have a higher heater power density than the first part. Alternatively, it is preferable that the second part have a higher temperature increase rate than the first part. Still alternatively, it is preferable that the second part have a higher heating temperature than the first part after the first and second parts perform the heating for the same amount of time. The second part preferably covers an outer surface of the partitioning portion which coincides with a half or more of the smokable material in a longitudinal direction of the smokable material in a state where the smokable material is located at a desired position within the partitioning portion. This makes it possible to reduce energy consumption and shorten the time between the activation of the heating portion and a time point when a first puff is ready to be taken.

[0008] The highest temperature in a temperature profile during the heating of the smokable material by the heating portion preferably ranges from 250°C to 310°C, both inclusive, from 250°C to 300°C, both inclusive, or from 250°C to 290°C, both inclusive. The temperature of the heating portion here means temperature at a place where the heat for heating the smokable material is generated, that is, temperature of the resistive heating portion, a susceptor or the like. If the highest temperature in the temperature profile during the heating of the smokable material by the heating portion is set within any one of the foregoing temperature ranges, it is possible to quickly increase the temperature of the smokable material without damaging the device.

[0009] The first thermal insulating portion preferably contacts the heating portion and the fixing portion. This provides the heating unit for a flavor inhaler with a simpler, more stable structure, as compared to when the first thermal insulating portion does not contact either one of the heating portion and the fixing portion.

[0010] It is preferable that the heating portion include a major surface parallel to the side surface of the partitioning portion and that the first thermal insulating portion be arranged to extend along the major surface of the heating portion. This enables the first thermal insulating portion to insulate the heating portion with efficiency. The meaning of "to be parallel to the side surface of the partitioning portion" here includes to be substantially parallel to the side surface of the partitioning portion. The first thermal insulating portion is preferably so arranged as to cover a whole major surface of the heating portion.

[0011] The partitioning portion preferably has substantially uniform wall thickness. This makes it possible to heat the partitioning portion as a whole more evenly. The structure of the partitioning portion is then simplified, which facilitates highly accurate manufacture. The meaning of "uniform thickness" here includes substantially uniform thickness. The thickness of the partitioning portion ranges, for example, from 0.04 mm to 1.00 mm, both inclusive, preferably from 0.04 mm to 0.50 mm, both inclusive, and more preferably from 0.05 mm to 0.10 mm, both inclusive.

[0012] The partitioning portion may include a tubular member with or without a bottom. The partitioning portion may include a bottom portion. Alternatively, the heating unit for a flavor inhaler may include an abutment portion inside or outside of the partitioning portion. An expendable part containing the smokable material which is inserted in the receiving portion of the partitioning portion (hereinafter, referred to simply as an expendable part) abuts the abutment portion. The bottom portion or the abutment portion preferably supports part of the expendable part so that an end surface of the expendable part is at least partially exposed. The bottom portion of the partitioning portion or the abutment portion may include a convex portion or a groove portion. The bottom portion of the partitioning portion or the abutment portion may also include a hole for taking air into the partitioning portion. The partitioning portion may be made, for example, of metal, such as stainless steel, which has a high thermal conductivity, heat-resistant resin, paper or another like material. The partitioning portion may be, for example, a bottomed cylinder-like container or a bottomless cylinder-like element. The partitioning portion may have a cylindrical shape or a polygonal tube-like shape.

[0013] The partitioning portion may include a susceptor. In such a case, it is preferable that the heating portion include a tubular induction coil that surrounds the side surface of the partitioning portion, and that the first thermal insulating portion be magnetically permeable and electrically nonconductive (electrically insulative). The meaning of "to be electrically nonconductive" here includes to be substantially electrically nonconductive. This provides an IH (induction heating) assembly with an integrated, stable structure.

[0014] The side surface of the partitioning portion may include a susceptor. This enables the partitioning portion to receive energy (magnetic force line that generates around an induction coil) from the induction coil more efficiently, as compared to when the partitioning portion includes a susceptor only in the bottom surface thereof. More specifically, the side surface of the partitioning portion may include a pipe-like susceptor surrounding the receiving portion and have a current pathway surrounding the receiving portion. In such a case, the side surface of the partitioning portion has an annular current pathway, so that an eddy current is generated with efficiency. Alternatively, the side surface of the partitioning portion may be formed of a susceptor and have a current pathway surrounding the receiving portion. In this case, since the side surface of the partitioning portion itself is formed of the susceptor, the partitioning portion has a simple, inexpensive configuration.

[0015] The term "susceptor" in this description means material that can convert electromagnetic energy into heat and further means material that intends to heat the "smokable material." The susceptor is arranged at a position where the susceptor can transmit heat to the "smokable material." When the susceptor is located within a variable electromagnetic field, the heating of the susceptor is caused by an eddy current inducted in the susceptor or a magnetic hysteresis loss in the susceptor.

[0016] The susceptor preferably contains material that is selected from at least one of the group consisting of aluminum, iron, nickel, and alloy made from the aforementioned metals (for example, nichrome and stainless steel). The susceptor may have any shape and may be in the form, for example, of granulates, a bar, a strip, a pipe, a tube or the like. If the susceptor has a pipe-like shape including an annular electric power channel, an eddy current is efficiently generated. A plurality of susceptors in either identical or different shapes may be arranged in the partitioning portion.

[0017] "To be magnetically permeable" in this description means to have a relative magnetic permeability larger than 1 but smaller than 1.000001. Magnetically permeable and electrically nonconductive (electrically insulative) materials include, for example, glass, plants, wood, paper, resins including PEEK, and other like materials.

[0018] The bottom portion of the partitioning portion is preferably made of a magnetically permeable and electrically nonconductive (electrically insulative) material. If the bottom portion of the partitioning portion includes a susceptor, there is a possibility that the distal end of the smokable material is locally overheated. If the bottom portion of the partitioning portion is made of the aforementioned material, no induction heating is generated in the bottom portion of the partitioning portion, so that the smokable material is more uniformly heated from the side surface, as compared to when the bottom portion includes a susceptor.

[0019] The heating unit for a flavor inhaler preferably includes a second thermal insulating portion between the partitioning portion and the induction coil. In such a case, the second thermal insulating portion may be magnetically permeable and electrically nonconductive (electrically insulative). The meaning of "to be electrically nonconductive" here includes to be substantially electrically nonconductive. This provides an IH (induction heating) assembly with an integrated, stable structure. The invention further provides at least one of the following operation and advantageous effects. The second thermal insulating portion represses transmission of heat of the susceptor to a sheath of a litz wire which may form the induction coil. Since the second thermal insulating portion represses the transmission of heat from the susceptor to the induction coil, the heat is discouraged from being transferred outside the receiving portion. The housing is repressed from being overheated by the heat of the susceptor. Due to the magnetic permeability and nonconductivity (electrical insulation property) of the second thermal insulating portion, heat generation is less likely to occur in the second thermal insulating portion, and the susceptor that is arranged inside the second thermal insulating portion is efficiently heated by the magnetic force line that is generated by the induction coil.

[0020] The first and second thermal insulating portions have the same configuration. This makes the heating unit for a flavor inhaler simpler and less expensive, as compared to when the first and second thermal insulating portions have different configurations. At least either one of the first and second thermal insulating portions may include a portion located between adjacent wires of the induction coil. In other words, the first thermal insulating portion may have the portion located between the adjacent wires of the induction coil, or alternatively, the second thermal insulating portion may have the portion located between the adjacent wires of the induction coil. This makes it possible to fix a position of the induction coil in a long axis direction and therefore achieve stable induction heating. Both the first and second thermal insulating portions may have portions located between adjacent wires of the induction coil. This makes it possible to more firmly fix the position of the induction coil in the long axis direction and therefore achieve more stable induction heating.

[0021] The first and second thermal insulating portions may form an integrated thermal insulating portion. The thermal insulating structure of the heating unit for a flavor inhaler then becomes more simple. The induction coil may be embedded in the integrated thermal insulating portion. Alternatively, both inner and outer sides of the induction coil are at least partially covered with the integrated thermal insulating portion. This firmly fixes the position of the induction coil. The second thermal insulating portion may contact both the partitioning portion and the induction coil. The structure of the heating unit for a flavor inhaler becomes more stable, as compared to when the second thermal insulating portion does not contact either one of the partitioning portion and the induction coil.

[0022] At least either one of the first and second thermal insulating portions includes air and a supporting portion that keeps the heating portion and the partitioning portion at a predetermined distance from each other when the heating portion is fixed to the partitioning portion or restricts the movement of the air contained in the first or second thermal insulating portion. At least either one of the first and second thermal insulating portions also includes air in the supporting portion. In other words, the first thermal insulating portion may have the supporting portion and the air provided in the supporting portion. Alternatively, the second thermal insulating portion may have the supporting portion and the air provided in the supporting portion. Still alternatively, the first and second thermal insulating portions may each have the supporting portion and the air provided in the supporting portion. This makes it possible to more effectively insulate the heat for heating the smokable material which is generated by the resistive heating portion, the susceptor, and the like. At least either one of the first and second thermal insulating portions may have a thickness ranging, for example, from 0.10 mm to 3.00 mm, both inclusive, from 0.30 mm to 1.50 mm, both inclusive, or from 0.50 mm to 1.0 mm, both inclusive. In other words, the first thermal insulating portion may have a thickness ranging from 0.10 mm to 3.00 mm, both inclusive, from 0.30 mm to 1.50 mm, both inclusive, or from 0.50 mm to 1.0 mm, both inclusive. Alternatively, the second thermal insulating portion may have a thickness ranging from 0.10 mm to 3.00 mm, both inclusive, from 0.30 mm to 1.50 mm, both inclusive, or from 0.50 mm to 1.0 mm, both inclusive. Still alternatively, the first and second thermal insulating portions may each have a thickness ranging from 0.10 mm to 3.00 mm, both inclusive, from 0.30 mm to 1.50 mm, both inclusive, or from 0.50 mm to 1.0 mm, both inclusive. This makes it possible to maintain a desired thermal insulation performance and reduce a space required to arrange the first or second thermal insulating portion at the same time. The supporting portion of at least either one of the first and second thermal insulating portions preferably has a thermal conductivity of 0.300 W/m/K or less, more preferably 0.100 W/m/K or less, and most preferably 0.050 W/m/K or less. In other words, the first thermal insulating portion preferably has a thermal conductivity of 0.300 W/m/K or less, more preferably 0.100 W/m/K or less, and most preferably 0.050 W/m/K or less. Alternatively, the second thermal insulating portion preferably has a thermal conductivity of 0.300 W/m/K or less, more preferably 0.100 W/m/K or less, and most preferably 0.050 W/m/K or less. Still alternatively, the first and second thermal insulating portions preferably have a thermal conductivity of 0.300 W/m/K or less, more preferably 0.100 W/m/K or less, and most preferably 0.050 W/m/K or less. This decreases the thermal conductivity of the first or second thermal insulating portion.

[0023] The thermal conductivity of at least either one of the first and second thermal insulating portions is preferably 0.050 W/m/K or less, more preferably 0.026 W/m/K or less, and most preferably 0.013 W/m/K or less. In other words, the thermal conductivity of the first thermal insulating portion is preferably 0.050 W/m/K or less, more preferably 0.026 W/m/K or less, and most preferably

0.013 W/m/K or less. Alternatively, the thermal conductivity of the second thermal insulating portion is preferably 0.050 W/m/K or less, more preferably 0.026 W/m/K or less, and most preferably 0.013 W/m/K or less. Still alternatively, the thermal conductivity of the first and second thermal insulating portions is preferably 0.050 W/m/K or less, more preferably 0.026 W/m/K or less, and most preferably 0.013 W/m/K or less. This makes it possible to more effectively insulate the heat for heating the smokable material which is generated by the resistive heating portion, the susceptor, and the like. The thermal conductivity of at least either one of the first and second thermal insulating portions may be changed, for example, by the thickness of the first or second thermal insulating portion, the thermal conductivity of the supporting portion, the shape or cubic volume of the supporting portion, the volume of the air provided in the supporting portion, or the like.

