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

(11) **EP 3 987 957 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
27.04.2022 Bulletin 2022/17

(21) Application number: **20826523.1**

(22) Date of filing: **16.06.2020**

(51) International Patent Classification (IPC):
A24F 47/00 *(2020.01)* ***A24F 40/46*** *(2020.01)*
A24F 40/48 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 40/46; A24F 40/48; A24F 47/00

(86) International application number:
PCT/JP2020/023502

(87) International publication number:
WO 2020/255939 (24.12.2020 Gazette 2020/52)

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

(30) Priority: **18.06.2019 JP 2019112912**

(71) Applicant: **Japan Tobacco Inc.**
Tokyo 105-6927 (JP)

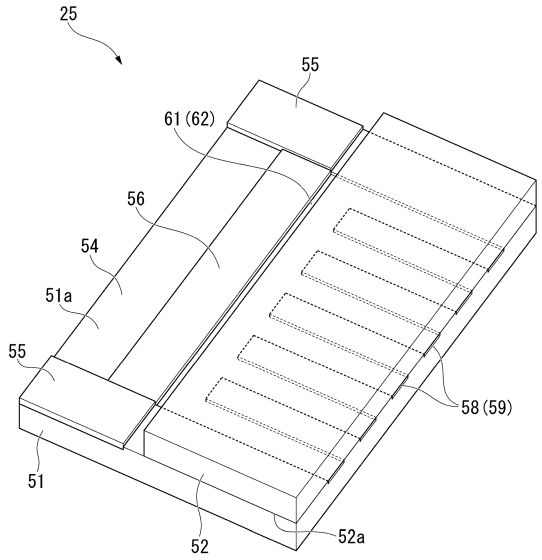
(72) Inventors:
- **KAIHATSU, Yutaka**
Tokyo 130-8603 (JP)
- **SUGIYAMA, Akihiro**
Tokyo 130-8603 (JP)

(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

(54) HEATING PART AND NON-COMBUSTION-TYPE INHALER

(57) A heater (25) includes a liquid supply channel (58) which is formed in a main body and configured to transport a liquid, and atomizer (56) which is disposed near an outlet of the liquid supply channel in the main body and atomizes the liquid when the liquid is supplied. The heater is configured to be usable in a non-combustion-type suction device having a suction port. In the heater, a liquid exposure area (61), in which the liquid is exposed to a surface of the main body, is formed between the liquid supply channel and the atomizer.

FIG. 5



EP 3 987 957 A1

Description

[Technical Field]

[0001] The present invention relates to a heater and a non-combustion-type suction device. Priority is claimed on Japanese Patent Application No. 2019-112912, filed June 18, 2019, the content of which is incorporated herein by reference.

[Background Art]

[0002] In the related art, a non-combustion-type suction device (hereinafter, may be simply referred to as a suction device) which tastes a flavor by sucking vapor (for example, aerosol) atomized by heating has been known. For example, as this kind of suction device, there is a suction device including a cartridge in which a content (for example, an aerosol source) which can be atomized is accommodated and a power supply unit on which a storage battery is mounted.

[0003] In the suction device, a heater generates heat due to electric power supplied from the storage battery. As a result, the content in the cartridge is atomized. A user can suck atomized aerosol together with air through a suction port. For example, Patent Document 1 describes an aerosol generator which generates an aerosol.

[Citation List]

[Patent Document]

[0004] [Patent Document 1]
Published Japanese Translation No. 2004-524073 of the PCT International Publication

[Summary of Invention]

[Technical Problem]

[0005] Meanwhile, the aerosol generator of Patent Document 1 has a problem that a flow path of atomized aerosol is formed between a first layer and a second layer, and the generated aerosol is difficult to flow.

[0006] Therefore, the present invention has been made in consideration of the above circumstances, and an object thereof is to provide a heater and a non-combustion-type suction device capable of efficiently transporting the generated aerosol.

[Solution to Problem]

[0007]

(1) In order to achieve the above object, in a heater according to a first aspect of the present invention, in the heater is used in a non-combustion-type suction device having a suction port, the heater including: a liquid supply channel formed in the main body and configured to transport liquid; and atomizer disposed near an outlet of the liquid supply channel in the main body and configured to atomize the liquid when the liquid is supplied, in which a liquid exposure area, in which the liquid is exposed to a surface of the main body, is formed between the liquid supply channel and the atomizer.

(2) In the heater according to the aspect of (1), a plurality of the liquid supply channels may be formed.

(3) In the heater according to the aspect of (1) or (2), the main body may include a first member in which the atomizer is disposed, and a second member laminated on the first member, and the liquid supply channel may be formed between facing surfaces of the first member and the second member.

(4) In the heater according to the aspect of (3), the liquid supply channel may be a groove formed by processing the facing surface of at least one of the first member and the second member.

(5) In the heater according to the aspect of (3), films may be provided between the facing surfaces of the first member and the second member, and the liquid supply channel may be constituted by a gap formed between the facing surfaces of the first member and the second member by the films.

(6) In the heater according to any one aspect of (3) to (5), at least one of the first member and the second member may be formed of glass.

(7) In the heater according to any one aspect of (1) to (6), the liquid supply channel and the atomizer may be arranged on the same plane.

(8) In the heater according to any one aspect of (1) to (7), the atomizer may have a heat generating resistor configured to atomize the liquid, and the heat generating resistor may extend in a longitudinal direction intersecting the liquid supply channel.

(9) The heater according to the aspect of (8), in the liquid exposure area, a liquid joining portion configured to guide the liquid along the longitudinal direction may be formed between an end part of the atomizer on the liquid supply channel side and an end of the liquid supply channel.

(10) The heater according to any one aspect of (1) to (9), a liquid absorbing member may be provided at a position facing the liquid exposure area.

(11) In the heater according to any one aspect of (1) to (10), the atomizer may be attachable to or detachable from the main body.

(12) In order to achieve the above object, according to another aspect of the present invention, there is provided a non-combustion-type suction device including: the heater according to any one aspect of (1) to (11); and a power supply unit configured to supply power to the heater.

(13) In the non-combustion-type suction device according to the aspect of (12), the heater may be at-

tachable to or detachable from the power supply unit.
(14) The non-combustion-type suction device according to the aspect of (12) or (13) may further include a flavor source storage device.
(15) In the non-combustion-type suction device according to the aspect of (14), the flavor source storage device may contain a tobacco component.

[Advantageous Effects of Invention]

[0008] According to a heater and a non-combustion-type suction device of the present invention, it is possible to efficiently transport the generated aerosol is efficiently transported.

[Brief Description of Drawings]

[0009]

Fig. 1 is a perspective view of a suction device according to a first embodiment of the present invention.
Fig. 2 is an exploded perspective view of the suction device according to the first embodiment of the present invention.
Fig. 3 is a perspective view showing a connection state of a cartridge and a coupler according to the first embodiment of the present invention.
Fig. 4 is a perspective view showing a separation state of the cartridge, a heater, and the coupler according to the first embodiment of the present invention.
Fig. 5 is a perspective view of the heater according to the first embodiment of the present invention.
Fig. 6 is a front view of the heater according to the first embodiment of the present invention viewed from a suction port side.
Fig. 7 is a cross-sectional view taken along line VII-VII of Fig. 6.
Fig. 8 is a cross-sectional view taken along line VIII-VIII of Fig. 1.
Fig. 9 is an enlarged cross-sectional view showing the connection state of the cartridge, the heater, and the coupler according to the first embodiment of the present invention, and is a cross-sectional view taken along line IX-IX of Fig. 3.
Fig. 10 is a plan view of a heater according to a second embodiment of the present invention.
Fig. 11 is a front view of the heater according to the second embodiment of the present invention viewed from a suction port side.
Fig. 12 is a side view of the heater according to the second embodiment of the present invention.
Fig. 13 is a perspective view showing a modification example of the heater according to the embodiment of the present invention.
Fig. 14 is a cross-sectional view showing another modification example of the heater according to the embodiment of the present invention.
Fig. 15 is a perspective view showing a modification example of the suction device according to the embodiment of the present invention.

[Description of Embodiments]

(First Embodiment)

[0010] Next, a first embodiment of the present invention will be described with reference to the drawings.

[Suction device]

[0011] Fig. 1 is a perspective view of a suction device.
[0012] A suction device 1 shown in Fig. 1 is a so-called non-combustion-type suction device. The suction device is a device in which a user sucks an aerosol atomized by heating through a tobacco (tobacco capsule).
[0013] The suction device 1 includes a main body unit 10, and a cartridge 11 and a tobacco capsule 12 which are mounted to be attachable to or detachable from the main body unit 10. The tobacco capsule 12 may be omitted.

<Main Body Unit>

[0014] The main body unit 10 includes a power supply unit 21, a holding unit 22, and a suction port 23. The power supply unit 21 and the holding unit 22 are each formed in a flat elliptical shape with an axis O as a central axis. The power supply unit 21, the holding unit 22, and the suction port 23 are all disposed side by side on the axis O. The power supply unit 21 and the holding unit 22 are connected to each other to be attachable or detachable, and the holding unit 22 and the suction port 23 are connected to each other to be attachable or detachable. A shape of each of the power supply unit 21 and the holding unit 22 may be other than the flat elliptical shape, and may be a circular shape or a rectangular shape, for example.
[0015] In the following description, a direction along the axis O is referred to as an axial direction. In this case, in the axial direction, a side from the suction port 23 toward the power supply unit 21 is referred to as an opposite suction port side, and a side from the power supply unit 21 toward the suction port portion 23 is referred to as a suction port side. In a direction intersecting the axis O in a plan view from the axial direction, a direction along a long axis of the flat ellipse is referred to as a major axis direction, and a direction along a short axis thereof is referred to as a minor axis direction. In the present specification, the "direction" means two directions, and when indicating one direction of the "direction", it is described as a "side".

<Power Supply Unit>

[0016] Fig. 2 is an exploded perspective view of the suction device 1.

[0017] As shown in Fig. 2, the power supply unit 21 includes a first housing 31, a storage battery 32 which is accommodated in the first housing 31, and a coupler 33 which is directly or indirectly connected to the storage battery 32.

<First Housing>

[0018] The first housing 31 is formed in a flat elliptical bottomed tubular shape with the axis O as the central axis. A bottom part 34 is arranged at an end part of the first housing 31 on the opposite suction port side. An opening 35 is formed at an end part of the first housing 31 on the suction port side. The storage battery 32 and the coupler 33 are capable of being be taken in and out of the first housing 31 through the opening 35. In other words, an inside of the first housing 31 is configured as an accommodation space 36 for the storage battery 32 and the coupler 33. A control circuit (not shown) is accommodated in the first housing 31. The first housing 31 is formed so as to have substantially the same cross section along the axial direction.

[0019] The storage battery 32 is accommodated on the opposite suction port side of the accommodation space 36 of the first housing 31. The coupler 33 is arranged on the suction port side of the storage battery 32. The coupler 33 may be held in the first housing 31 by using an intervening member (not shown). The end part of the coupler 33 on the suction port side is disposed to protrude from the opening 35.

[0020] An air intake port 37 (refer to Fig. 8) is formed in the first housing 31. The air intake port 37 is formed as a through hole that communicates between the accommodation space 36 and the outside. For example, the air intake port 37 is formed in the first housing 31 at the vicinity of facing the coupler 33. The first housing 31 may be formed with a charging opening for charging the storage battery 32. A shape of air intake port 37 or the number of the air intake ports 37 can be changed as appropriate. The air intake port 37 may be formed in the second housing 71 described below.

