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

(11) **EP 4 094 604 A1**

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

(43) Date of publication:
30.11.2022 Bulletin 2022/48

(21) Application number: **20938239.9**

(22) Date of filing: **25.05.2020**

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

(52) Cooperative Patent Classification (CPC):
A24F 40/51

(86) International application number:
PCT/JP2020/020611

(87) International publication number:
WO 2021/240617 (02.12.2021 Gazette 2021/48)

(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

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

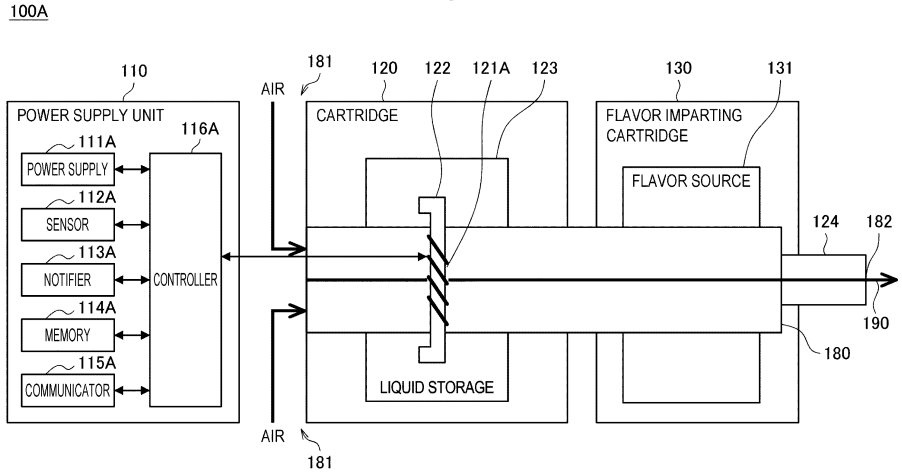
(72) Inventors:
- **SERITA, Kazutoshi**
  Tokyo 130-8603 (JP)
- **SUGANO, Yuka**
  Tokyo 130-8603 (JP)
- **SENJU, Masatoshi**
  Tokyo 130-8603 (JP)
- **TEZUKA, Hiroshi**
  Tokyo 130-8603 (JP)

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

(54) **INHALING DEVICE, CONTROL METHOD, AND PROGRAM**

(57) [Problem] To provide a system capable of suitably detecting bio-information on a user who uses an inhaling device. [Solution] This inhaling device comprises: an operation part that receives an operation of a user; and a bio-information detection part that detects bio-information on the user, wherein the bio-information detection part is disposed in the operation part or near the operation part.

FIG. 1



EP 4 094 604 A1

Description

Technical Field

[0001] The present invention relates to an inhaler device, a control method, and a program.

Background Art

[0002] Inhaler devices, such as electronic cigarettes and nebulizers, that generate a substance to be inhaled by a user are widely used. For example, an inhaler device generates an aerosol with flavor components using a substrate containing an aerosol source for generating an aerosol, a flavor source for giving the flavor components to the generated aerosol, and the like. A user can taste flavors by inhaling (hereinafter also referred to as a puff) the aerosol with the flavor components generated by the inhaler device.

[0003] In these years, detection of biological information regarding a user of an inhaler device and use of the biological information for various services are being examined. In Patent Literature 1, for example, a technique for detecting biological information regarding a user from a contact part of an inhaler device when one of the users fingers comes into contact with the inhaler device is disclosed.

Citation List

Patent Literature

[0004] Patent Literature 1: International Publication No. 2019/175810

Summary of Invention

Technical Problem

[0005] Techniques for detecting biological information regarding a user of an inhaler device, however, are still in its infancy and need further improvements.

[0006] The present invention, therefore, has been conceived in view of the above problem, and aims to provide a mechanism capable of appropriately detecting biological information regarding a user of an inhaler device.

Solution to Problem

[0007] In order to solve the above problem, according to an aspect of the present invention, an inhaler device including an operation unit that receives an operation performed by a user and a biological information detector that detects biological information regarding the user is provided. The biological information detector is provided at or near the operation unit.

[0008] The biological information detector may transmit a transmission wave, receive a reflected wave, which is the transmission wave reflected from the user's body, and detect the biological information on a basis of the received reflected wave.

[0009] The inhaler device may further include a passing part that passes the transmission wave and the reflected wave and that is provided at least at and/or near the operation unit.

[0010] The biological information may include at least blood pressure, heart rate, a blood oxygen level, and/or oxygen saturation.

[0011] The inhaler device may further include a controller that controls, in accordance with the operation received by the operation unit, operation of a generation unit, which generates an aerosol to be inhaled by the user.

[0012] The biological information detector may detect the biological information before the generation unit starts the generation of the aerosol.