[0024] The supporting portion of at least either one of the first and second thermal insulating portions may be, for example, fiber, non-woven fabric, woven fabric, a porous element or the like. In other words, the supporting portion of the first thermal insulating portion may be fiber, non-woven fabric, woven fabric, a porous element or the like. Alternatively, the supporting portion of the second thermal insulating portion may be fiber, non-woven fabric, woven fabric, a porous element or the like. Still alternatively, the supporting portion of each of the first and second thermal insulating portions may be fiber, non-woven fabric, woven fabric, a porous element or the like. The supporting portion of at least either one of the first and second thermal insulating portions may be made of any material that delivers the desired thermal insulation performance and may be made, for example, of ceramic, glass, aerogel, plants, wood, paper or another like material. In other words, the supporting portion of the first thermal insulating portion may be made of ceramic, glass, aerogel, plants, wood, paper or another like material. Alternatively, the supporting portion of the second thermal insulating portion may be made of ceramic, glass, aerogel, plants, wood, paper or another like material. Still alternatively, the supporting portion of each of the first and second thermal insulating portions may be made of ceramic, glass, aerogel, plants, wood, paper or another like material. The supporting portion of at least either one of the first and second thermal insulating portions preferably has flexibility. In other words, the supporting portion of the first thermal insulating portion preferably has flexibility. Alternatively, the supporting portion of the second thermal insulating portion preferably has flexibility. Still alternatively, the supporting portion of each of the first and second thermal insulating portions preferably has flexibility. This facilitates the installation of the first or second thermal insulating portion and allows the first or second thermal insulating portion to be mounted on the partitioning portion in various shapes. Since the supporting portion of at least either one of the first and second thermal insulating portions may be made of any material that delivers the desired thermal insulation performance, the supporting portion may be made, for example, of metal fibers, organic compound fibers, ceramic fibers, such as glass fibers, sheet-like ceramic fibers, such as sheet-like glass fibers, glass wool, Superwool (registered trademark), rock wool, mineral wool or another like material. In other words, the supporting portion of the first thermal insulating portion may be made, for example, of metal fibers, organic compound fibers, ceramic fibers, such as glass fibers, sheet-like ceramic fibers, such as sheet-like glass fibers, glass wool, Superwool (registered trademark), rock wool, mineral wool or another like material. Alternatively, the supporting portion of the second thermal insulating portion may be made, for example, of metal fiber, organic compound fiber, ceramic fiber, such as glass fiber, sheet-like ceramic fiber, such as sheet-like glass fibers, glass wool, Superwool (registered trademark), rock wool, mineral wool or another like material. Still alternatively, the supporting portion of each of the first and second thermal insulating portions may be made, for example, of metal fibers, organic compound fibers, ceramic fibers, such as glass fibers, sheet-like ceramic fibers, such as sheet-like glass fibers, glass wool, Superwool (registered trademark), rock wool, mineral wool or another like material. Other examples of ceramic fibers include carbon fibers, alumina fibers, silicon carbide fibers, and the like. Examples of materials composing fibers of metal fibers include metals, alloys, organic compound resins, such as plastic, which are coated with metal or alloy, non-metal cores completely covered with metal or alloy. Examples of the metals and the metals composing alloys include aluminum, stainless steel (stainless steel), iron and the like. Examples of the organic compound fibers include fibers obtained by fiberizing a highly heat-resisting material, such as PEEK. If at least the supporting portion is made of ceramic fiber, such as glass fiber, an effect is expected, which represses radiant heat transmission from an area having high temperature due to the heat for heating the smokable material which is generated by the resistive heating portion, the susceptor, and the like.

[0025] An air volume ratio of at least either one of the first and second thermal insulating portions is preferably 50% or more, more preferably 65% or more, and most preferably 80% or more. The air volume ratio is preferably 95 or less. In other words, the air volume ratio of the first thermal insulating portion is preferably 50% or more, more preferably 65% or more, and most preferably 80% or more, but preferably 95% or less. Alternatively, the air volume ratio of the second thermal insulating portion is preferably 50% or more, more preferably 65% or more, and most preferably 80% or more, but preferably 95% or less. Still alternatively, the air volume ratio of the first and second thermal insulating portions is preferably 50% or more, more preferably 65% or more, and most preferably 80% or more, but preferably 95% or less. The "air volume ratio" means the ratio of air volume to the volume of the supporting portion and the air. If the air volume ratio is set to fall in the range of the foregoing values, it becomes easy to maintain higher thermal insulation performance and obtain a proper compressional stress of the thermal insulating portion at the same time.

[0026] Compressional stress of the supporting portion of at least either one of the first and second thermal insulating portions preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. In other words, the compressional stress of the first thermal insulating portion preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. Alternatively, the compressional stress of the second thermal insulating portion preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. Still alternatively, the compressional stress of the first and second thermal insulating portions preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. This represses the first or second thermal insulating portion from being changed in shape and reduces a deterioration in thermal insulation function which is attributable to a decrease in volume of the air contained in the thermal insulating portion in the state where the first or second thermal insulating portion is fixed, for example, by being applied with pressure from the fixing portion. It is also possible to maintain a proper flexibility of the first or second thermal insulating portion and improve easiness of arrangement of the first or second thermal insulating portion.

[0027] If at least either one of the first and second thermal insulating portions is a sheet, a compressional stress of the thermal insulating sheet in a thickness direction preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. In other words, the compressional stress of the thermal insulating sheet of the first thermal insulating portion in a thickness direction preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. Alternatively, the compressional stress of the thermal insulating sheet of the second thermal insulating portion in the thickness direction preferably ranges from 0.1 N/mm^2 to 1.0 N/mm^2, both inclusive, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, both inclusive, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2, both inclusive. Still alternatively, the compressional stress of the thermal insulating sheet of each of the first and second thermal insulating portions in the thickness direction ranges preferably from 0.1 N/mm^2 or more to 1.0 N/mm^2 or less, more preferably from 0.1 N/mm^2 to 0.5 N/mm^2, and most preferably from 0.1 N/mm^2 to 0.3 N/mm^2. This represses a change of the shape of the first or second thermal insulating portion and reduces a deterioration in thermal insulation function which is attributable to a decrease in volume of the air contained in the thermal insulating portion in the state where the first or second thermal insulating portion is fixed, for example, by being applied with pressure from the fixing portion in the thickness direction of the thermal insulating sheet. It is also possible to maintain a proper flexibility of the first or second thermal insulating portion and improve easiness of arrangement of the first or second thermal insulating portion.

[0028] Density of the air provided in the supporting portion of at least either one of the first and second thermal insulating portions is preferably uniform in the thickness direction of the first or second thermal insulating portion. In other words, the density of the air provided in the supporting portion of the first thermal insulating portion is preferably uniform in the thickness direction of the first thermal insulating portion. Alternatively, the density of the air provided in the supporting portion of the second thermal insulating portion is preferably uniform in the thickness direction of the second thermal insulating portion. Still alternatively, the density of the air provided in the supporting portion of each of the first and second thermal insulating portions is preferably uniform in the thickness direction of the first or second thermal insulating portion. This allows the first or second thermal insulating portion to deliver more uniform thermal insulation performance. The meaning of "to be uniform" here includes to be substantially uniform. The thickness direction of the first or second thermal insulating portion may be referred to as a direction orthogonal to the side surface of the partitioning portion, a direction orthogonal to a longitudinal direction of the partitioning portion or a direction orthogonal to a direction where the smokable material is inserted into the partitioning portion.

[0029] The density of the air provided in the supporting portion of at least either one of the first and second thermal insulating portions is preferably uniform in a width direction of the first or second thermal insulating portion. In other words, the density of the air provided in the supporting portion of the first thermal insulating portion is preferably uniform in the width direction of the first thermal insulating portion. Alternatively, the density of the air provided in the supporting portion of the second thermal insulating portion is preferably uniform in the width direction of the second thermal insulating portion. Still alternatively, the density of the air provided in the supporting portion of each of the first and second thermal insulating portions is preferably uniform in the width direction of the first or second thermal insulating portion. This allows the first or second thermal insulating portion to deliver more uniform thermal insulation performance. The meaning of "to be uniform" here includes to be substantially uniform. The width direction of the first or second thermal insulating portion may be referred to as a direction parallel to the side surface of the partitioning portion, the longitudinal direction of the partitioning portion or the direction where the smokable material is inserted into the partitioning portion.

[0030] The fixing portion may be a biasing portion that biases the heating portion toward the partitioning portion. The biasing portion may be, for example, a ring or sheet that is contracted by heat, or alternatively an elastic ring or sheet made of rubber or another like material. The biasing portion is preferably configured to be thermally contractive. This enables the biasing portion to fix the heating portion more reliably. It is also possible to arrange the fixing portion in an uncontracted state at a predetermined position and then contract the fixing portion to fix the heating portion, which facilitates assembly. The biasing portion is preferably configured so that contraction percentage in a circumferential direction of the partitioning portion (which may also be referred to as a circumferential direction around a longitudinal axis of the partitioning portion) is higher than contraction percentage in the longitudinal direction of the partitioning portion (which may also be referred to as the direction where the smokable material is inserted into the partitioning portion) in a state where the biasing portion covers the partitioning portion and the heating portion. It is more preferable that the biasing portion be thermally contracted only in the circumferential direction of the partitioning portion. If the biasing portion is not thermally contracted in the longitudinal direction of the partitioning portion, a longitudinal area of the partitioning portion which is available for the fixing portion to be fixed is not reduced, so that the heating portion is more reliably fixed. The biasing portion may have a heatproof temperature selected, for example, from a range from 150°C to 300°C, both inclusive, a range from 150°C to 270°C, both inclusive, and a range from 150°C to 230°C, both inclusive, in light of the flexibility of the biasing portion (a member, the heatproof temperature of which is too high, is made of ceramic or another like material and will possibly cause a problem associated with flexibility).

[0031] The biasing portion may be a sheet member or a cord member (which may be wound into a ring-like shape). The biasing portion may be made, for example, of at least one material selected from the group consisting of polyester, polyurethane, nylon, polyvinyl formal, polyvinyl butyral, polyimide (PI), polypropylene (PP), polyethylene terephthalate (PET), gelatin, and polysaccharide. The biasing portion is preferably made of polyimide.

[0032] The heating unit for a flavor inhaler may further include an electromagnetic shield between the fixing portion and the induction coil. The electromagnetic shield may contain, for example, nickel-zinc-based ferrite.

[0033] The induction coil may be formed of a single wire or may be a helical litz wire from the perspective of effective heat generation. The litz wire includes a core made of metal and a sheath portion comprises an electrically insulating element that covers the core. The single core or the core of the litz wire preferably contains, for example, a material selected from at least one of the group consisting of copper, aluminum, nickel, silver, gold, and alloys such as stainless steel. The sheath portion of the litz wire may be made, for example, of polyimide or polyester. A heatproof temperature of the sheath portion may range, for example, from 150°C to 300°C, both inclusive, from 150°C to 270°C, both inclusive, or from 150°C to 230°C, both inclusive, from the perspective of the flexibility of the sheath portion (a member, the heatproof temperature of which is too high, is made of ceramic or another like material and will possibly cause a problem associated with flexibility).