<Storage Battery>

[0021] The storage battery (power supply unit) 32 is formed in a substantially prismatic shape with the axis O as the axial direction. At the end surface of the storage battery 32 on the suction port side, the storage battery 32 is electrically connected to a wiring portion 40 of the coupler 33. The storage battery 32 mounted on the suction device 1 uses a secondary battery as a power supply that is capable of being charged and discharged. The power supply unit of the suction device 1 is not limited to the storage battery 32, but may be a super capacitor or the like. The power supply unit may be a primary battery.

<Coupler>

[0022] Fig. 3 is a perspective view showing a state in which a cartridge, the coupler, and a heater are connected. Fig. 4 is a perspective view showing a separation state of the cartridge, the coupler, and the heater.

[0023] As shown in Figs. 3 and 4, the coupler 33 has a hollow case 39 and the wiring portion 40 arranged in the case 39. The case 39 is formed in a flat elliptical shape. An inside of the case 39 is configured as an accommodation space 41 that accommodates the wiring portion 40 and a part of the heater 25. The case 39 is formed to have substantially the same cross section along the axial direction.

[0024] An air passage hole 42 is formed in the vicinity of an end part of the case 39 on the opposite suction port side. The air passage hole 42 is configured to pass through the air taken in from the outside. The air passage hole 42 is a through hole formed in a rectangular shape in a plan view. The air passage hole 42 is formed to communicate between the accommodation space 36 of the first housing 31 and the accommodation space 41 of the coupler 33. A shape of the air passage hole 42 and the number of the air passage holes 42 may change as appropriate. The air passage hole 42 may not be formed.

[0025] An aerosol passage hole 43 is formed in the vicinity of an end part of the case 39 on the suction port side. The aerosol passage hole 43 is configured to pass through the aerosol. The aerosol passage hole 43 is a through hole formed in a rectangular shape in a plan view. The aerosol passage hole 43 is formed in a long rectangular shape having a long side along the major axis direction. The aerosol passage hole 43 is formed so as to communicate between the accommodation space 36 of the first housing 31 and the accommodation space 41 of the coupler 33. The air passage hole 42 and the aerosol passage hole 43 are each formed on different surfaces of the case 39 in the minor axis direction. The air passage hole 42 is formed at a position facing the air intake port 37. A shape of aerosol passage hole 43 and the number of aerosol passage holes 43 may change as appropriate.

[0026] A pair of wiring portions 40 is disposed in the vicinity of both end parts in the accommodation space 41 in the major axis direction. For example, for the wiring portion 40, a thin metal steel plate formed in a shape of a rectangular plate is used. The wiring portions 40 are disposed along the axial direction in the accommodation space 41. An end surface 44 is formed by bending a thin steel plate at an end part of the wiring portion 40 on the opposite suction port side. The end part of the wiring portion 40 on the opposite suction port side is disposed so that the end surface 44 is exposed to the opposite suction port side of the case 39. When the coupler 33 is attached to the first housing 31, the end surface 44 comes into contact with an electrode (not shown) of the storage battery 32 and is configured to be electrically conductive.

For example, the wiring portion 40 may be constituted by a printed wire in which a metal wire is printed on a resin base material.

[0027] A heater holding portion 45 (refer to Fig. 9) is formed on the suction port side of the wiring portion 40 in the accommodation space 41. The heater holding portion 45 includes a wall portion 46, a placement portion 47, and an abutting piece 48. The wall portion 46 comes into contact with the end part of the heater 25 on the opposite suction port side. One surface (lower surface) of the heater 25 in the minor axis direction is placed on the placement portion 47. The abutting piece 48 comes into contact with the other surface (upper surface) of the heater 25 in the minor axis direction. When the heater 25 is inserted from the opening of the case 39 on the suction port side, the heater 25 moves to the opposite suction port side in the space formed between the placement portion 47 and the abutting piece 48, the end part of the heater 25 on the opposite suction port side comes into contact with the wall portion 46, and thus, the heater 25 is held at a predetermined position in the case 39 of the coupler 33. The heater 25 is configured to be attachable to or detachable from the coupler 33.

<Heater>

[0028] Fig. 5 is a perspective view of the heater. Fig. 6 is a front view of the heater viewed from the suction port side. Fig. 7 is a cross-sectional view taken along line VII-VII in Fig. 6.

[0029] As shown in Figs. 5 to 7, the heater 25 includes a flat plate-shaped first member 51 and a flat plate-shaped second member 52 having a size different from that of the first member 51. Each of the first member 51 and the second member 52 are configured as a main body of the heater 25. The first member 51 and the second member 52 are laminated in the minor axis direction. The first member 51 is located on a lower side in the minor axis direction, and the second member 52 is located on an upper side. Both the first member 51 and the second member 52 are formed of soda glass. Each of the first member 51 and the second member 52 is formed of a glass plate having substantially the same thickness. For example, the first member 51 and the second member 52 are adhered to each other by an adhesive. A method of joining the first member 51 and the second member 52 may be a method other than the adhesive. The first member 51 and the second member 52 may be formed of sintered glass or sintered ceramics instead of the soda glass. Shapes and thicknesses of the first member 51 and the second member 52 may change as appropriate.

[0030] End surfaces of the first member 51 and the second member 52 on the suction port side are arranged on the same plane. Both end surfaces of the first member 51 and the second member 52 in the major axis direction are each arranged on the same plane. The first member 51 and the second member 52 have different axial lengths. Specifically, an axial length L1 of the first member 51 is longer (larger) than an axial length L2 of the second member 52. That is, when the heater 25 is viewed in a plan view from a side (upper side) where the second member 52 is disposed, a portion of the surface of the first member 51 is exposed and is visually recognized. This exposed and visible surface is referred to as an exposed surface 54.

[0031] The exposed surface 54 has a rectangular shape that is long in the major axis direction. A pair of electrodes 55 are provided near both end parts on the exposed surface 54 in the major axis direction. For example, the pair of electrodes 55, 55 is formed of a silver paste and has a rectangular plate-like shape. The electrodes 55 are formed to have a predetermined length along the axial direction from an end part of the exposed surface 54 on the opposite suction port side. In a state where the heater 25 is attached to the coupler 33, the electrode 55 and the wiring portion 40 of the coupler 33 are in contact with each other to be electrically conductive. The electrode 55 may be other than the silver paste, and may be, for example, gold, copper, platinum, aluminum, palladium, stainless steel, graphite, or a conductive complex.

[0032] The exposed surface 54 is provided with a heat generating resistor (atomizer) 56 which connects the pair of electrodes 55 and 55 to each other. For example, the heat generating resistor 56 is formed of an oxide and has a rectangular plate-like shape. The heat generating resistor 56 extends along a longitudinal direction (major axis direction) of the heater 25. Both end parts of the heat generating resistor 56 in the major axis direction are each connected to the pair of electrodes 55 and 55 to be electrically conductive. Electricity flows to the electrode 55, and thus, a temperature of the heat generating resistor 56 increases to a predetermined temperature. The heat generating resistor 56 is heated to an appropriate temperature at which an aerosol is generated. The heat generating resistor 56 may be other than an oxide, and may be, for example, stainless steel, titanium alloy, nickel-chromium alloy, ferroalloy alloy, or Kanthal alloy (registered trademark) having high corrosion resistance. The heat generating resistor 56 may have any shape and may not be formed in a rectangular plate.

[0033] A liquid supply channel 58 is formed between facing surfaces (surfaces) 51a and 52a of the first member 51 and the second member 52. The liquid supply channel 58 is a flow path through which the liquid flows. For example, the liquid supply channel 58 is configured so that the liquid is transported in the liquid supply channel 58 by a capillary phenomenon. In the present embodiment, the liquid supply channel 58 is formed by forming a groove 59 on the surface 51a of the first member 51 by etching or the like. A plurality of grooves 59 (six in the present embodiment) are formed at substantially equal intervals along the major axis direction. The groove 59 is formed to have a predetermined length along the axial direction from a suction port side end part. A width in the major axis direction and a depth in the minor axis

direction of the groove 59 are formed to have a substantially uniform size over the entire length of the groove 59. The plurality of grooves 59 are all formed to have the same shape. The grooves 59 are formed up to a position facing the vicinity of the end part of the second member 52 on the opposite suction port side.

[0034] A shape of the groove 59 is not limited to the shape of the present embodiment. For example, the width of the groove in the major axis direction may be formed so as to gradually decrease from the suction port side toward the opposite suction port side. The number of grooves 59 is not limited to six, and may be one or two or more. When a plurality of grooves 59 are formed, the shape of each groove 59 may be different.

[0035] In the present embodiment, a gap 60 is formed between the end part of the heat generating resistor 56 on the suction port side and the end part of the second member 52 on the opposite suction port side. In other words, the surface 51a (exposed surface 54) of the first member 51 is exposed between the heat generating resistor 56 and the second member 52. This exposure area is referred to as a liquid exposure area 61.

[0036] The liquid exposure area 61 is formed in a rectangular shape that is long in the major axis direction when the heater 25 is viewed in a plan view from the side where the second member 52 is disposed. The groove 59 is not formed in the liquid exposure area 61. In other words, the liquid exposure area 61 is configured such that the liquids supplied from the plurality of liquid supply channels 58 are joined. That is, in the present embodiment, the liquid exposure area 61 is also configured as a liquid joining portion 62. The heat generating resistor 56 is disposed at the end part of the liquid exposure area 61 on the opposite suction port side. The surface 51a of the first member 51 on which the heat generating resistor 56 is disposed and a bottom surface of the groove 59 are formed on the same plane. That is, the liquid that has reached the liquid exposure area 61 (liquid joining portion 62) comes into contact with the heat generating resistor 56 to generate an aerosol. For example, an axial length L3 of the liquid exposure area 61 is 0.3 mm.

[0037] The groove 59 may be extended to the liquid exposure area 61, and the end part of the groove 59 on the opposite suction port side may be formed so as to be in direct contact with the heat generating resistor 56. That is, the liquid joining portion 62 may not be formed. This will be described in detail in a second embodiment.

[0038] A groove along the shape of the heat generating resistor 56 may be formed on the surface 51a of the first member 51 on which the heat generating resistor 56 is disposed so that the heat generating resistor 56 is embedded in the surface 51a of the first member 51. In this case, an upper surface of the heat generating resistor 56 and the surface 51a of the first member 51 may be arranged on the same plane.

[0039] An inclined surface may be formed on an end surface (surface facing the liquid exposure area 61) of the heat generating resistor 56 on the suction port side. For example, the inclined surface may have an inclination angle of 45 degree with respect to the surface 51a of the first member 51. With this configuration, the liquid is efficiently guided to the heat generating resistor 56, and an amount of liquid supplied to the heat generating resistor 56 is easily adjusted.

[0040] The groove along the shape of the heat generating resistor 56 may be formed on the surface 51a of the first member 51 on which the heat generating resistor 56 is disposed so that the entire heat generating resistor 56 is embedded in the first member 51. In this case, the upper surface of the heat generating resistor 56 is arranged so as to be lower than the surface 51a of the first member 51. With this configuration, a large amount of liquid is easily supplied to the heat generating resistor 56.

[0041] The shape of the heat generating resistor 56 may be appropriately changed depending on the shape of the heater 25, and may be square, trapezoidal, or circular in a plan view, for example. The liquid supply channel 58 may be formed up to a position where the liquid supply channel 58 overlaps the heat generating resistor 56 in a plan view.

[0042] In a state where the heater 25 is attached to the coupler 33, the aerosol passage hole 43 is located above the heat generating resistor 56 and the liquid exposure area 61 (refer to Fig. 9).