[0013] If the operation unit receives a first operation, which is a certain operation continuously performed for a certain period of time, the controller may control the generation unit such that the generation unit performs an operation corresponding to the first operation. The biological information detector may detect the biological information in a period for which the first operation is performed.

[0014] If the operation unit receives a second operation, which is a certain number of times of a certain operation performed successively, the controller may control the generation unit such that the generation unit performs an operation corresponding to the second operation. The biological information detector may detect the biological information in a period for which the second operation is performed.

[0015] The biological information detector may detect the biological information after the generation unit starts the generation of the aerosol.

[0016] The controller may perform a certain type of control if a difference between a first piece of the biological information detected before the generation unit starts the generation of the aerosol and a second piece of the biological information detected after the generation unit starts the generation of the aerosol satisfies a certain condition.

[0017] The certain type of control may include at least a change to an operation profile that defines the operation of the generation unit and/or imposition of a restriction on a function of generating the aerosol.

[0018] The inhaler device may further include a notifier that notifies of information indicating that the certain type of control has been performed.

[0019] The controller may perform control according to the operation received by the operation unit on condition that the biological information detector has detected the biological information.

[0020] The inhaler device may further include a wireless communication unit that wirelessly communicates with another device and a memory that stores informa-

tion. If the biological information detector detects the biological information with the wireless communication unit and the other device wirelessly connected to each other, the wireless communication unit may transmit the biological information. If the biological information detector detects the biological information without the wireless communication unit and the other device wirelessly connected to each other, the memory may store the biological information.

[0021] The wireless communication unit may transmit at least a detection time of the biological information, identification information regarding a substrate used by the generation unit to generate the aerosol, and/or identification information regarding the inhaler device while associating the detection time, the identification information regarding the substrate, and/or the identification information regarding the inhaler device with the biological information. The memory may store at least the detection time of the biological information, the identification information regarding the substrate, and/or the identification information regarding the inhaler device while associating the detection time of the biological information, the identification information regarding the substrate, and/or the identification information regarding the inhaler device with the biological information.

[0022] In addition, in order to solve the above problem, according to another aspect of the present invention, a control method for controlling an inhaler device including an operation unit and a biological information detector is provided. The control method includes detecting an operation performed by a user on the operation unit and detecting biological information regarding the user using the biological information detector provided at or near the operation unit.

[0023] In addition, in order to solve the above problem, according to another aspect of the present invention, a program for causing a computer that controls an inhaler device including an operation unit and a biological information detector to perform detecting an operation performed by a user on the operation unit and detecting biological information regarding the user using the biological information detector provided at or near the operation unit is provided.

Advantageous Effects of Invention

[0024] As described above, according to the present invention, a mechanism capable of appropriately detecting biological information regarding a user of an inhaler device is provided.

Brief Description of Drawings

[0025]

[Fig. 1] Fig. 1 is a schematic diagram of an inhaler device according to a first configuration example.
[Fig. 2] Fig. 2 is a schematic diagram of an inhaler device according to a second configuration example.
[Fig. 3] Fig. 3 is a diagram illustrating an example of arrangement of a biological information detector according to a present embodiment.
[Fig. 4] Fig. 4 is a diagram illustrating another example of the arrangement of the biological information detector according to the present embodiment.
[Fig. 5] Fig. 5 is a flowchart illustrating an example of a procedure of a process performed by the inhaler device according to the present embodiment.

Description of Embodiments

[0026] A preferred embodiment of the present invention will be described in detail hereinafter with reference to the accompanying drawings. Structural elements having substantially the same functional configuration will be given the same reference numerals, and redundant description thereof is omitted herein and in the drawings.

<<1. Configuration example of inhaler device>>

[0027] An inhaler device generates material to be inhaled by a user. In the example described below, the material generated by the inhaler device is an aerosol. Alternatively, the material generated by the inhaler device may be gas.

(1) First configuration example

[0028] Fig. 1 is a schematic diagram of the inhaler device according to the first configuration example. As illustrated in Fig. 1, an inhaler device 100A according to the present configuration example includes a power supply unit 110, a cartridge 120, and a flavor imparting cartridge 130. The power supply unit 110 includes a power supply 111A, a sensor 112A, a notifier 113A, a memory 114A, a communicator 115A, and a controller 116A. The cartridge 120 includes a heater 121A, a liquid guide 122, and a liquid storage 123. The flavor imparting cartridge 130 includes a flavor source 131 and a mouthpiece 124. In the cartridge 120 and the flavor imparting cartridge 130, an airflow path 180 is defined.

[0029] The power supply 111A stores electric power. The power supply 111A supplies electric power to the structural elements of the inhaler device 100A under the control of the controller 116A. The power supply 111A may be a rechargeable battery such as a lithium ion secondary battery.