[0034] The induction coil may be wound into a helical shape (three-dimensional volute) or a spiral shape (two-dimensional volute). The shape of the induction coil may be cylindrical (shape of a curved helical or spiral coil) or planar. The induction coil may be located adjacent to the partitioning portion, surround the partitioning portion or protrude into the partitioning portion. If the induction coil is arranged to surround the partitioning portion, energy is efficiently supplied to a heat generating part of the partitioning portion. The induction coil may comprise one or more induction coils. As examples of the configuration of the induction coil surrounding the partitioning portion, the induction coil may be formed into a helical shape so as to surround the partitioning portion, may be formed by bending a spiral coil so as to surround the partitioning portion or may include a plurality of planar coils surrounding the partitioning portion. If formed into the helical shape so as to surround the partitioning portion, the induction coil has a simple structure, which reduces manufacturing costs.

[0035] A frequency applied to the induction coil may range from about 80 kHz to 500 kHz, both inclusive, preferably from about 150 kHz to 250 kHz, both inclusive, and more preferably from 190 kHz to 210 kHz, both inclusive. Alternatively, the frequency applied to the induction coil may range from 1 MHz to 30 MHz, both inclusive, preferably from 2 MHz to 10 MHz, both inclusive, and more preferably from 5 MHz to 7 MHz, both inclusive. The aforementioned frequencies may be determined from the perspective of characteristics of the susceptor which include the material and shape thereof.

[0036] The heating unit for a flavor inhaler may be arranged to operate in a variable electromagnetic field having a magnetic flux density ranging from about 0.5 tesla (T) to 2.0 tesla (T), both inclusive, at a maximum.

[0037] The solid smokable material may be wrapped with a first wrapping paper having air permeability. The first wrapping paper may be provided with a lid that has air permeability and prevents the smokable material from falling. The lid may be stuck to the first wrapping paper with glue or fixed to the first wrapping paper by frictional force. The lid may be, for example, a paper filter or an acetate filter. The expendable part may include a tubular member. The tubular member may be a paper tube or a hollow filter.

[0038] The hollow filter may be formed of a packed layer including one or more hollow channels and a plug wrapper that covers the packed layer. The packed layer has a high fiber packing density, so that during inhalation, air and aerosol flow only through the hollow channels and hardly flow within the packed layer. The hollow filter may have a mouthpiece that is formed of a filter portion adjacent to the hollow filter.

[0039] The solid smokable material has a longitudinal length preferably ranging from 40 mm to 90 mm, both inclusive, more preferably from 50 mm to 75 mm, both inclusive, and still more preferably from 50 mm to 60 mm, both inclusive. The solid smokable material has a circumference preferably ranging from 15 mm to 25 mm, both inclusive, more preferably from 17 mm to 24 mm, both inclusive, and still more preferably from 20 mm to 23 mm, both inclusive. The solid smokable material may have a length ranging from 12 mm to 22 mm, both inclusive. The first wrapping paper may have a length ranging from 12 mm to 22 mm, both inclusive. The hollow filter portion may have a length ranging from 7 mm to 26 mm, both inclusive. The filter portion may have a length ranging from 6 mm to 20 mm, both inclusive.

[0040] The smokable material contained in the expendable part may contain an aerosol source that is heated at predetermined temperature to generate aerosol. The aerosol source is not particularly limited in kind. Materials extracted from various natural products and/or constituents thereof may be selected as the aerosol source depending on the intended use. Examples of the aerosol source include glycerin, propylene glycol, triacetin, 1,3-butanediol, and a mixture of these substances. The aerosol source contained in the solid smokable material is not particularly limited in content (percentage by weight relative to weight of the smokable material). However, from the perspective of sufficient generation of aerosol and smooth provision of a smoking flavor, the content of the aerosol source contained in the solid smokable material is normally 5% by weight or more, but preferably 10% by weight or more, and normally 50% by weight or less, but preferably 20% by weight or less.

[0041] Materials that can be used as the solid smokable material include tobacco as a flavor source which contains laminae, midribs, and the like, and other publicly-known plants. The flavor source, such as tobacco, may be in shredded form, a sheet-like shape, a cord-like shape, powdered form, granular form, pellet form, slurry form, porous form or the like. If the smokable material has a circumference ranging from 20 mm to 23 mm, both inclusive, and a length ranging from 18 mm to 22 mm, both inclusive, the content of the smokable material, such as tobacco, contained in the expendable part ranges, for example, from 200 mg to 400 mg, both inclusive, and preferably from 250 mg to 320 mg, both inclusive. Moisture content (percentage by weight relative to the weight of the smokable material as a whole) of the smokable material containing tobacco or the like as a flavor source ranges, for example, from 8% by weight to 18% by weight, both inclusive, and preferable from 10% by weight to 16% by weight. The moisture content in the aforementioned ranges represses a stain in the wrapping paper and improves a winding ability during manufacture. There is no particular limitation on size and preparation method of tobacco shreds used as an example of the smokable material. For example, dried tobacco leaves shredded into a width ranging from 0.8 mm to 1.2 mm, both inclusive, may be used. Dried tobacco leaves may also be used after being pulverized and uniformed into an average particle size ranging from about 20 μm to about 200 μm, both inclusive, processed into a sheet, and shredded into a width ranging from 0.8 mm to 1.2 mm, both inclusive. The dried tobacco leaves processed into a sheet may be gathered, instead of being shredded, and used as the smokable material. The smokable material may be in liquid form, and the liquid may have consistency. In such a case, a large part of the smokable material may be the aerosol source. A content (percentage by weight relative to weight of the smokable material as a whole) of the aerosol source contained in the liquid smokable material may be 80% by weight or more, 90% by weight or more or 95% by weight or more. The smokable material may contain one or more kinds of aroma chemicals. The kinds of the aroma chemicals are not particularly limited, but menthol is preferable from the perspective of provision of a favorable smoking flavor.

[0042] The expendable part may have a second wrapping paper that differs from the first wrapping paper. The second wrapping paper is wrapped around at least one of the tubular member, the hollow filter portion, and the filter portion. The second wrapping paper may wrap a part of the first wrapping paper that is wrapped around the smokable material. The first and second wrapping papers of the expendable part may be made of base paper having a basis weight raging, for example, from 20 gsm to 65 gsm, both inclusive. The first and second wrapping papers are not particularly limited in thickness. However, from the perspective of rigidity, air permeability, and easiness of adjustment in paper manufacturing, the thickness is preferably in a range from 10 μm to 100 μm, both inclusive.

[0043] The first and second wrapping papers of the expendable part may contain loading material. Content of the loading material may range from 10% by weight to 60% by weight, bot inclusive, and preferably from 15% by weight to 45% by weight, both inclusive, relative to the total weight of the first and second wrapping papers. The content of the loading material is preferably in the range from 15% by weight to 45% by weight relative to a range of preferable basis weight (25 gsm - 45 gsm). The loading material may be, for example, calcium carbonate, titanium dioxide, kaolin or the like. Paper containing one of the aforementioned loading materials has a bright white color which is favorable in terms of appearance of the paper that is used as wrapping paper of the expendable part, and permanently preserves the whiteness thereof. The wrapping paper containing a large amount of such a loading material maintains an ISO whiteness of 83% or more. On utilitarian grounds that the first and second wrapping papers are used as wrapping paper of the expendable part, it is preferable that the first and second wrapping papers have a tension strength of 8 N/15 mm or more. The tension strength can be increased by reducing the content of the loading material. More specifically, the tension strength can be increased by reducing the content of the loading material below the upper limit of the content of the loading material which is exemplified above with respect to the range of the basis weight.

[0044] Features of the other modes than the first mode may be combined with or applied to the first mode as long as the combination or application does not interfere the operation and advantageous effects of the first mode.

[0045] According to a second mode, there is provided a flavor inhaler. The flavor inhaler includes the above-mentioned heating unit for a flavor inhaler, and an outer thermal insulating portion. The outer thermal insulating portion is arranged between the fixing portion and the housing. The flavor inhaler then includes the first thermal insulating portion of the heating unit for a flavor inhaler, and the outer thermal insulating portion, which improves efficiency in heating the smokable material and represses a temperature rise in the housing. In other words, the partitioning portion is kept warm by the first thermal insulating portion at a point that is a relatively small space and close to the heating portion, and the overheating of an outer surface of the housing is repressed by the outer thermal insulating portion at a point that is a relatively large space and away from the heating portion.

[0046] The flavor inhaler is preferably a portable or handheld device. The outer thermal insulating portion is preferably larger in thickness than the first thermal insulating portion. This enhances a thermal insulating effect. The thickness here means thickness in a direction orthogonal to the side surface of the partitioning portion. The outer thermal insulating portion is arranged to cover at least a whole major surface of the first thermal insulating portion. This enhances the thermal insulating effect.

[0047] The outer thermal insulating portion may include, for example, a case that defines an internal space. The case may be made, for example, of metal, such as stainless steel, or synthetic resin, such as plastic. The internal space may be, for example, vacuumed or filled with thermal insulating material, such as aerogel. In particular, if aerogel thermal insulating material and the first thermal insulating portion made of ceramic fiber, such as glass fiber, or the like are combined together, the first thermal insulating portion reduces the radiant heat transmitted from the heating portion before the radian heat reaches the aerogel thermal insulating material, that is, the outer thermal insulating portion. Therefore, even the aerogel thermal insulating material whose thermal insulation performance against the radiant heat is low effectively contributes to thermal insulation. In that case, the first thermal insulating portion preferably has an emissivity of 0.7 or more, and more preferably 0.9 or more. If the emissivity is a value in the foregoing range, transmissivity is decreased. It is therefore possible to effectively repress the radiant heat transmission from a place where the heat for heating the smokable material which has the highest temperature within the flavor inhaler is generated. In other words, if the outer thermal insulating portion made of thermal insulating material, such as aerogel thermal insulating material whose thermal insulation performance against radiant heat is low is combined with the first thermal insulating portion that preferably has an emissivity of 0.7 or more, and more preferably 0.9 or more, a complementary, synergistic thermal insulating effect can be expected.

[0048] Features of the other modes than the second mode may be combined with or applied to the second mode as long as the combination or application does not interfere the operation and advantageous effects of the second mode.

[0049] According to a third mode, there is provided a flavor inhaler that heats and atomizes smokable material. The flavor inhaler comprises a partitioning portion including an opening and a side surface surrounding the opening, a heating portion that heats the partitioning portion, a housing that receives the partitioning portion and the heating portion, a thermal insulating portion arranged between the side surface of the partitioning portion and the housing, and an outer thermal insulating portion arranged between the thermal insulating portion and the housing. The smokable material may be solid smokable material. Since the flavor inhaler includes the thermal insulating portion and the outer thermal insulating portion, a heating efficiency of the smokable material is improved, and a temperature rise in the housing is repressed. In other words, the partitioning portion is kept warm by the thermal insulating portion at a point that is a relatively small space and close to the heating portion, and the overheating of an outer surface of the housing is decreased by the outer thermal insulating portion at a point that is a relatively large space and away from the heating portion.

[0050] The thermal insulating portion is arranged within an area of A/5 from the outer surface of the partitioning portion, preferably A/10, and more preferably A/20, where A is the shortest distance between the outer surface of the partitioning portion and an inner surface of the housing. This makes it possible to efficiently keep the partitioning portion warm.