<Holding Unit>

[0043] As shown in Figs. 1, 2, and 8, the holding unit 22 has a hollow second housing 71. The second housing 71 is formed in a flat elliptical tubular shape. The second housing 71 is formed to have substantially the same appearance shape as the first housing 31. The cartridge 11 and the tobacco capsule 12 are accommodated in an accommodation space 72 of the second housing 71. The cartridge 11 contains a liquid. The cartridge 11 and the tobacco capsule 12 are accommodated to be attachable to or detachable from the second housing 71. In the accommodation space 72, the cartridge 11 is configured to be arranged on the opposite suction port side of the tobacco capsule 12.

<Cartridge>

[0044] The cartridge 11 includes a liquid tank 74 and a duct 75. The liquid tank 74 stores a liquid of the aerosol source. The duct 75 serves as a flow path for the aerosol.

[0045] The liquid tank 74 is formed in a substantially flat elliptical tubular shape. The liquid of the aerosol source is accommodated inside the liquid tank 74. A duct 75 is arranged along the axial direction on one side (upper side) of the liquid tank 74 in the minor axis direction. In the liquid tank 74, a recessed portion 76 (refer to Fig. 3) is formed along the axial direction at a location where the duct 75 is arranged. The duct 75 is disposed so as to fit into the recessed portion 76. The liquid tank 74 and the duct 75 are configured to be attachable to or detachable

from each other.

[0046] An insertion port 77 into which the end part of the heater 25 on the suction port side can be inserted is formed on an end surface of the liquid tank 74 on the opposite suction port side (refer to Fig. 4). In a state where the heater 25 is inserted in the insertion port 77, the liquid in the liquid tank 74 flows into the liquid supply channel 58 and then flows toward the opposite suction port side to be guided to the liquid exposure area 61.

[0047] The duct 75 includes a take-in portion 78 and a straight portion 79. The take-in portion 78 takes in the aerosol generated in the heater 25. The straight portion 79 is connected to the take-in portion 78 and carries the aerosol to the suction port side along the axial direction. The take-in portion 78 has an opening at a position facing the aerosol passage hole 43 formed in the case 39 of the coupler 33. The take-in portion 78 has a shape curved by substantially 90 degree, and one end of the take-in portion 78 is connected to the aerosol passage hole 43 and the other end of the take-in portion 78 is connected to the straight portion 79. The take-in portion 78 covers the entire surface of the aerosol passage hole 43. The take-in portion 78 is configured such that the opening of the aerosol passage hole 43 and the opening of the take-in portion 78 communicate with each other. The straight portion 79 extends along the axial direction. An opening portion 80 is formed at an end part of the straight portion 79 on the suction port side (refer to Fig. 8). The opening portion 80 is arranged at a position where the opening portion 80 is in contact with or faces a bottom wall part 85 of the tobacco capsule 12 on the opposite suction port side.

<Tobacco Capsule>

[0048] The tobacco capsule 12 is mounted in the second housing 71 to be attachable to or detachable from the second housing 71. The tobacco capsule 12 includes a capsule portion 83 and a filter 84. The capsule portion 83 and the filter 84 are formed in a flat elliptical shape with the axis O as the central axis. The capsule portion 83 and the filter 84 are formed with substantially the same outer shape along the axial direction. In the capsule portion 83, the bottom wall part 85 that closes the opposite suction port side in the axial direction is formed with a mesh opening (not shown) that penetrates the bottom wall part 85 in the axial direction. The bottom wall part 85 and the opening portion 80 of the duct 75 are close to each other at a contacting or facing positions. The filter 84 is arranged on an axial suction port side of the capsule portion 83. Tobacco is sealed in an internal space 86 of the capsule portion 83. The tobacco capsule 12 is not limited to the above-described configuration, and shape and disposition of the filter 84 and the like are arbitrary.

<Suction port portion>

[0049] The suction port portion 23 is provided to be attachable to or detachable from the second housing 71 of the holding unit 22. An opening portion 89 is formed at an end part of the suction port portion 23 on the opposite suction port side. The end part of the suction port portion 23 on the opposite suction port side is formed in a flat elliptical shape substantially the same as that of the second housing 71. The opening portion 89 of the suction port portion 23 is disposed to axially face the filter 84 of the tobacco capsule 12. A flat elliptical opening portion 90 is formed at an end part of the suction port portion 23 on the suction port side. The opening portion 90 is formed in the same shape as that of the opening portion 89. The opening portion 89 may be formed larger than the opening portion 90. The suction port portion 23 is not limited to the above-described configuration, and a shape of the opening portion or the like is arbitrary.

<Assembly Method of Suction device>

[0050] Next, a method of assembling the suction device 1 described above will be described.

[0051] As shown in Fig. 2, when assembling the suction device 1 of the present embodiment, first, the holding unit 22 is assembled to the power supply unit 21. Specifically, the coupler 33 is attached to the power supply unit 21, and the heater 25 is inserted into the accommodation space 41 of the coupler 33. In this state, the end part of the first housing 31 on the suction port side and the end part of the second housing 71 on the opposite suction port side engage with each other. In this case, the liquid tank 74 is already accommodated in the accommodation space 72 of the second housing 71. When engaging the first housing 31 and the second housing 71, the end part of the heater 25 on the suction port side is inserted into the insertion port 77 of the liquid tank 74. The liquid tank 74 may be inserted and attached to the accommodation space 72 after the first housing 31 and the second housing 71 engage with each other.

[0052] Subsequently, the tobacco capsule 12 is inserted into the accommodation space 72. Specifically, the tobacco capsule 12 is inserted from the opening of the end part of the second housing 71 on the suction port side.

[0053] Next, the suction port portion 23 is attached to the holding unit 22. Specifically, the end part of the second housing 71 on the suction port side and the end part of the suction port portion 23 on the opposite suction port side engage with each other.

[0054] With the above, the assembly of the suction device 1 is completed.

<Use Method of Suction device>

[0055] When using the suction device 1 described above, for example, a user presses a power button (not shown) provided on the first housing 31. In this case, for example, by pressing the button a plurality of times (for example, five times), an activation signal is output.

[0056] Subsequently, the user sucks the suction port portion 23 in a holding state. Then, the air in the holding unit 22 (duct 75) is sucked, and thus, a pressure inside the duct 75 becomes negative. When the inside of the duct 75 becomes a negative pressure, the inside of the first housing 31 also becomes a negative pressure, and thus, air is taken in from the air intake port 37. The air that has flowed into the accommodation space 36 of the first housing 31 passes through the air passage hole 42 and is taken into the case 39 (accommodation space 41) of the coupler 33. The air that has flowed into the coupler 33 passes through the aerosol passage hole 43 and then passes through the duct 75. The air coming out of the opening portion 80 of the duct 75 passes through the tobacco capsule 12 and the suction port portion 23 and enters the mouth of the user.

[0057] Here, a control unit (not shown) that has received the activation signal energizes the heater 25 (heat generating resistor 56). When the heater 25 is energized, the heat generating resistor 56 generates heat. At about the same time, the liquid of the aerosol source contained in the liquid tank 74 passes through the liquid supply channel 58 of the heater 25 and is supplied to the liquid exposure area 61 (liquid joining portion 62). When the heat generating resistor 56 and the liquid come into contact with each other and the liquid is heated, the aerosol source is atomized and aerosol is generated.

[0058] The atomized aerosol fills above the heat generating resistor 56 and the liquid exposure area 61. The atomized aerosol, passes through the aerosol passage hole 43 together with the introduced fresh air, and then is supplied to the tobacco capsule 12 through the duct 75 (the take-in portion 78 and the straight portion 79). Tobacco flavor is added to the mixed gas of the aerosol and air supplied to the tobacco capsule 12 by the tobacco capsule 12. After that, the mixed gas enters the mouth of the user from the suction port portion 23. Accordingly, the user can taste the flavor of tobacco.

<Action/Effect of Suction device and Heater>

[0059] The heater 25 of the present embodiment includes the liquid supply channel 58 which is formed between the first member 51 and the second member 52 and configured to transport the liquid, and the heat generating resistor 56 which is arranged near the outlet of the liquid supply channel 58 and atomizes the liquid when the liquid is supplied. In the heater 25, the liquid exposure area 61, in which the liquid is exposed to the surface 51a of the first member 51, is formed between the liquid supply channel 58 and the heat generating resistor 56. With such a configuration, the aerosol is capable of being generated in the open liquid exposure area 61, and the generated aerosol is efficiently transported.

[0060] Since the plurality of liquid supply channels 58 are formed, when the liquid is transported to the liquid exposure area 61, even though the liquid cannot be transported due to factors such as clogging of one liquid supply channel 58, the liquid can be reliably transported through the other liquid supply channels 58.

[0061] The heater 25 includes the first member 51 on which the heat generating resistor 56 is disposed and the second member 52 laminated on the first member 51, and the liquid supply channel 58 is formed between the facing surfaces 51a and 52a of the first member 51 and the second member 52. Accordingly, the heater 25 is easily manufactured. The heater 25 may not have two members such as the first member 51 and the second member 52, but may be formed by processing one rectangular parallelepiped member to form a liquid supply channel 58 or the like corresponding to the present embodiment.

[0062] Since the liquid supply channel 58 is formed of the groove 59 formed by processing the surface 51a of the first member 51, the liquid supply channel 58 is easily formed. The groove may be formed in the second member 52 to form the liquid supply channel, or the grooves 59 may be formed in both the first member 51 and the second member 52 to form the liquid supply channel.

[0063] Since the first member 51 and the second member 52 are made of soda glass, it is possible to suppress the temperature from becoming high and prevent the glass from breaking. At least one of the first member 51 and the second member 52 may be made of soda glass.

[0064] Since the liquid supply channel 58 and the heat generating resistor 56 are arranged on the same plane, the liquid of the aerosol source transported from the liquid tank 74 is smoothly brought into contact with the heat generating resistor 56. That is, the aerosols is generated efficiently.

[0065] Since the heat generating resistor 56 extends in the longitudinal direction intersecting the liquid supply channel 58, the liquid transported via the liquid supply channel 58 is smoothly brought into contact with the heat generating resistor 56. That is, the aerosols is generated efficiently.

[0066] In the liquid exposure area 61, since the liquid joining portion 62 is formed between the end part of the heat generating resistor 56 on the liquid supply channel 58 side and the end of the liquid supply channel 58, the liquid guided to the liquid joining portion 62 is smoothly brought into contact with the heat generating resistor 56. That is, the aerosols is generated efficiently.

[0067] Since the heat generating resistor 56 is configured to be attachable to or detachable from the first member 51, the heat generating resistor 56 is easily replaced even when rust or the like occurs over time. Similarly, the electrode 55 may be configured to be attachable to or detachable from the first member 51.

[0068] The suction device 1 of the present embodiment includes the heater 25 described above and the power supply unit 21 which supplies power to the heater 25, and the heater 25 is configured to be attachable to or detachable from the power supply unit 21. Accordingly, a power supply (storage battery 32) and the heater 25 are easily replaced.

[0069] Since the suction device 1 of the present embodiment includes the tobacco capsule 12, it is possible to add a flavor such as a tobacco component to the aerosol. Instead of the tobacco capsule 12, a flavor source containing no tobacco component may be adopted as a flavor source storage device. The tobacco capsule 12 may be accommodated in the suction port portion 23 instead of being accommodated in the holding unit 22, or may be connected to the suction port side of the suction port portion 23.

[0070] Heretofore, the preferred embodiment of the present invention is described. However, the present invention is not limited to the embodiment. Addition, omission, replacement, and other modifications of configurations can be made without departing from a spirit of the present invention. In addition, the present invention is not limited by the embodiment, but is limited only by claims.

[0071] For example, an engagement structure between the first housing 31 and the second housing 71 and between the second housing 71 and the suction port portion 23 is arbitrary. When the first housing 31 and the second housing 71 have a tubular shape, a screw structure such as a screw may be adopted instead of the engagement structure.

[0072] In the present embodiment, the duct 75 is provided as the flow path of the aerosol, but the present invention is not limited to this. For example, a gap may be provided between the liquid tank 74 and the second housing 71, and the gap may be configured as the flow path of the aerosol. The flow path corresponding to the duct 75 may be formed in the second housing 71.

(Second Embodiment)

[0073] Next, a second embodiment of the present invention will be described with reference to the drawings. In the present embodiment, only a configuration of a heater is different from that of the first embodiment, and the other configurations are substantially the same as those of the first embodiment. Therefore, the same portions are designated by the same reference numerals and detailed description thereof will be omitted.

<Heater>

[0074] Fig. 10 is a plan view of the heater. Fig. 11 is a front view of the heater viewed from the suction port side. Fig. 12 is a side view of the heater.

[0075] As shown in Figs. 10 to 12, a heater 125 includes a flat plate-shaped first member 151 and a flat plate-shaped second member 152 having a size different from that of the first member 151. The first member 151 and the second member 152 are configured as the main body of the heater 125. The first member 151 and the second member 152 are laminated in the minor axis direction. The first member 151 is located on a lower side in the minor axis direction, and the second member 152 is located on an upper side. Both the first member 151 and the second member 152 are formed of soda glass. The first member 151 is formed of a glass plate material having a thickness larger than that of the second member 152. For example, the first member 151 and the second member 152 are adhered to each other by an adhesive. A method of joining the first member 151 and the second member 152 may be a method other than the adhesive. The first member 151 and the second member 152 may be formed of sintered glass or sintered ceramics instead of the soda glass.

[0076] The first member 151 is formed in a substantially rectangular parallelepiped shape. End surfaces of the first member 151 and the second member 152 on the suction port side are arranged on the same plane. Both end surfaces of the first member 151 and the second member 152 in the major axis direction are each arranged on the same plane. The first member 151 and the second member 152 have different axial lengths. Specifically, an axial length L4 of the first member 151 is longer (larger) than an axial length L5 of the second member 152. That is, when the heater 125 is viewed in a plan view from a side (upper side) where the second member 152 is disposed, a part of the surface of the first member 151 is exposed and is visually recognized. This exposed and visible surface is referred to as an exposed surface 154.

[0077] An axial length L6 in the vicinity of both end parts of the second member 152 in the major axis direction is shorter (smaller) than L5. That is, a shape of an end part of the second member 152 facing the exposed surface 154 is formed to be convex in a plan view. A pair of electrodes 155 and 155 are provided near both end parts in the major axis direction on the exposed surface 154 of the first member 151. The pair of electrodes 155 and 155 and the second member 152 are disposed at positions where the electrodes 155 and 155 and the second member 152 do not interfere with each other in a plan view.

[0078] For example, the pair of electrodes 155 and 155 are formed of silver paste and have a rectangular plate-like shape. The electrode 155 is formed to have a predetermined length along the axial direction from an end part of the exposed surface 154 on the opposite suction port side. In a state where the heater 125 is attached to the coupler 33, the electrode 155 and the wiring portion 40 of the coupler 33 are in contact with each other to be electrically conductive. The electrode 155 may be other than the silver paste, and may be, for example, gold, copper, platinum, aluminum, palladium, stainless steel, graphite, or a conductive complex.

[0079] The exposed surface 154 is provided with a heat generating resistor (atomizer) 156 which connects the pair of electrodes 155 and 155 to each other. For example, the heat generating resistor 156 is formed of an oxide and has a rectangular plate-like shape. The heat generating resistor 156 extends along the longitudinal direction (major axis direction) of the heater 125. Both end parts of the heat generating resistor 156 in the major axis di-

rection are each connected to a pair of electrodes 155 and 155 to be electrically conductive. Electricity flows to the electrode 155, and thus, a temperature of the heat generating resistor 156 increases to a predetermined temperature. The heat generating resistor 156 is heated to an appropriate temperature at which an aerosol is generated. The heat generating resistor 156 may be other than an oxide, and may be, for example, stainless steel, titanium alloy, nickel-chromium alloy, ferroalloy alloy, or Kanthal alloy (registered trademark) having high corrosion resistance. The heat generating resistor 156 may have any shape and may not be formed in a rectangular plate.

[0080] The heat generating resistor 156 is disposed at the end part of the exposed surface 154 on the opposite suction port side. Each of shapes of end parts of the pair of electrodes 155 and 155 and the heat generating resistor 156 facing the second member 152 is formed in a concave shape in a plan view. A convex gap 160 in a plan view is formed between the second member 152, and the pair of electrodes 155 and 155, and the heat generating resistor 156. In other words, the surface 151a (exposed surface 154) of the first member 151 is exposed between the heat generating resistor 156 and the second member 152. This exposure area is referred to as a liquid exposure area 161. The gap 160 between the end part of the heat generating resistor 156 on the suction port side and the end part of the second member 152 on the opposite suction port side has substantially the same axial length (width) over the entire length.

[0081] A liquid supply channel 158 is formed between the facing surfaces (surfaces) 151a and 152a of the first member 151 and the second member 152. The liquid supply channel 158 is a flow path through which the liquid flows. For example, the liquid supply channel 158 is configured so that the liquid can travel in the liquid supply channel 158 by a capillary phenomenon. In the present embodiment, the liquid supply channel 158 is formed by forming a groove 159 on the surface 151a of the first member 151 by etching or the like. A plurality of grooves 159 (nine in the present embodiment) are formed at substantially equal intervals along the major axis direction. The groove 159 is formed to have a predetermined length along the axial direction from the suction port side end part. A width in the major axis direction and a depth in the minor axis direction of the groove 159 are formed to have a substantially uniform size over the entire length of the groove 159. The plurality of grooves 159 are all formed to have the same shape. The groove 159 is formed in a triangular cross section when viewed from the front. The groove 159 is formed from the suction port side end part of the first member 151 to a position where it comes into contact with the suction port side end of the heat generating resistor 156. The shape of the groove 159 may arbitrarily set, and for example, the groove 159 may be formed in a semicircular cross section when viewed from the front.

[0082] The liquid exposure area 161 is formed in a rectangular shape that is long in the major axis direction when the heater 125 is viewed in a plan view from the side where the second member 152 is disposed. The groove 159 is formed in the liquid exposure area 161, and the groove 159 and the heat generating resistor 156 are connected in series. In other words, in the liquid exposure area 161, the liquid supplied from the plurality of liquid supply channels 158 is guided by the groove 159 such that the liquid is capable of coming into contact with the heat generating resistor 156. That is, the liquid that has reached the liquid exposure area 161 comes into contact with the heat generating resistor 156 to generate an aerosol.

[0083] A groove along the shape of the heat generating resistor 156 may be formed on the surface 151a of the first member 151 on which the heat generating resistor 156 is disposed such that all or a portion of the heat generating resistor 156 is embedded in the surface 151a of the first member 151. In this case, the upper surface of the heat generating resistor 156 and the surface 151a of the first member 151 may be arranged on the same plane.

[0084] In a state where the heater 125 is attached to the coupler 33, the aerosol passage hole 43 is located above the heat generating resistor 156 and the liquid exposure area 161.

[0085] Also in the present embodiment, substantially the same effects as those in the first embodiment can be obtained.

<First Modification Example>

[0086] Fig. 13 is a perspective view showing a modification example of the heater 25.

[0087] As shown in Fig. 13, ITO films 98 may be provided between the first member 51 and the second member 52, and a region where the ITO films 98 are not provided may be configured as the liquid supply channel 58. That is, the facing surface (surface) 51a of the first member 51 and the facing surface (surface) 52a of the second member 52 are not processed, and the liquid supply channel 58 may be formed by only providing the films (ITO film) 98 on the facing surface (surface) 51a (or 52a) of the first member 51 (or the second member 52).

<Second Modification Example>

[0088] Fig. 14 is a cross-sectional view showing another modification example of the heater 25.

[0089] As shown in Fig. 14, a liquid absorbing member 99 may be disposed so as to face above the heat generating resistor 56 and the liquid exposure area 61. The liquid absorbing member 99 is made of cotton, sponge material, or the like. The liquid absorbing member 99 may be disposed to be attachable to or detachable from the end part of the second member 52 on the opposite suction port side by some methods. With this configuration, when the liquid stays in the liquid exposure area 61, it is possible to suppress the liquid from splashing to the sur-

roundings even though it is turned upside down.

<Third Modification Example>

[0090] Fig. 15 is a perspective view of a suction device 100.

[0091] As shown in Fig. 15, the main body unit of the suction device 100 includes a third housing 101 in which the first housing 31 and the second housing 71 are integrally formed, and the suction port portion 23. With this configuration, the number of parts can be reduced.

[Industrial Applicability]

[0092] It is possible to provide a heater and a non-combustion-type suction device capable of efficiently transporting generated aerosol.

[Reference Signs List]

[0093]

1: Suction device (non-combustion-type suction device)
12: Tobacco capsule (flavor source storage device)
23: Suction port portion (suction port)
25, 125: Heater
32: Storage battery (power supply unit)
51, 151: First member (main body)
52, 152: Second member (main body)
56, 156: Heat generating resistor (atomizer)
58, 158: Liquid supply channel
59, 159: Groove
61, 161: Liquid exposure area
62: Liquid joining portion
98: ITO film (film)
99: Liquid absorbing member

Claims

1. A heater comprising:

a liquid supply channel formed in a main body and configured to transport a liquid; and
an atomizer disposed near an outlet of the liquid supply channel in the main body and configured to atomize the liquid when the liquid is supplied,
wherein the heater is configured to be usable in a non-combustion-type suction device having a suction port, and
a liquid exposure area, in which the liquid is exposed to a surface of the main body, is formed between the liquid supply channel and the atomizer.

2. The heater according to Claim 1,
wherein a plurality of the liquid supply channels are formed.

3. The heater according to Claim 1,
wherein the main body includes:

a first member in which the atomizer is disposed; and
a second member laminated on the first member, and
wherein the liquid supply channel is formed between facing surfaces of the first member and the second member.

4. The heater according to Claim 3,
wherein the liquid supply channel is a groove formed by processing the facing surface of at least one of the first member and the second member.

5. The heater according to Claim 3,

wherein films are provided between the facing surfaces of the first member and the second member, and
the liquid supply channel is constituted by a gap formed between the facing surfaces of the first member and the second member by the films.

6. The heater according to Claim 3,
wherein at least one of the first member and the second member is formed of glass.

7. The heater according to Claim 1,
wherein the liquid supply channel and the atomizer are arranged on the same plane.

8. The heater according to Claim 1,

wherein the atomizer has a heat generating resistor configured to atomize the liquid, and
the heat generating resistor extends in a longitudinal direction intersecting the liquid supply channel.

9. The heater according to Claim 8,
wherein in the liquid exposure area, a liquid joining portion configured to guide the liquid along the longitudinal direction is formed between an end part of the atomizer on the liquid supply channel side and an end of the liquid supply channel.

10. The heater according to Claim 1,
wherein a liquid absorbing member is provided at a position facing the liquid exposure area.

11. The heater according to Claim 1,
wherein the atomizer is attachable to or detachable from the main body.

12. A non-combustion-type suction device comprising:

the heater according to Claim 1; and
a power supply unit configured to supply power to the heater.

13. The non-combustion-type suction device according to Claim 12,
wherein the heater is attachable to or detachable from the power supply unit.

14. The non-combustion-type suction device according to Claim 12, further comprising a flavor source storage device.

15. The non-combustion-type suction device according to Claim 14,
wherein the flavor source storage device contains a tobacco component.