[0051] The outer thermal insulating portion is arranged away from the outer surface of the partitioning portion at 5A/6 or more, preferably 4A/6 or more, and more preferably 3A/6 or more, where A is the shortest distance between the outer surface of the partitioning portion and the inner surface of the housing. This makes it possible to repress the overheating of the outer surface of the housing with more efficiency.

[0052] Features of the other modes than the third mode may be combined with or applied to the third mode as long as the combination or application does not interfere the operation and advantageous effects of the third mode.

[0053] According to a fourth mode, there is provided a heating unit for a flavor inhaler which heats and atomizes smokable material. The heating unit for a flavor inhaler comprises a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material, a heating portion that heats the partitioning portion, and a second thermal insulating portion arranged between the partitioning portion and the heating portion. The partitioning portion includes a susceptor. The heating portion is a tubular induction coil surrounding the side surface of the partitioning portion. The second thermal insulating portion is magnetically permeable and electrically nonconductive (electrically insulative). The smokable material may be solid smokable material. The meaning of "to be electrically nonconductive" here includes to be substantially electrically nonconductive.

[0054] According to the fourth mode, there is provided an IH (induction heating) assembly with an integrated, stable structure. The second thermal insulating portion represses the transmission of heat of the susceptor to a sheath of a litz wire that may form the induction coil. Since the second thermal insulating portion further represses the transmission of heat from the susceptor to the induction coil, the heat of the susceptor is repressed from being absorbed in the induction coil. This discourages the heat from being transferred outside the receiving portion, and further represses the overheating of the housing which is caused by the heat of the susceptor. Due to the magnetic permeability and nonconductivity (electrical insulation property) of the second thermal insulating portion, heat generation is less likely to occur in the second thermal insulating portion, and the susceptor that is arranged inside the second thermal insulating portion is efficiently heated by the magnetic force line that is generated by the induction coil.

[0055] Features of the other modes than the fourth mode may be combined with or applied to the fourth mode as long as the combination or application does not interfere the operation and advantageous effects of the fourth mode.

[0056] According to a fifth mode, there is provided a heating unit for a flavor inhaler which heats and atomizes smokable material. The heating unit for a flavor inhaler comprises a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material, a heating portion that heats the partitioning portion, and a second thermal insulating portion arranged between the partitioning portion and the heating portion. The second thermal insulating portion is magnetically permeable and electrically nonconductive (electrically insulative). The partitioning portion includes a susceptor. The heating portion is a tubular induction coil surrounding the side surface of the partitioning portion. The second thermal insulating portion is magnetically permeable and electrically nonconductive (electrically insulative). The meaning of "to be electrically nonconductive" here includes to be substantially electrically nonconductive. The smokable material may be solid smokable material.

[0057] According to the fifth mode, the partitioning portion is inductively heated by the heating portion, but the second thermal insulating portion represses the transmission of the heat from the partitioning portion to the heating portion. In the fifth mode, the heating unit for a flavor inhaler may include an outer thermal insulating portion, as necessary. This suppresses a temperature rise in a housing. In the fifth mode, the heating unit for a flavor inhaler may include an electromagnetic shield, as necessary

[0058] Features of the other modes than the fifth mode may be combined with or applied to the fifth mode as long as the combination or application does not interfere the operation and advantageous effects of the fifth mode.

[0059] According to a sixth mode, there is provided a heating unit for a flavor inhaler which heats and atomizes smokable material. The heating unit for a flavor inhaler comprises a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material, a heating portion that heats a susceptor arranged in the receiving portion, and a fixing portion that fixes the heating portion to the partitioning portion. The partitioning portion is magnetically permeable and electrically nonconductive (electrically insulative). The heating portion is a tubular induction coil surrounding the side surface of the partitioning portion. The smokable material may be solid smokable material. The partitioning portion may be made of resin material, such as PEEK.

[0060] According to the sixth mode, there is provided an IH (induction heating) assembly with an integrated, stable structure. Since the heating portion is configured to heat the susceptor arranged in the receiving portion, the heat from the susceptor is repressed from being released from the receiving portion.

[0061] Features of the other modes than the sixth mode may be combined with or applied to the sixth mode as long as the combination or application does not interfere the operation and advantageous effects of the sixth mode.

BRIEF DESCRIPTION OF DRAWINGS

[0062]

Fig. 1 is a schematic cross-sectional view of a flavor inhaler according to a first embodiment.

Fig. 2 is a schematic cross-sectional view of a first thermal insulating portion.

Fig. 3 is a schematic cross-sectional view of an outer thermal insulating portion.

Fig. 4 is a schematic cross-sectional view showing another example of a heating unit for a flavor inhaler according to the first embodiment.

Fig. 5 is a schematic cross-sectional view of a flavor inhaler of a second embodiment.

Fig. 6 is a cross-sectional view of an enlarged part of first and second thermal insulating portions.

Fig. 7 is a schematic cross-sectional view showing another example of a heating unit for a flavor inhaler according to the second embodiment.

Fig. 8 shows another example of the flavor inhaler according to the second embodiment.

Fig. 9 shows still another example of the flavor inhaler according to the second embodiment.

Fig. 10 is a schematic cross-sectional view of a flavor inhaler according to a third embodiment.

DESCRIPTION OF EMBODIMENTS

<First Embodiment>

[0063] Embodiments of the invention will be discussed with reference to the drawings. With regard to the drawings discussed below, similar or corresponding constituent elements are provided with the same reference signs, and repetitive descriptions are omitted. Fig. 1 is a schematic cross-sectional view of a flavor inhaler 100 according to a first embodiment. The flavor inhaler 100 is preferably a portable or handheld device. As illustrated in Fig. 1, the flavor inhaler 100 includes a battery 10, a PCB (Printed Circuit Board) 20, a heating unit 40 for a flavor inhaler, and a housing 102.

[0064] The heating unit 40 for a flavor inhaler is configured to heat solid smokable material 30 and thus atomize the smokable material. The smokable material 30 forms a part of a columnar expendable part 31 extending along a longitudinal direction, for example. The expendable part 31 may include, for example, the smokable material that is a tobacco stick containing tobacco. The battery 10 is charged with power used in the flavor inhaler 100. For example, the battery 10 is a lithium-ion battery. The battery 10 may be chargeable through an external power source.

[0065] The PCB 20 is formed of a CPU, a memory, and the like. The PCB 20 controls operation of the flavor inhaler 100. For example, the PCB 20 begins the heating of the smokable material 30 in response to a user's operation on an input device, such as a push button and a slide switch, not shown, and finishes the heating of the smokable material 30 after a lapse of a predetermined time. When the number of puffs taken by the user exceeds a predetermined value, the PCB 20 may finish the heating of the smokable material 30 even before the lapse of the predetermined time from the beginning of the heating of the smokable material 30. For example, a puffing action is detected by a sensor, not shown.

[0066] Alternatively, the PCB 20 may begin the heating of the smokable material at the beginning of the puffing action and finish the heating of the smokable material 30 at the end of the puffing action. After the lapse of the predetermined time from the beginning of the puffing action, the PCB 20 may finish the heating of the smokable material 30 even before the end of the puffing action. In the present embodiment, the PCB 20 is arranged between the battery 10 and the heating unit 40 for a flavor inhaler.

[0067] In the example illustrated in the drawing, the flavor inhaler 100 is so configured as to receive the smokable material 30 in a stick-like shape. As illustrated, the battery 10, the PCB 20, and the heating unit 40 for a flavor inhaler may be arranged in a lateral direction, that is, a direction orthogonal to a direction where the smokable material 30 is inserted into the flavor inhaler 100. The housing 102 is a case in which the battery 10, the PCB 20, and the heating unit 40 for a flavor inhaler are received.

[0068] The heating unit 40 for a flavor inhaler includes a partitioning portion 50, a heating portion 60, a first thermal insulating portion 70, and a fixing portion 80. As illustrated, the heating portion 60 is arranged on an outer surface of the partitioning portion 50, and the first thermal insulating portion 70 is arranged between the heating portion 60 and the fixing portion 80. At the time of assembly of the heating unit 40 for a flavor inhaler, the first thermal insulating portion 70 is first wound on the outer side of the heating portion 60 with the heating portion 60 wound on the outer surface of the partitioning portion 50. The fixing portion 80 is then wound on an outer surface of the heating portion 60.

[0069] The partitioning portion 50 includes an opening 51 and a side surface 52 surrounding the opening 51. The partitioning portion 50 partitions a receiving portion 53 that receives the smokable material 30. In the example illustrated in the drawing, the partitioning portion 50 is a tubular member including a bottom portion 55. The bottom portion 55 preferably supports the smokable material 30 so that an end surface of the smokable material 30 is at least partially exposed. In the example illustrated in the drawing, the bottom portion 55 is provided with a hole 54 for taking air into the receiving portion 53, and the end surface of the smokable material 30 is partially exposed. The hole 54 leads to an air passage 102a formed in the housing 102. The air passage 102a leads outside the housing 102. The partitioning portion 50 of the first embodiment may be made of a highly thermally conductive metal, such as stainless steel.

[0070] The heating portion 60 is configured to heat the partitioning portion 50. The heating portion 60 is, for example, a resistive heating portion and capable of heating the partitioning portion 50 through heat transmission. In the first embodiment, the heating portion 60 is a film heater. More specifically, the heating portion 60 may have a structure in which an insulation layer 61 comprising electric insulating material and a heating layer 62 comprising a heating track are stacked. The heating portion 60 may comprise a heating track only. The insulation layer 61 covers at least one surface of the heating portion 60. It is, however, preferable that the insulating layer 61 be arranged to cover both surfaces of the heating portion 60.

[0071] The first thermal insulating portion 70 is arranged to contact both the heating portion 60 and the fixing portion 80. Fig. 2 is a schematic cross-sectional view of the first thermal insulating portion 70. As illustrated in Fig. 2, the first thermal insulating portion 70 may include a supporting portion 71 that keeps the heating portion 60 and the partitioning portion 50 at a predetermined distance from each other when the heating portion 60 is fixed to the partitioning portion 50, and air 72 that is provided in the supporting portion 71. In other words, the first thermal insulating portion 70 may include the supporting portion 71 having an air layer inside thereof. The supporting portion 71 of the first thermal insulating portion 70 preferably has flexibility. Specifically, for example, the supporting portion 71 of the first thermal insulating portion 70 may be made of glass fiber and may be a sheet-shaped glass fiber.

[0072] Density of the air 72 provided in the supporting portion 71 of the first thermal insulating portion 70 is preferably uniform in a thickness direction of the first thermal insulating portion 70. The density of the air 72 provided in the supporting portion 71 of the first thermal insulating portion 70 is preferably uniform also in a width direction of the first thermal insulating portion 70.

[0073] As illustrated in Fig. 1, it is preferable that the heating portion 60 include a major surface parallel to the side surface 52 of the partitioning portion 50, and that the first thermal insulating portion 70 be arranged to extend along the major surface of the heating portion 60. More preferably, the first thermal insulating portion 70 covers the heating portion 60 as a whole in a longitudinal direction of the partitioning portion 50 (the inserting direction of the smokable material). It is also preferable that the first thermal insulating portion 70 be arranged in a direction orthogonal to the side surface 52 of the partitioning portion 50 to cover a whole major surface of the heating portion 60 in the longitudinal direction of the partitioning portion 50. The first thermal insulating portion 70 is preferably arranged to cover the major surface of the heating portion 60 over the entire length in the circumferential direction of the partitioning portion 50. It is therefore preferable that the first thermal insulating portion 70 be arranged to cover the whole major surface of the heating portion 60.