FIG. 1

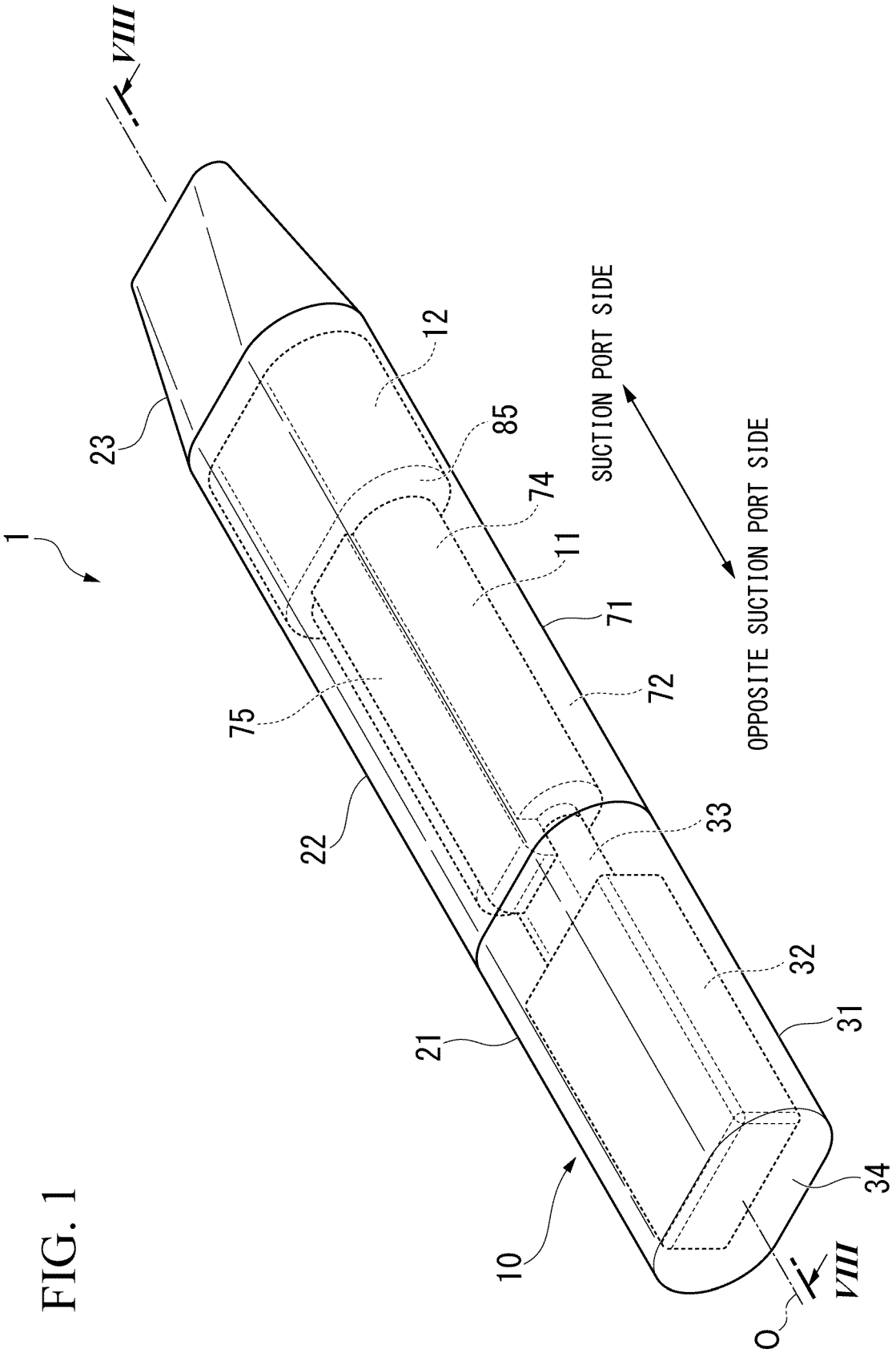

VIII
1
23
12
85
74
11
71
72
75
22
33
32
31
21
10
34
O
VIII
SUCTION PORT SIDE
OPPOSITE SUCTION PORT SIDE

FIG. 2

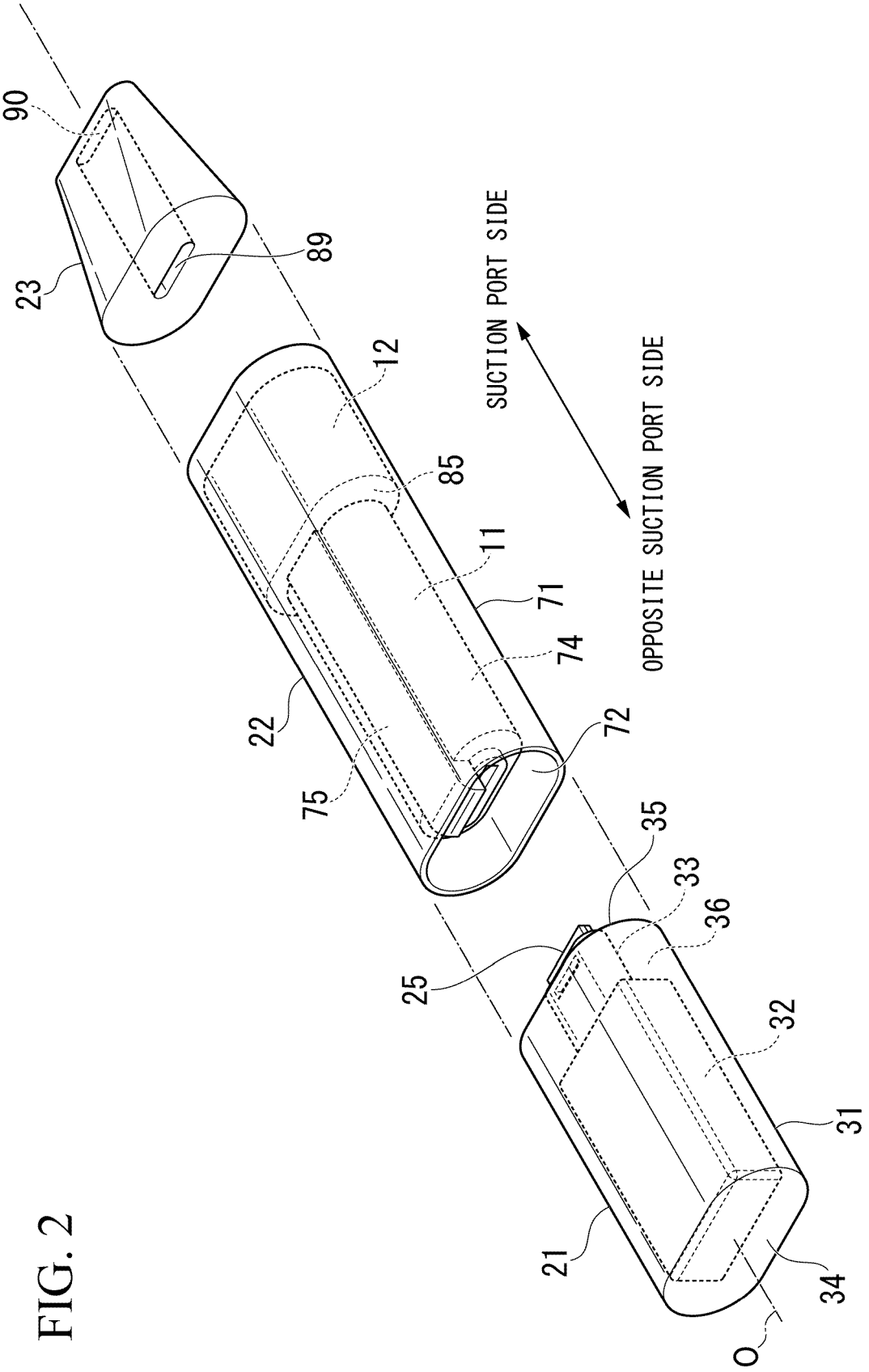

90
23
89
12
85
11
71
74
22
75
72
35
33
36
25
32
31
21
34
O
SUCTION PORT SIDE
OPPOSITE SUCTION PORT SIDE

FIG. 3

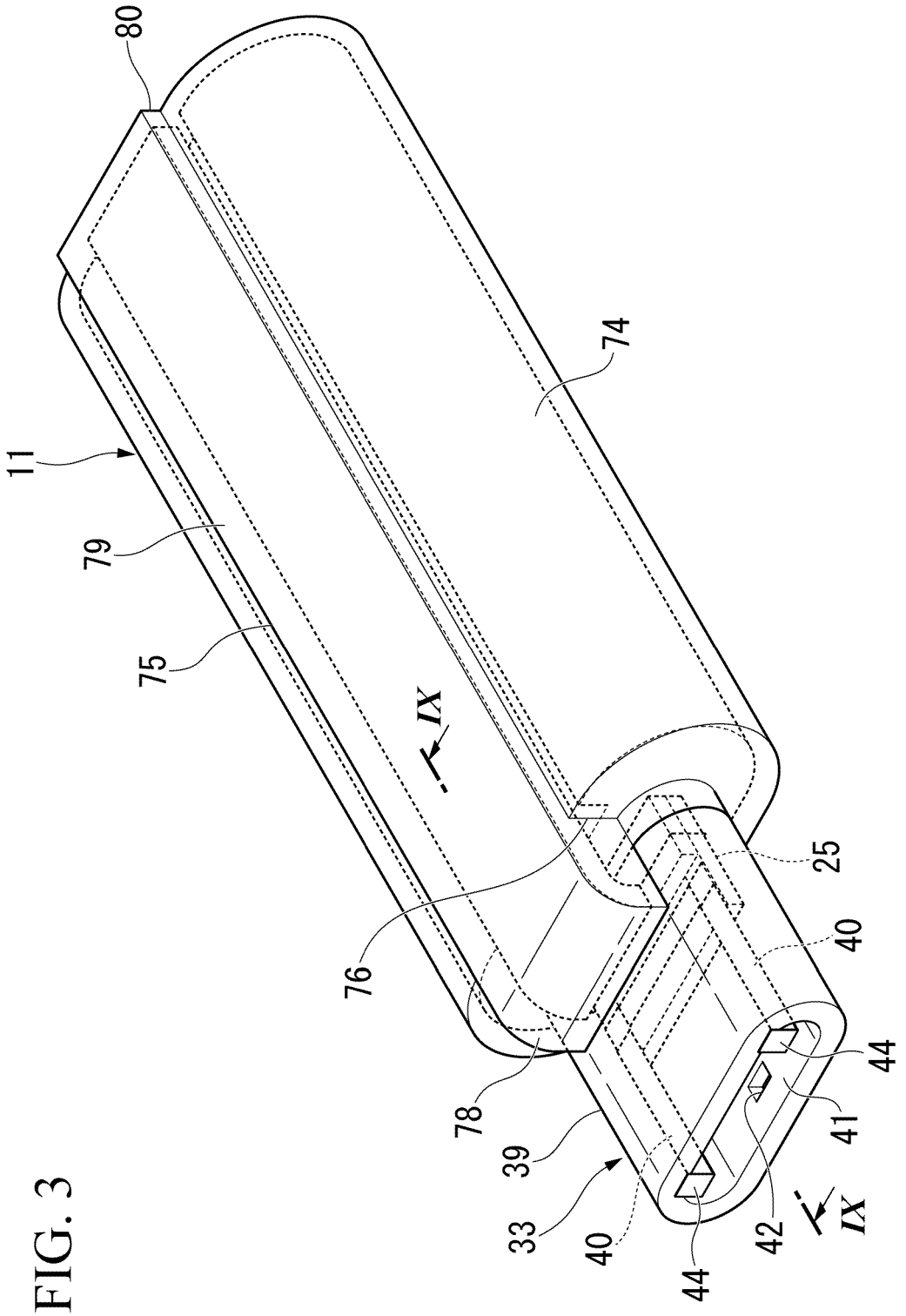


FIG. 4

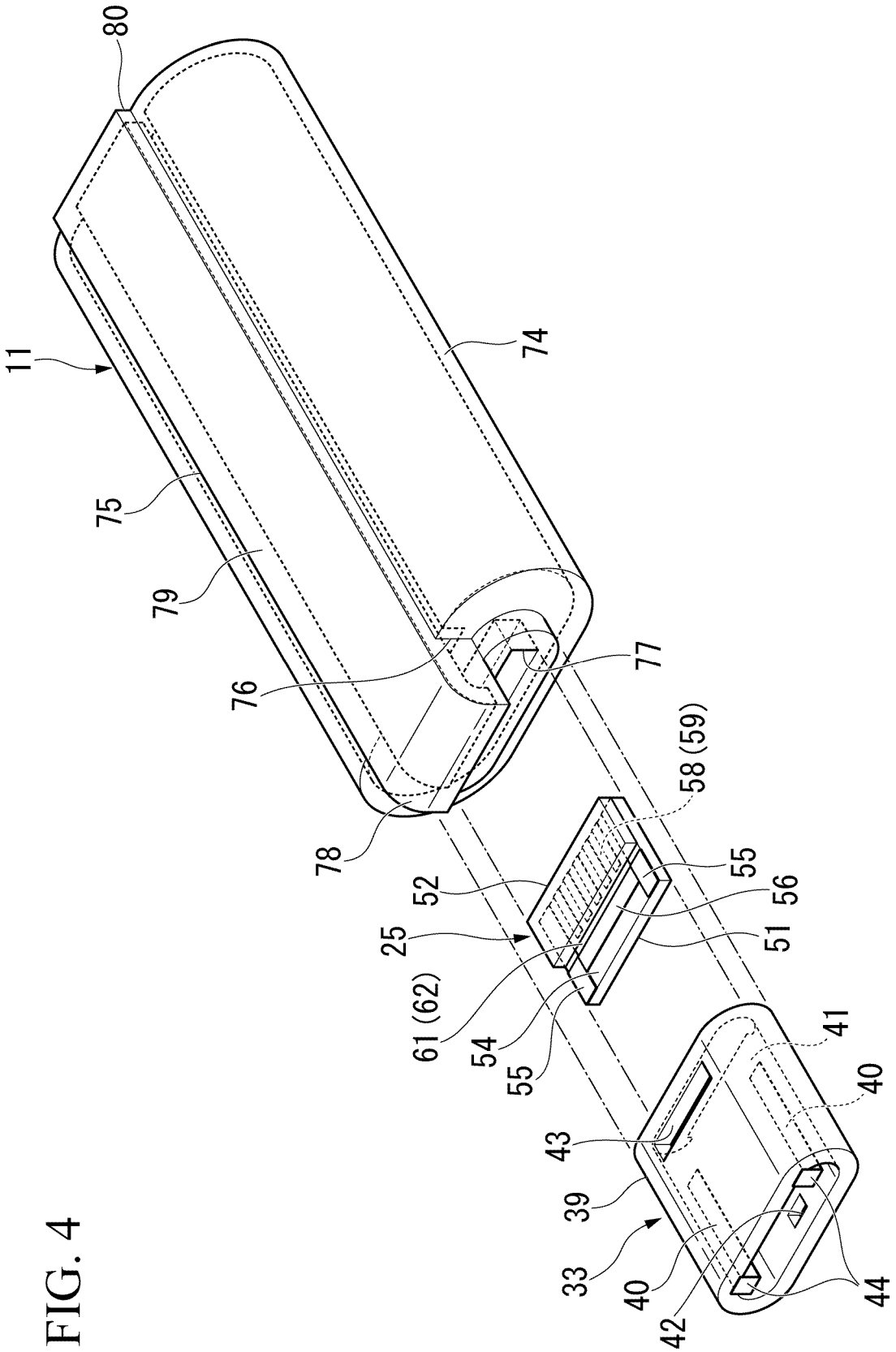

80
11
74
75
79
76
77
78
58 (59)
52
55
56
25
51
61 (62)
54
55
41
40
43
39
33
40
42
44

FIG. 5

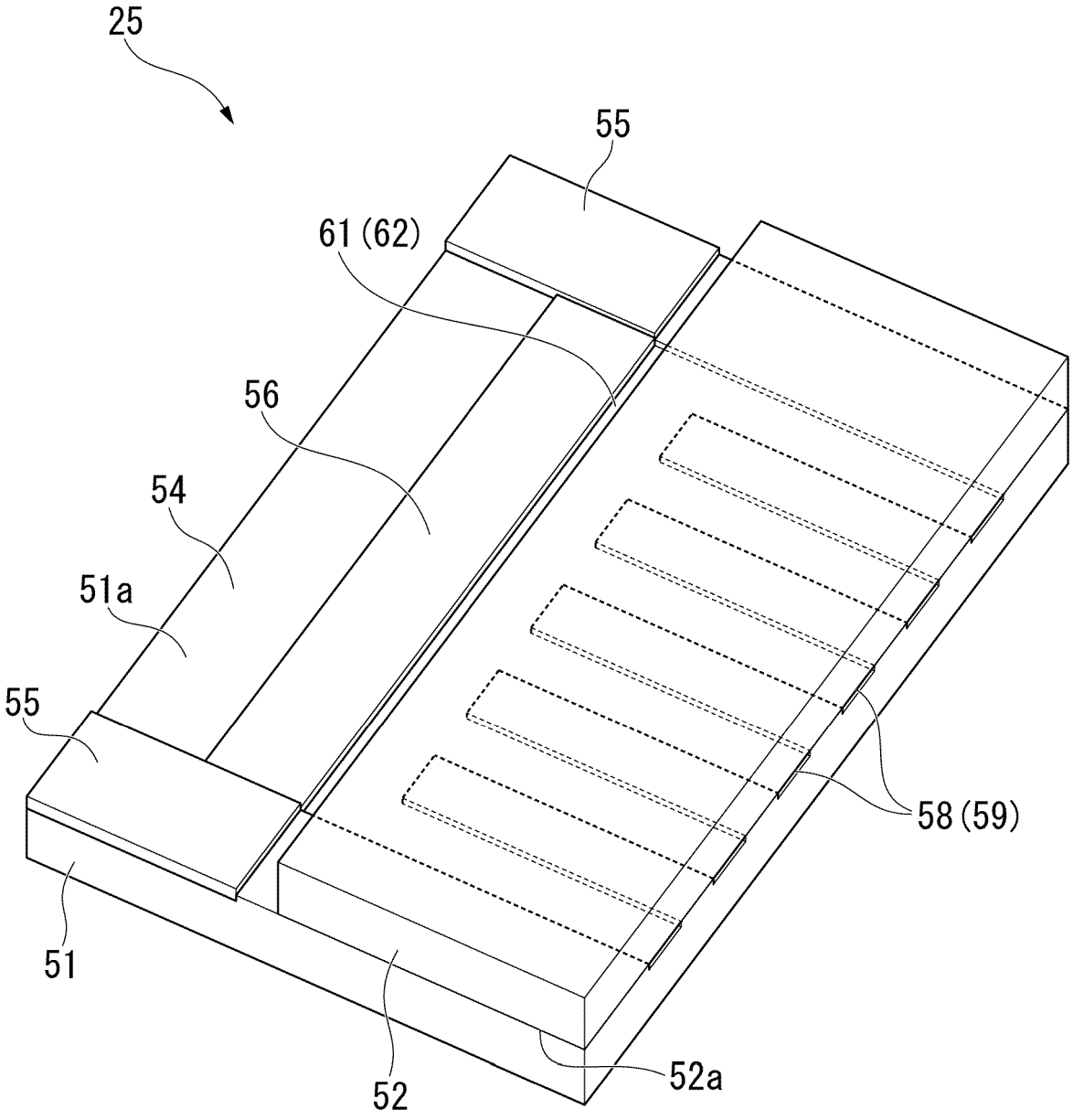


FIG. 6

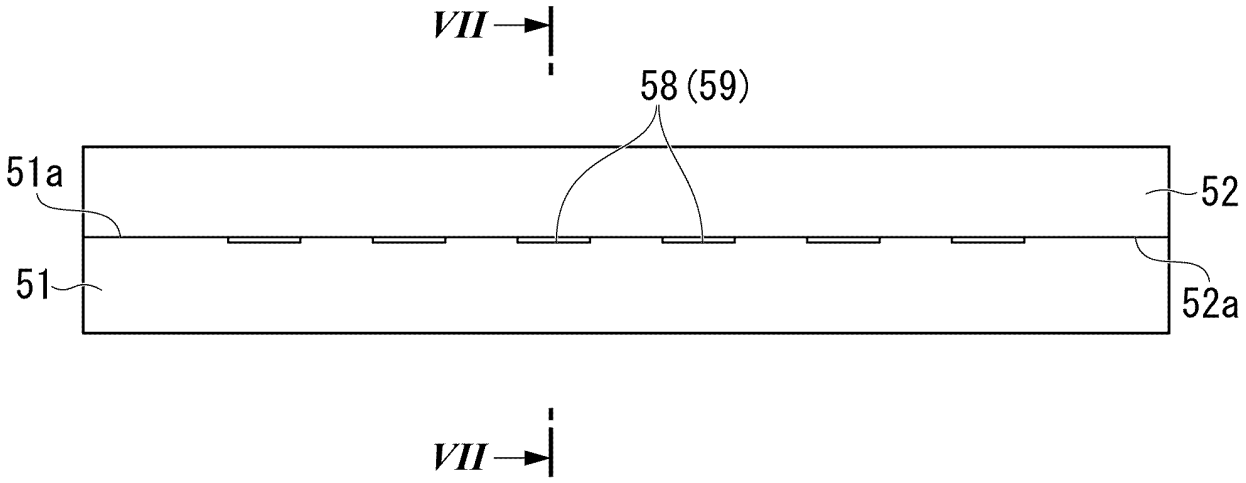

VII
58 (59)
51a
52
51
52a
VII

FIG. 7

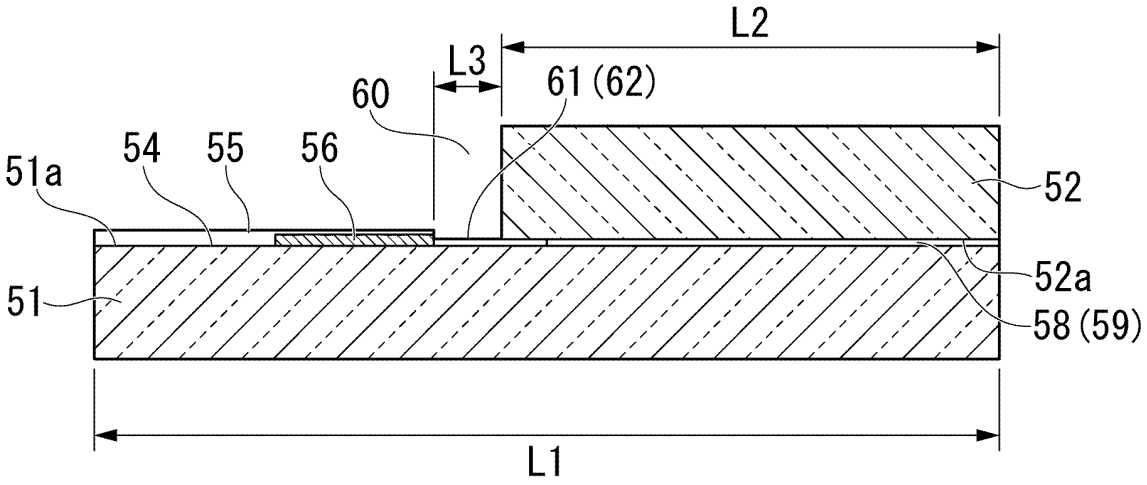

L2
L3
61 (62)
60
54
55
56
51a
52
52a
51
58 (59)
L1

FIG. 8

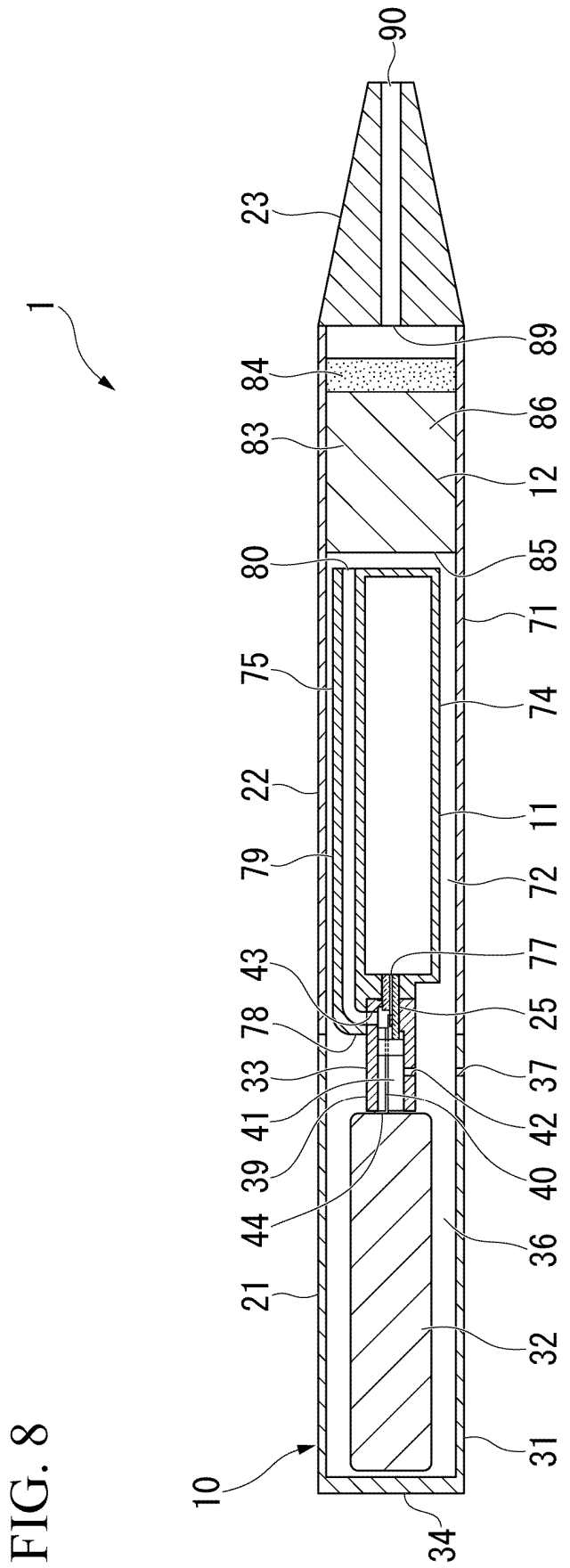

1
10
21
22
23
31
32
33
34
36
37
39
40
41
42
43
44
71
72
74
75
77
78
79
80
83
84
85
86
89
90
11
12