[0074] The fixing portion 80 is configured to fix the heating portion 60 to the partitioning portion 50. The heating portion 60 is substantially tightly fixed to the outer side of the partitioning portion 50. This further improves heating efficiency and stabilizes the structure around the chamber 50. The fixing portion 80 may be a biasing portion 80 that biases the heating portion 60 toward the partitioning portion 50. The biasing portion 80 may be a ring or sheet that is contracted by heat, or an elastic ring or sheet made of rubber or another like material. The biasing portion 80 is preferably configured to be thermally contractive. The biasing portion 80 is preferably configured so that contraction percentage in a circumferential direction of the partitioning portion 50 is higher than the longitudinal direction of the partitioning portion 50 in a state where the biasing portion 80 covers the partitioning portion 50 and the heating portion 60. It is more preferable that the biasing portion 80 is thermally contacted only in the circumferential direction of the partitioning portion 50.

[0075] In the first embodiment, the biasing portion 80 may be a sheet member. The biasing portion 80 is preferably made of polyimide.

[0076] In the first embodiment, since the first thermal insulating portion 70 is provided between the fixing portion 80 and the heating portion 60, the heat from the heating portion 60 is repressed from being transmitted to the fixing portion 80. This increases the temperature of the heating portion 60 higher than in conventional technology and makes it possible to heat the smokable material 30 to higher temperature, thereby contributing to the increase of aerosol generation amount and the improvement of flavors.

[0077] As illustrated in Fig. 1, the flavor inhaler 100 according to the first embodiment may further comprise an outer thermal insulating portion 85. The outer thermal insulating portion 85 is arranged between the fixing portion 80 and the housing 102. The flavor inhaler 100 therefore includes the first thermal insulating portion 70 of the heating unit 40 for a flavor inhaler and the outer thermal insulating portion 85. This improves the efficiency in heating the smokable material 30 and represses a temperature rise in the housing 102. In other words, the partitioning portion 50 is kept warm by the first thermal insulating portion 70 at a point that is a relatively small space and close to the heating portion 60, and the overheating of an outer surface of the housing 102, the PCB 20, and the battery 10 is repressed by the outer thermal insulating portion 85 at a point that is a relatively large space and away from the heating portion 60.

[0078] The outer thermal insulating portion 85 is preferably larger in thickness than the first thermal insulating portion 70. It is also preferable that the outer thermal insulating portion 85 be arranged in the direction orthogonal to the side surface 52 of the partitioning portion 50 to cover a whole major surface of the first thermal insulating portion 70 which is parallel to the side surface 52 of the partitioning portion 50 in the longitudinal direction of the partitioning portion 50. The outer thermal insulating portion 85 is preferably arranged to cover the first thermal insulating portion 70 over the entire length in the circumferential direction of the partitioning portion 50.

[0079] Fig. 3 is a schematic cross-sectional view of the outer thermal insulating portion 85. As illustrated in Fig. 3, the outer thermal insulating portion 85 may include a case 86 that defines an internal space 87. The case 86 may be made, for example, of metal, such as stainless steel, or synthetic resin, such as plastic. The internal space 87 may be vacuumed or filled with thermal insulating material, such as aerogel.

[0080] Referring to Fig. 1, it is preferable that the thermal insulating portion 70 be arranged with in an area of A/5 from the outer surface of the partitioning portion 50, preferably A/10, and more preferably A/20, where A is the shortest distance between the outer surface of the partitioning portion 50 and an inner surface of the housing 102. In other words, L1 is A/5 or less, preferably A/10 or less, and more preferably A/20 or less, where L1 is distance between the outer surface of the partitioning portion 50 and an outer surface of the first thermal insulating portion 70. This makes it possible to efficiently keep the partitioning portion 50 warm.

[0081] It is also preferable that the outer thermal insulating portion 85 be arranged away from the lateral side surface of the partitioning portion 50 at a distance of 5A/6 or more, preferably 4A/6 or more, and more preferably 3A/6 or more. In other words, L2 is 5A/6 or more, preferably 4A/6 or more, and more preferably 3A/6 or more, where L2 is distance between the outer surface of the partitioning portion 50 and the inner surface of the outer thermal insulating portion 85. This makes it possible to repress the overheating of the outer surface of the housing 102 with more efficiency.

[0082] Fig. 4 is a schematic cross-sectional view showing another example of the heating unit 40 for a flavor inhaler according to the first embodiment. In the heating unit 40 for a flavor inhaler illustrated in Fig. 1, the first thermal insulating portion 70 and the fixing portion 80 are arranged only at positions coinciding with the major surface of the heating portion 60. In contrast, according to the example illustrated in Fig. 4, the first thermal insulating portion 70 even covers end surfaces of the heating portion 60. That is, the first thermal insulating portion 70 is longer than the heating portion 60 in the longitudinal direction of the partitioning portion 50 and even covers both end portions of the heating portion 60. The heat from the heating portion 60 is thus more efficiently insulated. As illustrated in Fig. 4, the fixing portion 80 may cover end surfaces of the first thermal insulating portion 70 and the end surfaces of the heating portion 60. That is, the fixing portion 80 is longer than the first thermal insulating portion 70 and the heating portion 60 in the longitudinal direction of the partitioning portion 50 and even covers both end portions of the first thermal insulating portion 70 and both the end portions of the heating portion 60. This allows the fixing portion 80 to more firmly fix the heating portion 60 to the partitioning portion 50.

<Second Embodiment>

[0083] A flavor inhaler 100 according to a second embodiment will be now discussed. Fig. 5 is a schematic view of the flavor inhaler 100 according to the second embodiment. The flavor inhaler 100 according to the second embodiment differs from the flavor inhaler 100 according to the first embodiment in configuration of a heating unit 40 for a flavor inhaler.

[0084] In the second embodiment, the heating unit 40 for a flavor inhaler includes a partitioning portion 50, a second thermal insulating portion 73, a heating portion 60, a first thermal insulating portion 70, an electromagnetic shield 88, and a fixing portion 80.

[0085] The heating portion 60 of the second embodiment includes a substantially tubular induction coil surrounding a side surface 52 of the partitioning portion 50. The partitioning portion 50 may include a susceptor. The susceptor may be arranged at an outer or inner surface of the partitioning portion 50 or may be included in the side surface 52 forming the partitioning portion 50. In an example illustrated in the drawing, the side surface 52 of the partitioning portion 50 may be made of metal, such as stainless steel, so as to be inductively heated by the heating portion 60. This allows the partitioning portion 50 to more efficiently receive energy (magnetic force line that generates around an induction coil) from the heating portion 60, as compared to when the susceptor is included only in a bottom portion 55 of the partitioning portion 50. More specifically, the side surface 52 of the partitioning portion 50 includes a pipe-like susceptor surrounding a receiving portion 53 and further includes a current pathway surrounding the receiving portion 53. The side surface 52 of the partitioning portion 50 thus has an annular current pathway, which makes it possible to generate an eddy current with efficiency.

[0086] In the present embodiment, the bottom portion 55 of the partitioning portion 50 may be made of synthetic resin, such as PEEK, which is magnetically permeable and electrically nonconductive (electrically insulative). If the bottom portion 55 of the partitioning portion 50 includes a susceptor, there is a possibility that a distal end of a smokable material 30 is locally overheated. If the bottom portion 55 of the partitioning portion 50 is made of a magnetically permeable and electrically nonconductive material, induction heating is not generated in the bottom portion 55 of the partitioning portion 50, so that the smokable material 30 is more uniformly heated from a side surface thereof, as compared to when the bottom portion 55 includes a susceptor.

[0087] It is preferable that the first thermal insulating portion 70 be magnetically permeable and electrically nonconductive (electrically insulative). The first thermal insulating portion 70 protects the electromagnetic shield 88 and the fixing portion 80 from the heat of the partitioning portion 50. The second thermal insulating portion 73 may be magnetically permeable and electrically nonconductive (electrically insulative). This provides an IH (induction heating) assembly with a stable configuration in which members necessary for the heating are arranged around the partitioning portion in layers in order from inside to outside, and the members necessary for the heating are integrated together. The aforementioned configuration is advantageous in mass production of the IH assembly itself and mass production of the flavor inhaler in which the IH assembly is installed. The configuration has at least one of the following operation and advantageous effects. The sheath of the litz wire which may form the induction coil of the heating portion 60 is protected from the heat of the susceptor (side surface 52 of the partitioning portion 50) by the second thermal insulating portion 73. Since the second thermal insulating portion 73 represses the heat from the susceptor (side surface 52 of the partitioning portion 50) from being transmitted to the induction coil of the heating portion 60, the heat is discouraged from being transferred outside the receiving portion 53. The housing 102 is prevented from being overheated by the heat from the susceptor (side surface 52 of the partitioning portion 50).

[0088] The first thermal insulating portion 70 and the second thermal insulating portion 73 have the same configuration. The heating unit 40 for a flavor inhaler is more simple and inexpensive, as compared to when the first thermal insulating portion 70 and the second thermal insulating portion 73 have different configurations. Fig. 6 is a cross-sectional view of an enlarged part of the first thermal insulating portion 70 and the second thermal insulating portion 73. As illustrated in Fig. 6, at least either one of the first thermal insulating portion 70 and the second thermal insulating portion 73 may have portions 70a or 73a located between adjacent wires of the induction coil of the heating portion 60. This makes it possible to fix the longitudinal position of the induction coil and achieve stable induction heating. Alternatively, both the first thermal insulating portion 70 and the second thermal insulating portion 73 may have the portions 70a and 73a located between adjacent wires of the induction coil. This makes it possible to more firmly fix the longitudinal position of the induction coil and achieve more stable induction heating.

[0089] Fig. 7 is a schematic cross-sectional view showing another example of the heating unit 40 for a flavor inhaler according to the second embodiment. As illustrated in Fig. 7, the first thermal insulating portion 70 and the second thermal insulating portion 73 may have an integrated thermal insulating portion 75. This further simplifies the thermal insulating structure of the heating unit 40 for a flavor inhaler. In such a case, the induction coil of the heating portion 60 may be embedded in the integrated thermal insulating portion 75, or alternatively, both the inside and outside of the induction coil are at least partially covered with the integrated thermal insulating portion 75. This makes it possible to firmly fix the position of the induction coil.

[0090] In the second embodiment, the second thermal insulating portion 73 may contact both the partitioning portion 50 and the induction coil of the heating portion 60. The structure of the heating unit 40 for a flavor inhaler becomes more stable, as compared to when the second thermal insulating portion 73 does not contact either one of the partitioning portion 50 and the induction coil.

[0091] The second thermal insulating portion 73 may have air provided between the supporting portions as with the first thermal insulating portion 70 as illustrated in Fig. 2 in the first embodiment. The heat from the susceptor (side surface 52 of the partitioning portion 50) is thus insulated more effectively. The supporting portion of the second thermal insulating portion 73 preferably has flexibility. This facilitates the assembly of the second thermal insulating portion 73 and allows the second thermal insulating portion 73 to be mounted on the partitioning portion 50 in various shapes. More specifically, the supporting portion of the second thermal insulating portion 73 may be made of glass fiber.

[0092] Density of the air provided in the supporting portion of the second thermal insulating portion 73 is preferably uniform in a thickness direction of the second thermal insulating portion 73. The density of the air provided in the supporting portion of the second thermal insulating portion 73 is preferably uniform in a width direction of the second thermal insulating portion 73.

[0093] As illustrated in Fig. 5, the induction coil of the heating portion 60 may be arranged to surround the partitioning portion 50. The induction coil of the heating portion 60 may be formed of a single wire or may be a helical litz wire from the perspective of effective heat generation.