25

FIG. 9

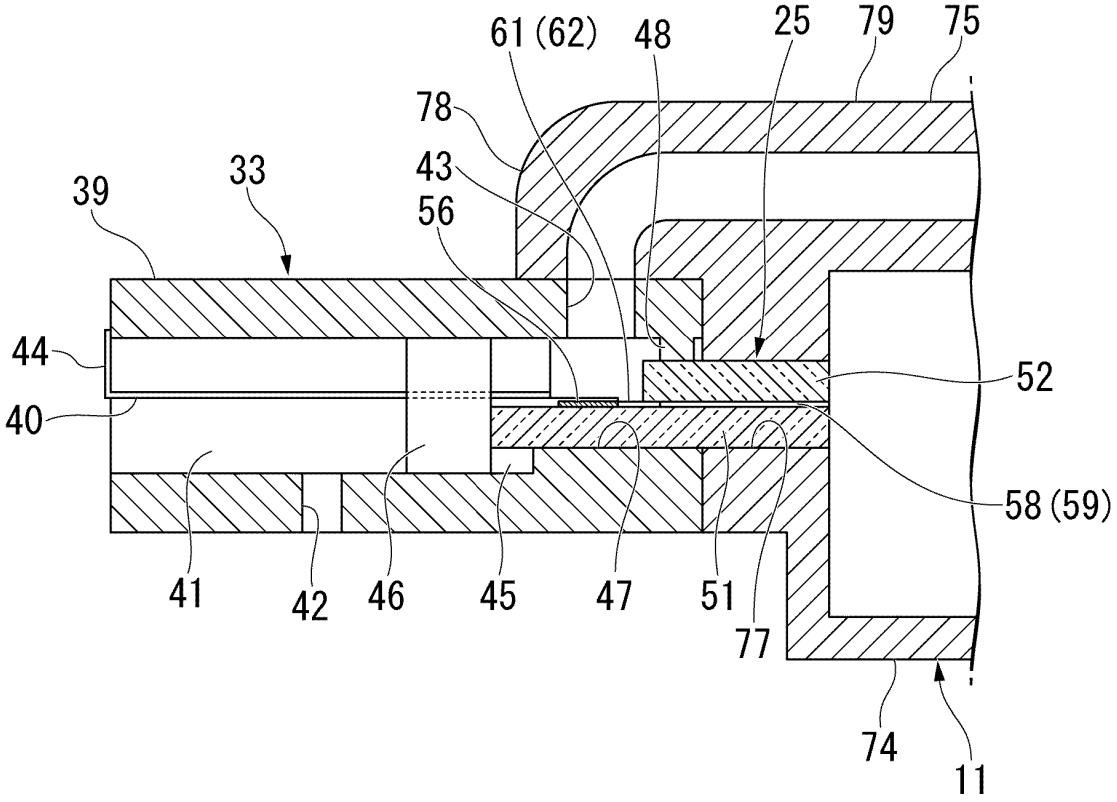

61 (62)
48
25
79
75
78
43
56
39
33
44
40
52
58 (59)
41
42
46
45
47
51
77
74
11

FIG. 10

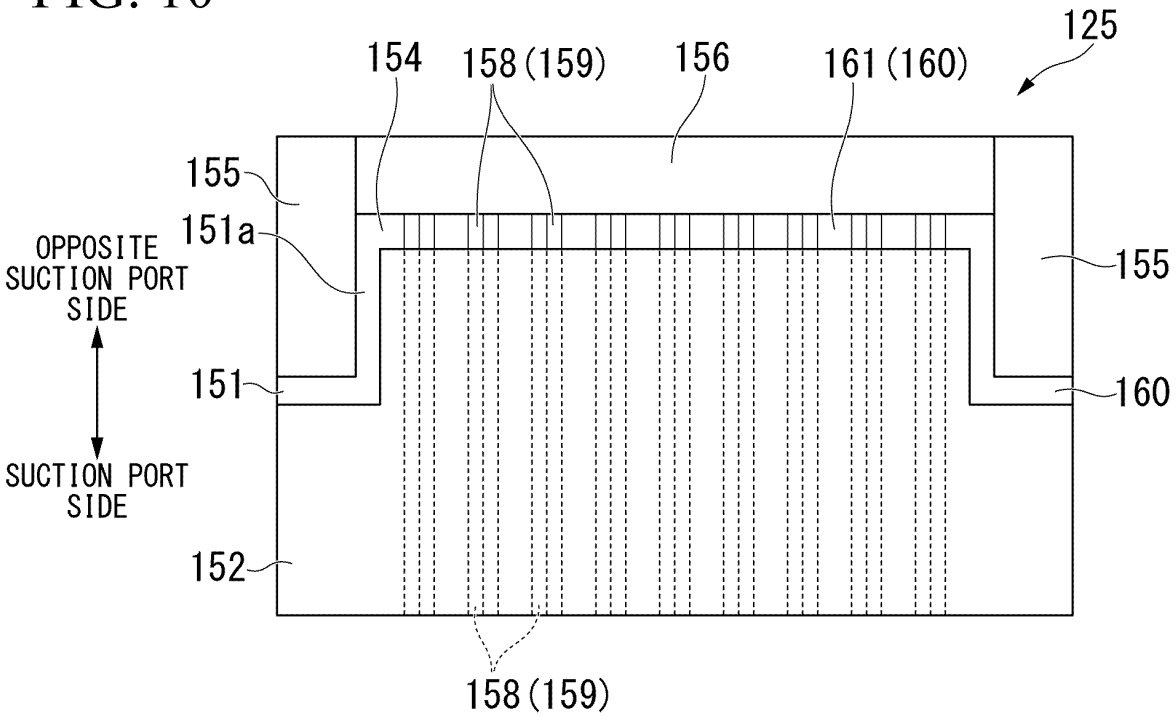

125
154
158 (159)
156
161 (160)
155
151a
OPPOSITE SUCTION PORT SIDE
155
151
160
SUCTION PORT SIDE
152
158 (159)

FIG. 11

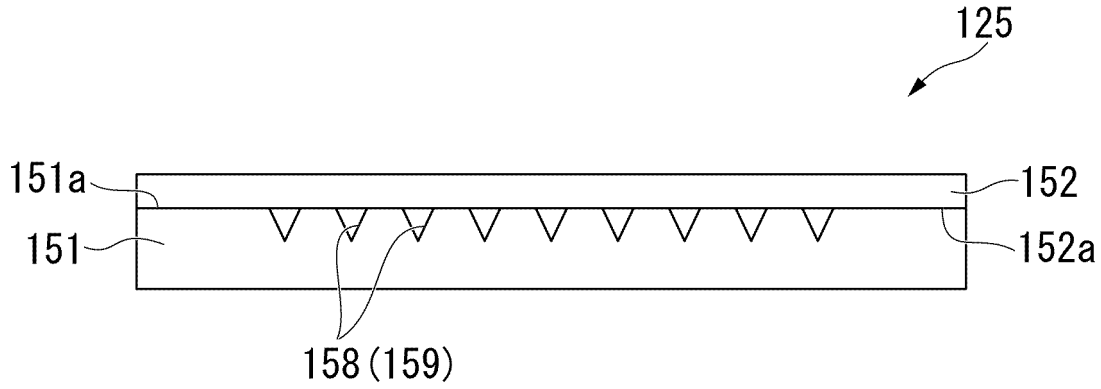

125
151a
152
151
152a
158 (159)