[0094] The induction coil of the heating portion 60 may be wound into a helical shape (three-dimensional volute) or a spiral shape (two-dimensional volute). The shape of the induction coil may be cylindrical (shape of a curved helical or spiral coil) or planar. The induction coil may be located adjacent to the partitioning portion 50, surround the partitioning portion 50 or protrude into the partitioning portion 50. If the induction coil is arranged to surround the partitioning portion 50, energy is efficiently supplied to a heat generating part of the partitioning portion 50. The induction coil may comprise one or more induction coils. As an example of the configuration in which the induction coil surrounds the partitioning portion 50, the induction coil may be formed into a helical shape so as to surround the partitioning portion 50, may be formed by bending a spiral coil so as to surround the partitioning portion 50 or may include a plurality of planar coils surrounding the partitioning portion 50. If formed into the helical shape so as to surround the partitioning portion 50, the induction coil is simply configured, which reduces manufacturing costs.

[0095] The electromagnetic shield 88 arranged between the fixing portion 80 and the induction coil of the heating portion 60 may contain, for example, nickel-zinc-based ferrite.

[0096] According to the above-discussed flavor inhaler 100 of the second embodiment which is illustrated in Fig. 5 or 7, the heating portion 60 including the induction coil is capable of heating the side surface 52 of the partitioning portion 50 through electromagnetic induction. During the heating, the first thermal insulating portion 70 and the second thermal insulating portion 73 repress the heat from the side surface 52 of the partitioning portion 50 from being transmitted to the fixing portion 80 or the electromagnetic shield 88. This increases the temperature of the partitioning portion 50 higher than in conventional technology and thus heats the smokable material 30 to higher temperature, contributing to the increase of aerosol generation amount and the improvement of flavors.

[0097] The partitioning portion 50 of the flavor inhaler 100 according to the second embodiment may include a susceptor within the receiving portion 53. Fig. 8 shows another example of the flavor inhaler 100 according to the second embodiment. In the illustrated example, a susceptor 90 in a shape of a pin, a blade or a plate is arranged inside the receiving portion 53 of the partitioning portion 50. The susceptor 90 is arranged to extend in a longitudinal direction of the partitioning portion 50. If the smokable material 30 is arranged by being inserted in the receiving portion 53 at a desired position, the susceptor 90 is inserted into the smokable material 30 to be located inside the smokable material 30. If the susceptor 90 is inductively heated by the heating portion 60 in the aforementioned state, the smokable material 30 is heated.

[0098] In the example illustrated in Fig. 8, the partitioning portion 50 may be made of synthetic resin, such as PEEK, which is magnetically permeable and electrically nonconductive (electrically insulative). Energy (magnetic force line that generates around an induction coil) from the heating portion 60 is efficiently transmitted to the susceptor 90 without being absorbed into the partitioning portion 50.

[0099] In the example illustrated in Fig. 8, the heating unit 40 for a flavor inhaler does not necessarily have to include the second thermal insulating portion 73. This is because, since the smokable material 30 lies between the susceptor 90 and the heating portion 60 during the heating of the smokable material 30, the heat from the susceptor 90 is repressed from being transmitted to the heating portion 60.

[0100] Fig. 9 shows still another example of the flavor inhaler 100 according to the second embodiment. In the example illustrated in Fig. 9, the heating unit 40 for a flavor inhaler does not include a susceptor but is instead provided with a susceptor 92 inside the smokable material 30. The susceptor 92 may have any shape. The susceptor 92 in the form, for example, of granulates, a bar, a strip, a pipe, a tube or the like may be arranged inside the smokable material 30. In the example illustrated in Fig. 9, the partitioning portion 50 may be made of synthetic resin, such as PEEK, which is magnetically permeable and electrically nonconductive (electrically insulative), as in the example illustrated in Fig. 8.

[0101] When the smokable material 30 is arranged at a desirable position in the inside of the receiving portion 53, the susceptor 92 is located inside the induction coil of the heating portion 60. If the susceptor 92 is inductively heated by the heating portion 60 in the aforementioned state, the smokable material 30 is heated.

[0102] As with the example illustrated in Fig. 8, in the example illustrated in Fig. 9, the heating unit 40 for a flavor inhaler does not necessarily have to include the second thermal insulating portion 73. This is because, since the smokable material 30 lies between the susceptor 92 and the heating portion 60 during the heating of the smokable material 30, the heat from the susceptor 92 is repressed from being transmitted to the heating portion 60.

<Third Embodiment>

[0103] A flavor inhaler 100 according to a third embodiment will be discussed below. Fig. 10 is a schematic cross-sectional view of the flavor inhaler 100 according to the third embodiment. The flavor inhaler 100 of the third embodiment differs from the flavor inhaler 100 of the second embodiment which is illustrated in Fig. 5 in configuration of a heating unit 40 for a flavor inhaler. More specifically, in the third embodiment, the heating unit 40 for a flavor inhaler does not include a first thermal insulating portion 70 and a fixing portion 80.

[0104] In the third embodiment, a side surface 52 of a partitioning portion 50 is inductively heated by a heating portion 60. A second thermal insulating portion 73 represses the transmission of the heat from the partitioning portion 50 to the heating portion 60. Furthermore, in the third embodiment, the heating unit 40 for a flavor inhaler may include an outer thermal insulating portion 85 as necessary. This suppresses a temperature rise in the housing 102. In the third embodiment, the heating unit 40 for a flavor inhaler may include an electromagnetic shield 88 as necessary.

[0105] In the third embodiment, the second thermal insulating portion 73 is biased against and fixed to the partitioning portion 50 by an induction coil of the heating portion 60. Even if the heating unit 40 for a flavor inhaler does not include the fixing portion 80, therefore, the second thermal insulating portion 73 can be fixed to an outer surface of the partitioning portion 50.

[0106] The embodiments of the invention have been discussed. The invention, however, is not limited to these embodiments. The invention may be modified in various ways without deviating from technical ideas described in the claims, description, and drawings. Shapes and materials which are not directly mentioned in the description and drawings but provide the operation and advantageous effects of the invention are included in the technical ideas of the invention. The shapes and degrees mentioned in the description are not limited strictly to these particular shapes and degrees at least when noted with the term "substantially," but include the shapes and degrees which provide at least an intended operation.

REFERENCE SIGN LIST

[0107]

30: Smokable material
40: Heating unit for a flavor inhaler
50: Partitioning portion
51: Opening
52: Side surface

53: Receiving portion
60: Heating portion
70: First thermal insulating portion
71: Supporting portion
72: Air
73: Second thermal insulating portion
75: Thermal insulating portion
80: Fixing portion, biasing portion
85: Outer thermal insulating portion
88: Electromagnetic shield
90: Susceptor
92: Susceptor
100: Flavor inhaler
102: Housing

Claims

1. A heating unit for a flavor inhaler which heats smokable material and atomizes the smokable material, comprising:

    a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material;
    a heating portion configured to heat the partitioning portion;
    a fixing portion configured to fix the heating portion to the partitioning portion; and
    a first thermal insulating portion arranged between the heating portion and the fixing portion.

2. The heating unit for a flavor inhaler according to Claim 1,
wherein the heating portion is arranged on an outer surface of the partitioning portion.

3. The heating unit for a flavor inhaler according to either one of Claims 1 and 2,

    wherein the heating portion includes a major surface parallel to the side surface of the partitioning portion, and
    wherein the first thermal insulating portion is arranged in a direction orthogonal to the side surface of the partitioning portion to cover a whole major surface of the heating portion.

4. The heating unit for a flavor inhaler according to any one of Claims 1 to 3,
wherein the heating portion is a film heater.

5. The heating unit for a flavor inhaler according to any one of Claims 1 to 3,

    wherein the partitioning portion includes a susceptor;
    wherein the heating portion includes a tubular induction coil surrounding the side surface of the partitioning portion; and
    wherein the first thermal insulating portion is magnetically permeable and electrically nonconductive.

6. The heating unit for a flavor inhaler according to Claim 5,
wherein the side surface of the partitioning portion is formed of the susceptor and has a current pathway surrounding the receiving portion.

7. The heating unit for a flavor inhaler according to either one of Claims 5 and 6, comprising a second thermal insulating portion between the partitioning portion and the induction coil,
the second thermal insulating portion being magnetically permeable and electrically nonconductive.

8. The heating unit for a flavor inhaler according to any one of Claims 1 to 7,
wherein the first thermal insulating portion includes a portion located between adjacent wires of the induction coil.

9. The heating unit for a flavor inhaler according to any one of Claims 1 to 8,
wherein the first thermal insulating portion includes air and a supporting portion that keeps the heating portion and the partitioning portion at a predetermined distance from each other when the heating portion is fixed to the partitioning portion.

10. The heating unit for a flavor inhaler according to any one of Claims 1 to 9,
wherein the supporting portion of the first thermal insulating portion is made of glass fiber.

11. The heating unit for a flavor inhaler according to any one of Claims 1 to 10,
wherein the first thermal insulating portion has a thickness ranging from 0.10 mm to 3.00 mm, both inclusive.

12. The heating unit for a flavor inhaler according to any one of Claims 5 to 11, comprising an electromagnetic shield between the fixing portion and the induction coil.

13. The heating unit for a flavor inhaler according to any one of Claims 1 to 12,
wherein the fixing portion is a biasing portion configured to bias the heating portion toward the partitioning portion.

14. A heating unit for a flavor inhaler which heats smok-

able material and atomizes the smokable material, comprising:

a partitioning portion including an opening and a side surface surrounding the opening, the partitioning portion being configured to partition a receiving portion that receives the smokable material;
a heating portion configured to heat the partitioning portion; and
a second thermal insulating portion arranged between the partitioning portion and the heating portion,
the second thermal insulating portion being magnetically permeable and electrically non-conductive,
the partitioning portion including a susceptor,
the heating portion being a tubular induction coil surrounding the side surface of the partitioning portion, and
the second thermal insulating portion being magnetically permeable and electrically non-conductive.

15. The heating unit for a flavor inhaler according to any one of Claims 1 to 14, comprising an outer thermal insulating portion arranged between the fixing portion and a housing.

Fig. 1

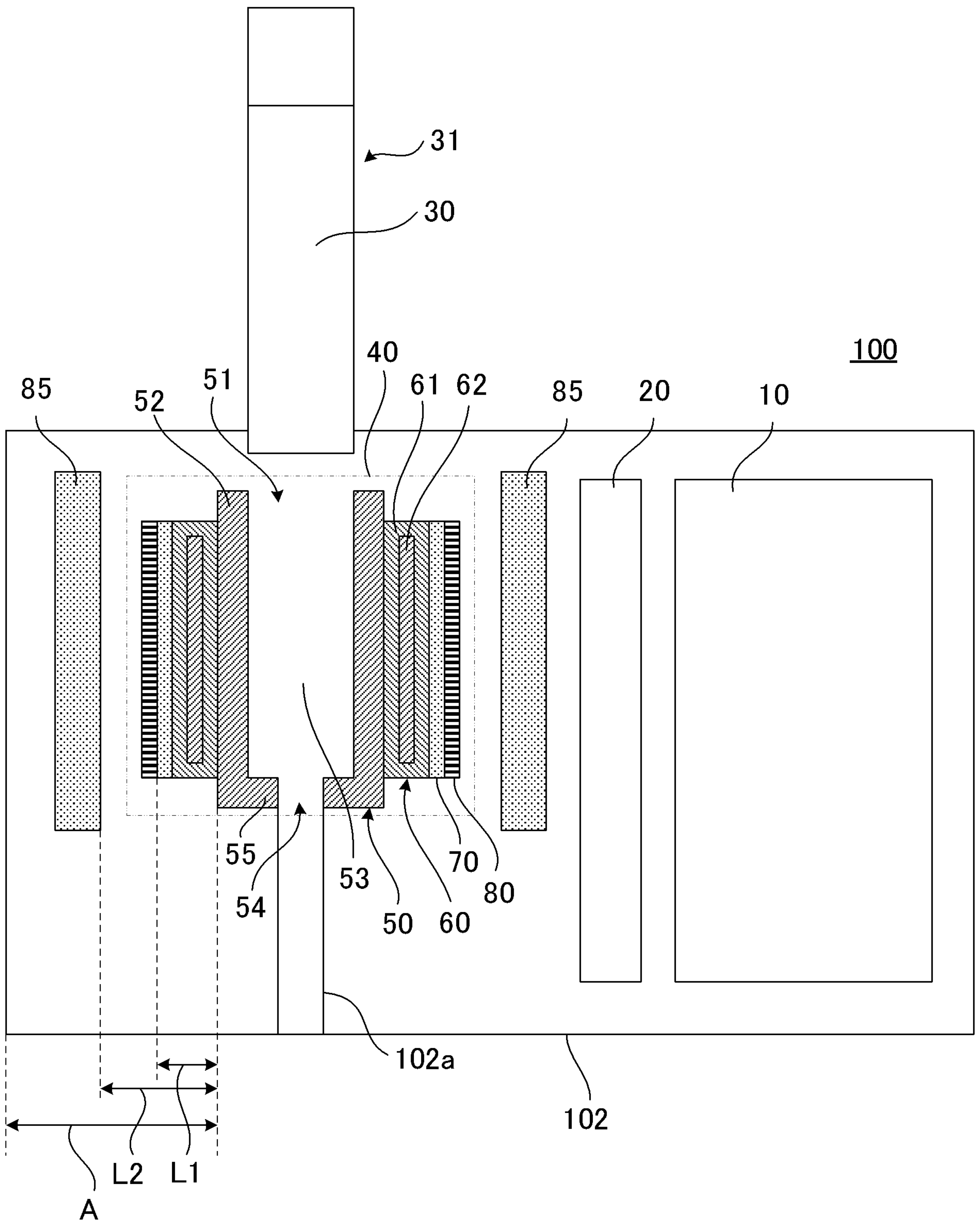
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Fig. 2