FIG. 12

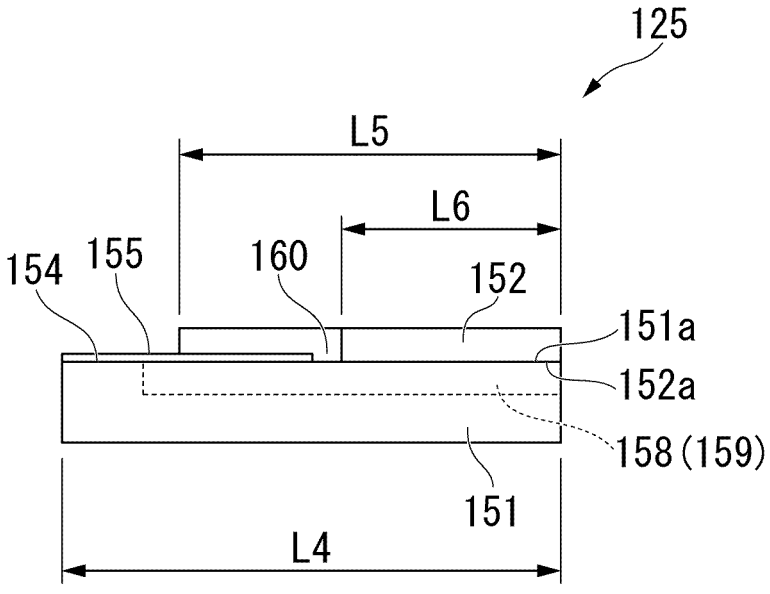

125
L5
L6
154
155
160
152
151a
152a
158 (159)
151
L4

FIG. 13

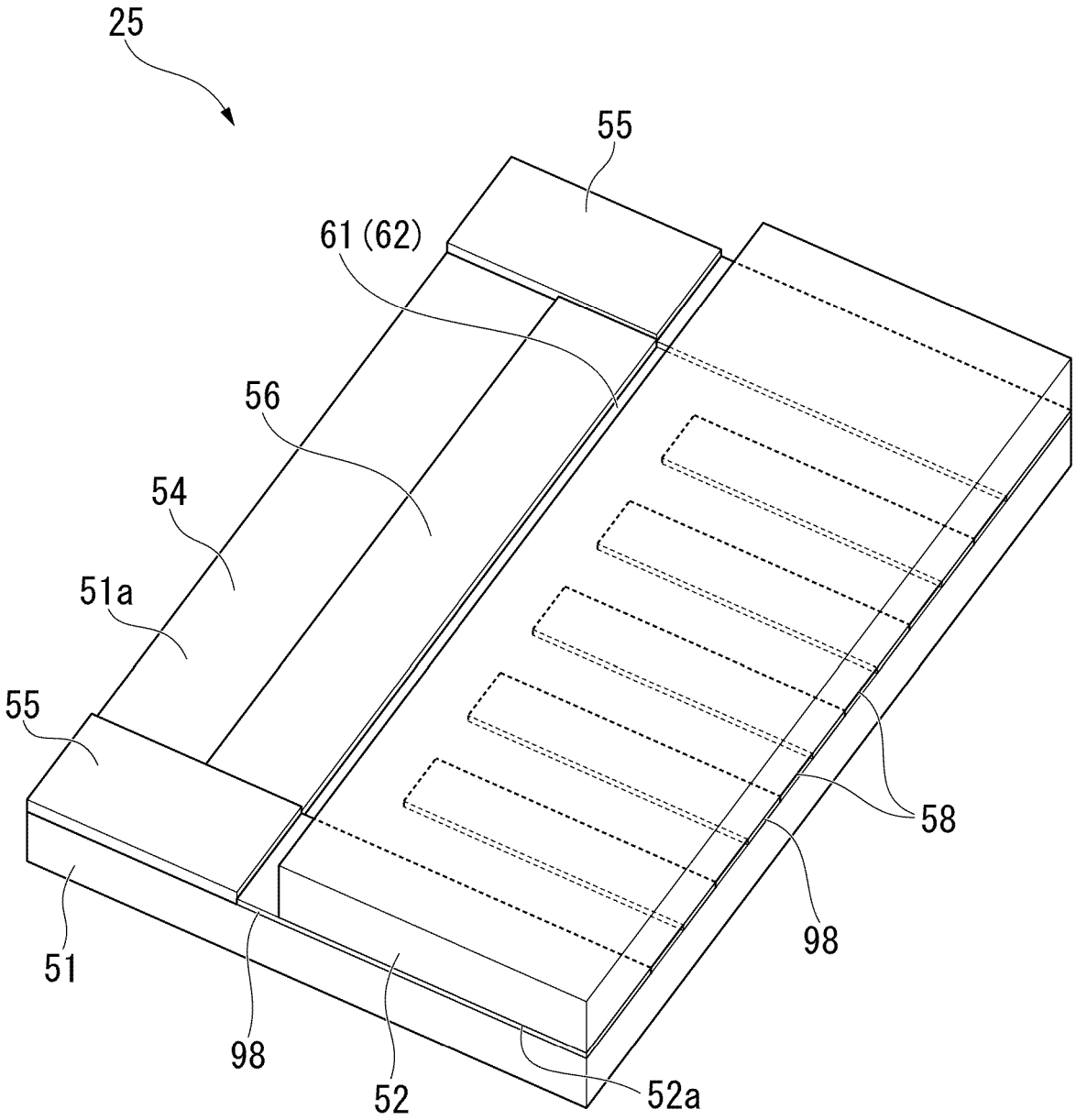
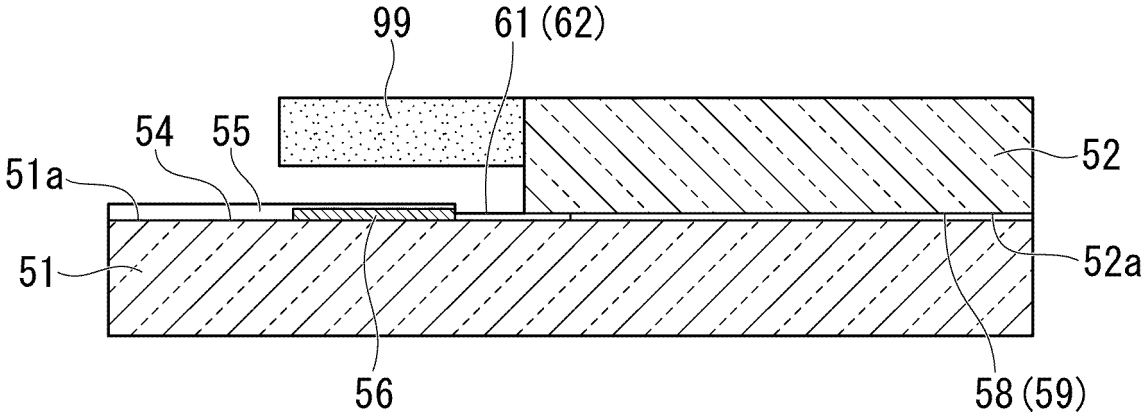


FIG. 14



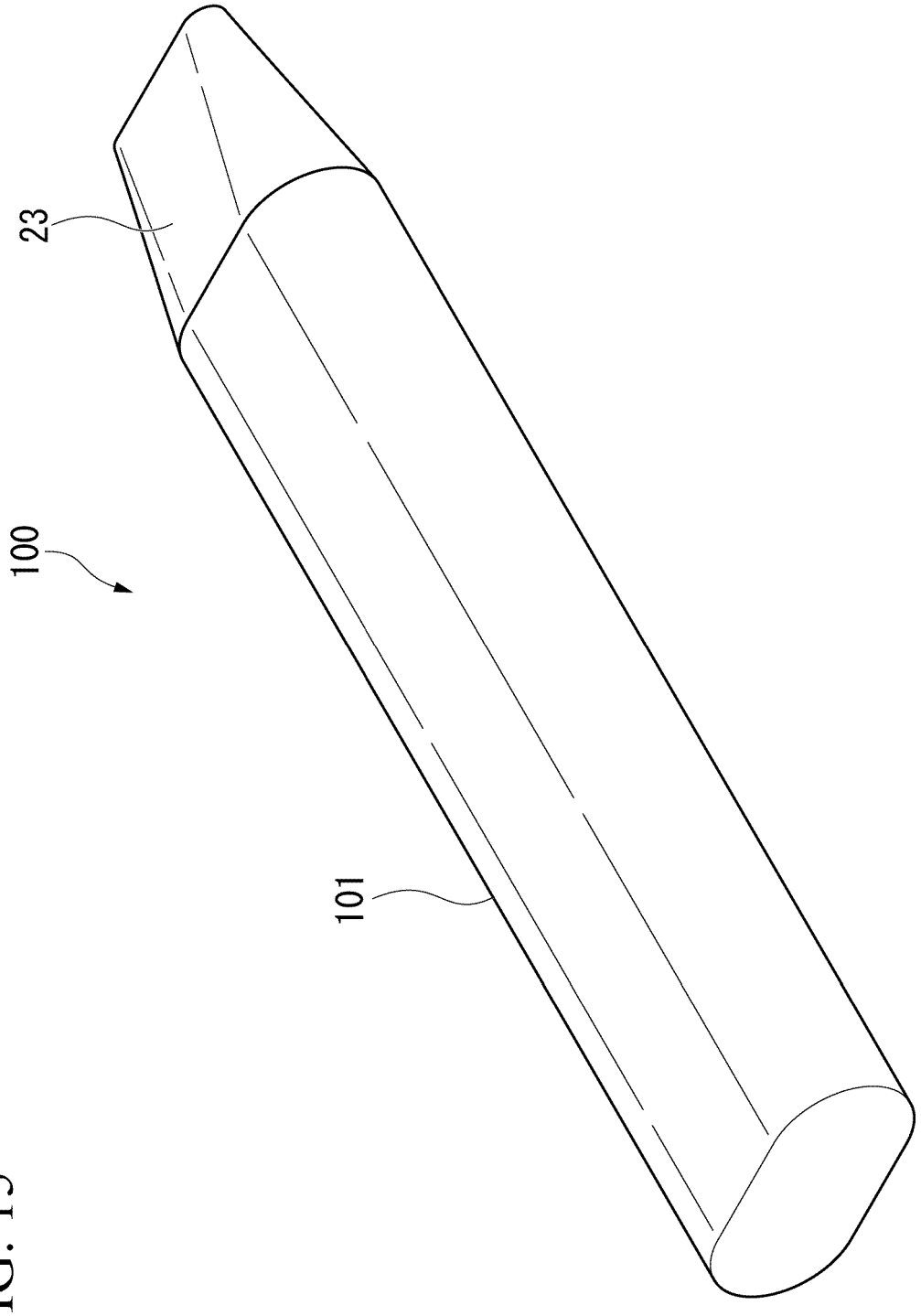


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/023502

A. CLASSIFICATION OF SUBJECT MATTER
A24F 47/00(2020.01)i; A24F 40/46(2020.01)i; A24F 40/48(2020.01)i
FI: A24F40/46; A24F40/48; A24F47/00

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)
A24F40/00-47/00, A61M15/06

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 A	US 2017/0367402 A1 (LAU, Raymond et al.) 28.12.2017 (2017-12-28) paragraphs [0056]-[0128], fig. 1-3	1-4,6-15 5
A	JP 2019-513361 A (PHILIP MORRIS PRODUCTS S.A.) 30.05.2019 (2019-05-30) entire text, all drawings	1-15
A	JP 2018-509158 A (RAI STRATEGIC HOLDINGS, INC.) 05.04.2018 (2018-04-05) entire text, all drawings	1-15

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"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
26 August 2020 (26.08.2020)	08 September 2020 (08.09.2020)

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

International application No.
PCT/JP2020/023502

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
US 2017/0367402 A1	28 Dec. 2017	WO 2017/220808 A1	
		JP 2019-521672 A	
		US 2020/0060346 A1	
		EP 3474690 A1	
		CN 109414060 A	
		KR 10-2019-0021215 A	
JP 2019-513361 A	30 May 2019	WO 2017/167610 A1	
		EP 3435796 A1	
		KR 10-2018-0122441 A	
		CN 109068732 A	
JP 2018-509158 A	05 Apr. 2018	US 2016/0262454 A1	
		US 2019/0110521 A1	
		WO 2016/145072 A1	
		EP 3267811 A1	
		CN 107529828 A	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2019112912 A **[0001]**
- JP 2004524073 W **[0004]**