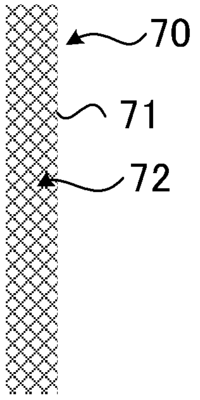


Fig. 3

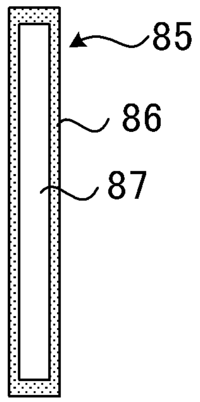


Fig. 4

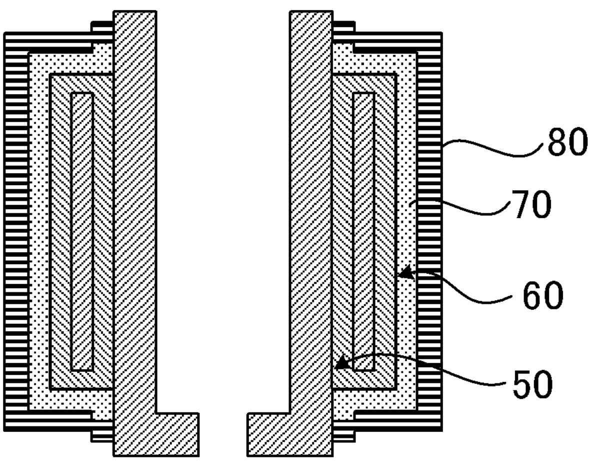


Fig. 5

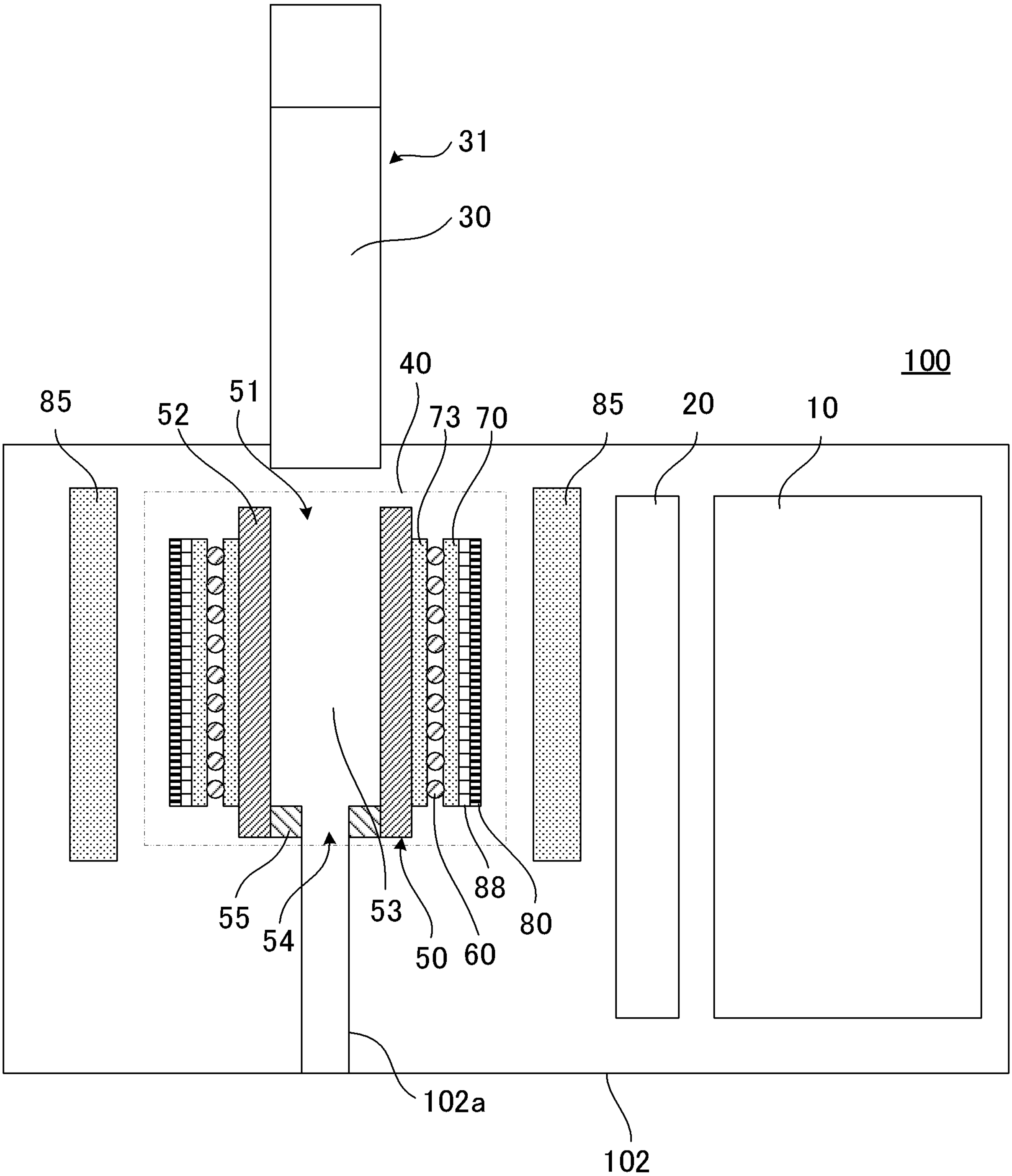


Fig. 6

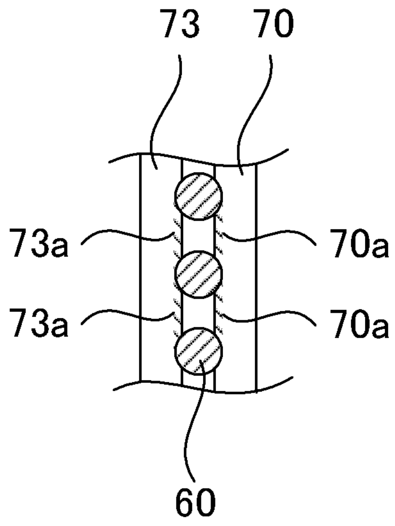


Fig. 7

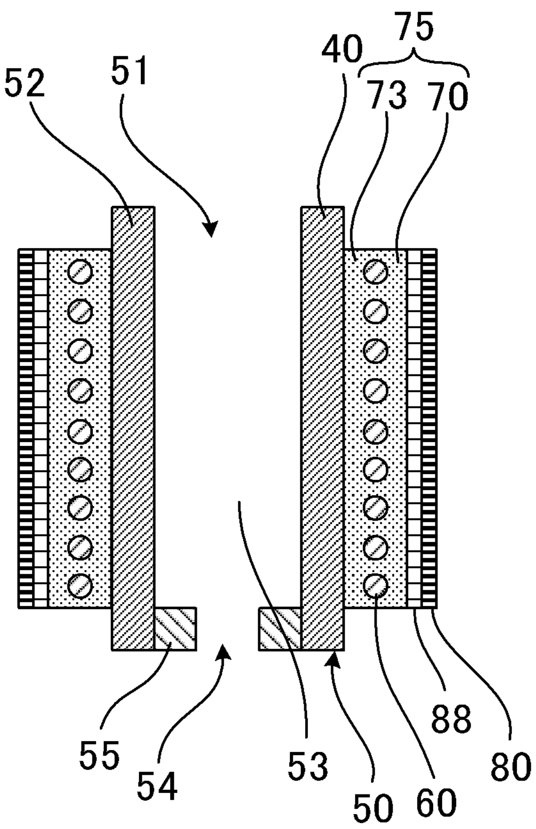


Fig. 8

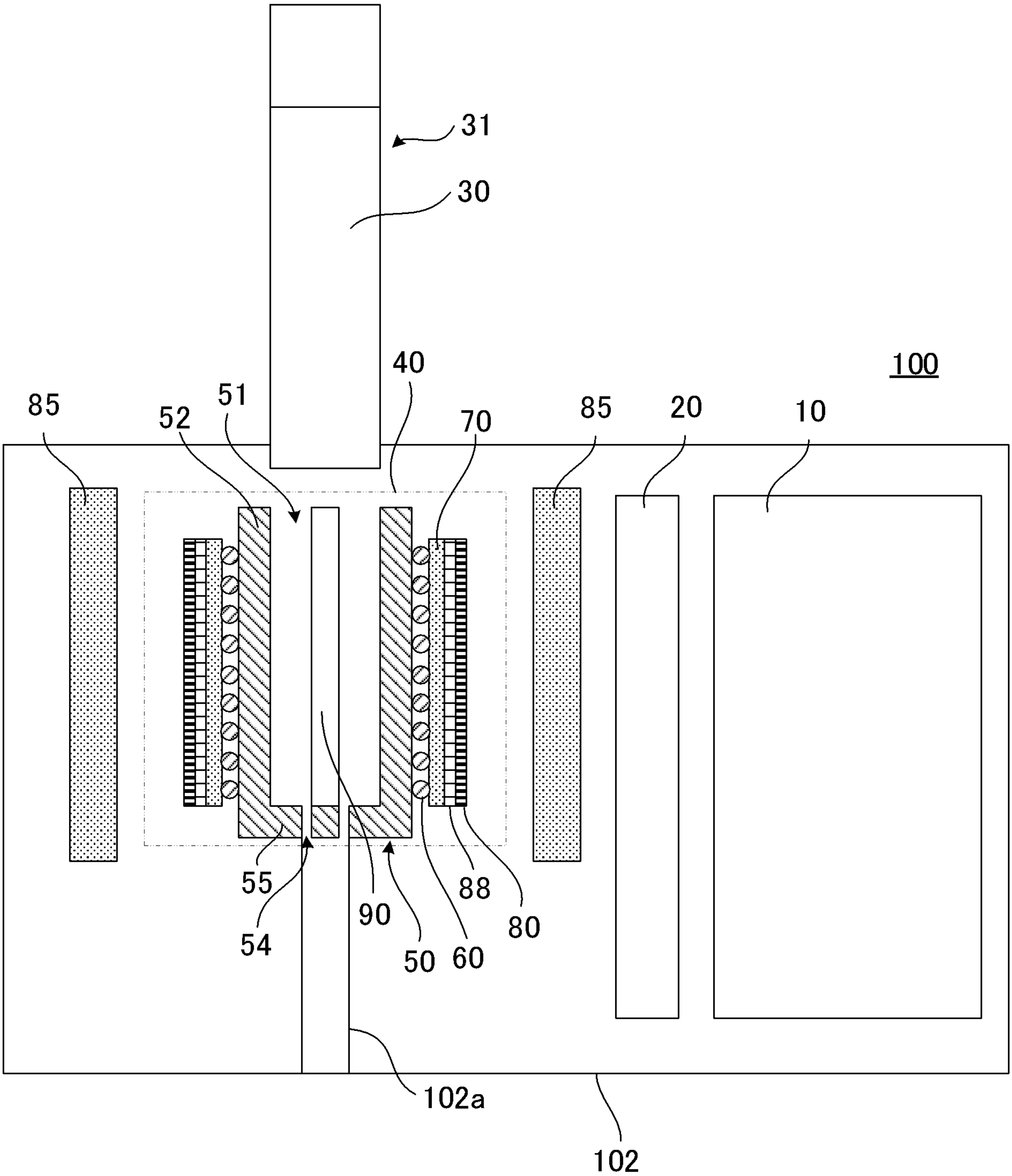


Fig. 9

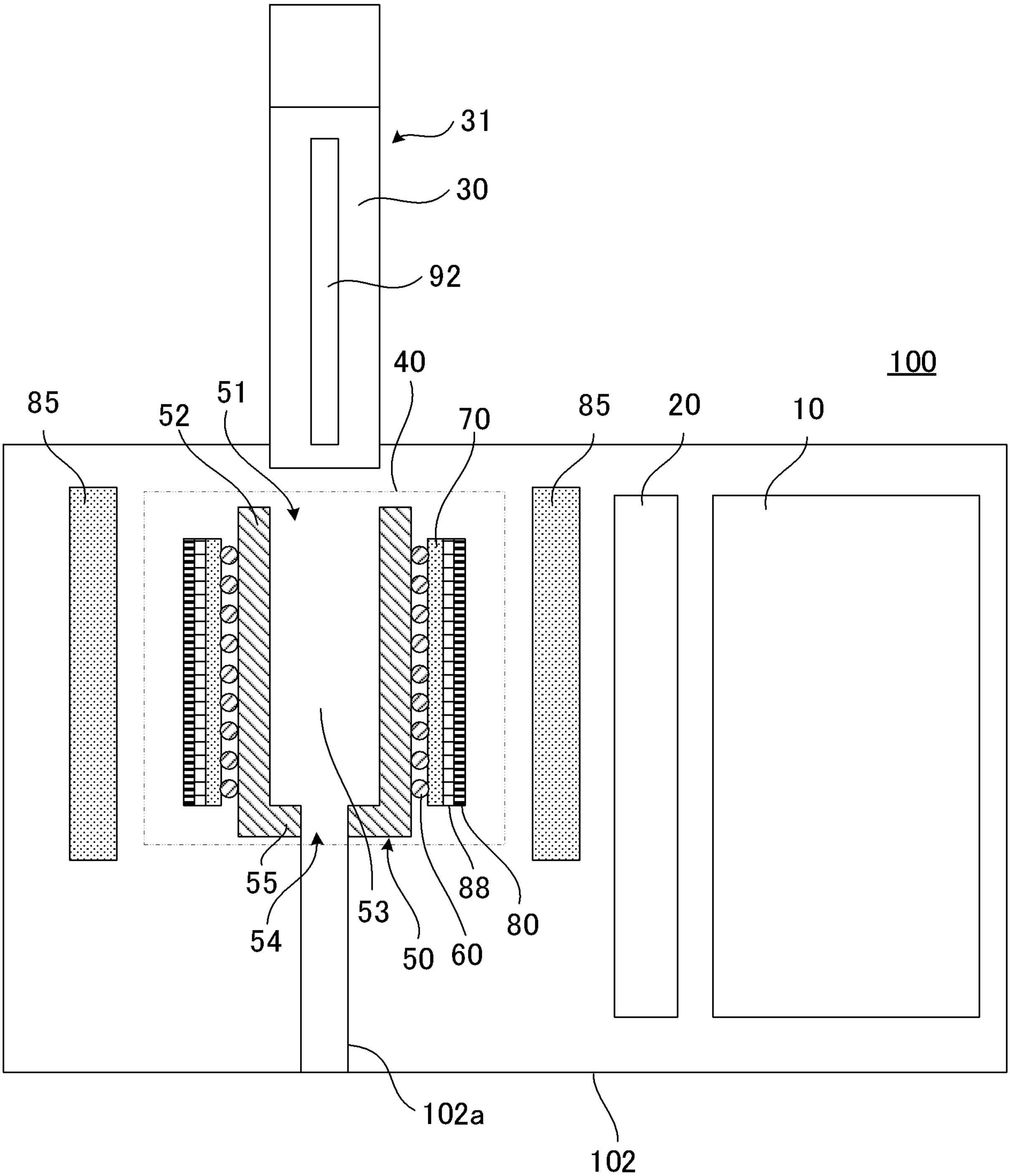
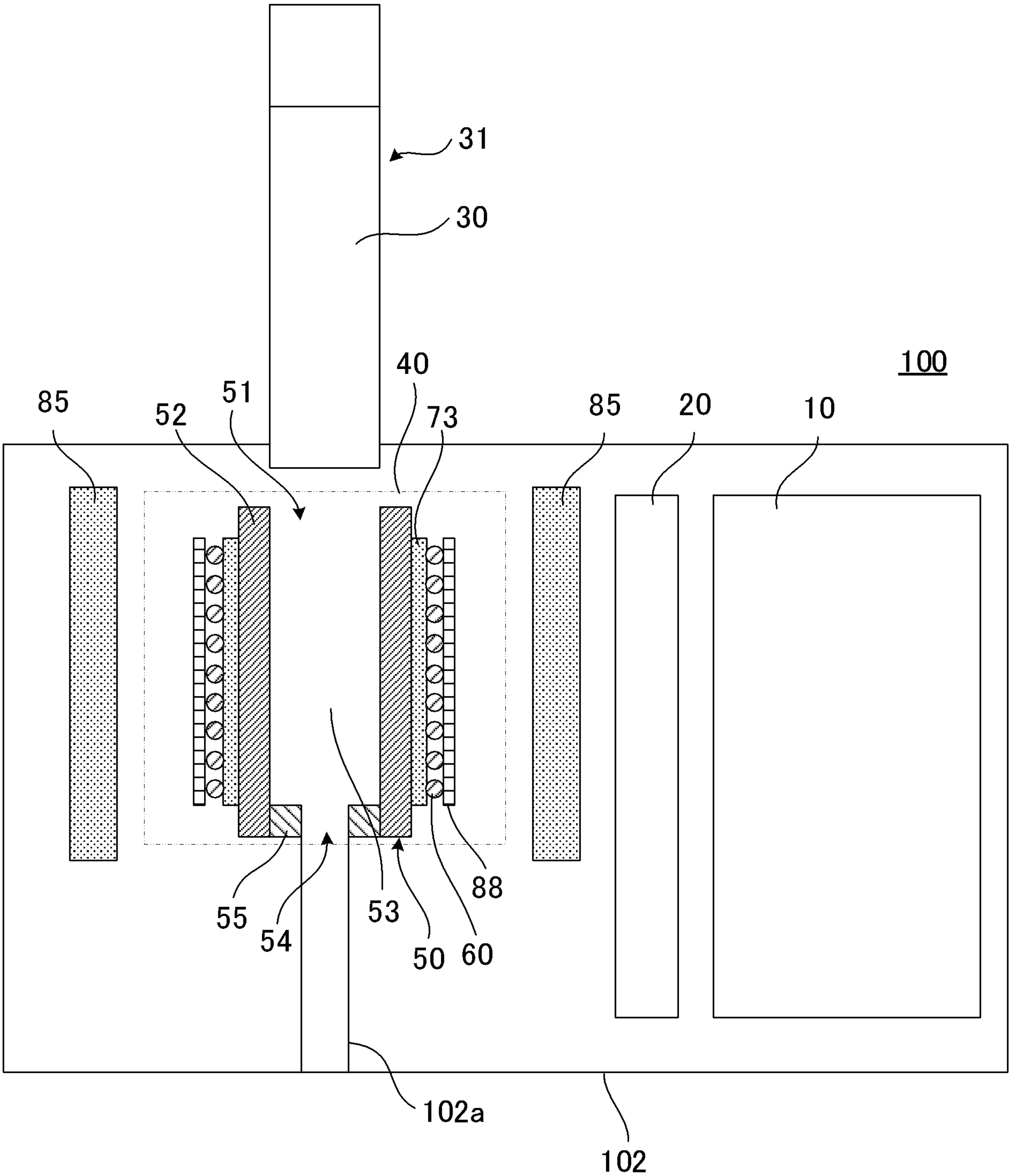


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2020/017425

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. A24F40/40(2020.01)i
FI: A24F40/40
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. A24F40/40

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2020
Registered utility model specifications of Japan	1996-2020
Published registered utility model applications of Japan	1994-2020

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 2015/0128971 A1 (VERLEUR, J. A.) 14 May 2015 (2015-05-14), paragraphs [0041]-[0044], fig. 2	1-3 4-12, 14-15 13
Y	JP 2018-522551 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 16 August 2018 (2018-08-16), paragraph [0021], fig. 4	4, 9-12, 15
Y	JP 2018-529324 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 11 October 2018 (2018-10-11), paragraphs [0042]-[0046], [0069]-[0073], fig. 1, 2	5-12, 14-15
Y	JP 2019-118344 A (SHANGHAI NEW TOBACCO PRODUCT RES INST CO., LTD.) 22 July 2019 (2019-07-22), paragraph [0092]	9-12, 15
Y	JP 2019-526247 A (PHILIP MORRIS PRODUCTS S.A.) 19 September 2019 (2019-09-19), paragraph [0114], fig. 2	12, 15

☐ Further documents are listed in the continuation of Box C.　☒ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 July 2020	14 July 2020

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

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JP 2018-529324 A	11 October 2018	US 2017/0055583 A1 paragraphs [0058]-[0062], [0085]-[0087], fig. 1, 2 WO 2017/036955 A2 EP 3344076 A2 CN 107920602 A KR 10-2018-0034640 A
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Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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