[0030] The sensor 112A acquires various items of information regarding the inhaler device 100A. In an example, the sensor 112A may be a pressure sensor such as a microphone condenser, a flow sensor, or a temperature sensor, and acquire a value generated in accordance with the user's inhalation. In another example, the sensor 112A may be an input device that receives information input by the user, such as a button or a switch.

[0031] The notifier 113A provides information to the

user. The notifier 113A may be a light-emitting device that emits light, a display device that displays an image, a sound output device that outputs sound, or a vibration device that vibrates.

[0032] The memory 114A stores various items of information for operation of the inhaler device 100A. The memory 114A may be a non-volatile storage medium such as flash memory.

[0033] The communicator 115A is a communication interface capable of communication in conformity with any wired or wireless communication standard. Such a communication standard may be, for example, Wi-Fi (registered trademark) or Bluetooth (registered trademark).

[0034] The controller 116A functions as an arithmetic processing unit and a control circuit, and controls the overall operations of the inhaler device 100A in accordance with various programs. The controller 116A includes an electronic circuit such as a central processing unit (CPU) or a microprocessor, for example.

[0035] The liquid storage 123 stores an aerosol source. The aerosol source is atomized to generate an aerosol. The aerosol source is a liquid such as polyhydric alcohol or water. Examples of the polyhydric alcohol include glycerine and propylene glycol. The aerosol source may include a flavor component that is either derived from tobacco or not derived from tobacco. For the inhaler device 100A that is a medical inhaler such as a nebulizer, the aerosol source may include a medicine.

[0036] The liquid guide 122 guides, from the liquid storage 123, the aerosol source that is the liquid stored in the liquid storage 123, and holds the aerosol source. The liquid guide 122 is, for example, a wick formed by twining fiber material such as glass fiber or porous material such as porous ceramic. In this case, the capillary action of the wick guides the aerosol source stored in the liquid storage 123.

[0037] The heater 121A heats the aerosol source to atomize the aerosol source and generate the aerosol. In the example illustrated in Fig. 1, the heater 121A includes a coil wound around the liquid guide 122. When the heater 121A produces heat, the aerosol source held by the liquid guide 122 is heated and atomized to generate the aerosol. The heater 121A produces heat when receiving electric power from the power supply 111A. In an example, the electric power may be supplied in response to the sensor 112A detecting a start of the user's inhalation and/or an input of predetermined information. Subsequently, the supply of the electric power may be stopped in response to the sensor 112A detecting an end of the user's inhalation and/or an input of predetermined information.

[0038] The flavor source 131 is a structural element for imparting a flavor component to the aerosol. The flavor source 131 may include a flavor component that is either derived from tobacco or not derived from tobacco.

[0039] The airflow path 180 is a flow path of air to be inhaled by the user. The airflow path 180 has a tubular structure having an air inlet hole 181 and an air outlet hole 182 at both ends. The air inlet hole 181 is an inlet of air into the airflow path 180, and the air outlet hole 182 is an outlet of the air from the airflow path 180. The liquid guide 122 is on the airflow path 180 at an upstream position (closer to the air inlet hole 181), and the flavor source 131 is on the airflow path 180 at a downstream position (closer to the air outlet hole 182). Air flowing in through the air inlet hole 181 when the user inhales mixes with the aerosol generated by the heater 121A. Subsequently, as indicated by an arrow 190, the mixture fluid of the aerosol and the air passes through the flavor source 131 and is conveyed to the air outlet hole 182. When the mixture fluid of the aerosol and the air passes through the flavor source 131, the flavor component included in the flavor source 131 is imparted to the aerosol.

[0040] The mouthpiece 124 is to be held in a mouth of the user during inhalation. The mouthpiece 124 has the air outlet hole 182. When the user inhales with the mouthpiece 124 in his/her mouth, the mixture fluid of the aerosol and the air enters the oral cavity of the user.

[0041] The configuration example of the inhaler device 100A has been described above. The inhaler device 100A is not limited to the above configuration, and may be configured in various ways as exemplified below.

[0042] In an example, the inhaler device 100A does not have to include the flavor imparting cartridge 130. In this case, the cartridge 120 includes the mouthpiece 124.

[0043] In another example, the inhaler device 100A may include various types of aerosol sources. Still another type of aerosol may be generated by mixing a plurality of types of aerosols generated from the plurality of types of aerosol sources in the airflow path 180 and causing a chemical reaction.

[0044] In addition, means for atomizing the aerosol source is not limited to heating by the heater 121A. For example, the means for atomizing the aerosol source may be vibration atomization or induction heating.

(2) Second configuration example

[0045] Fig. 2 is a schematic diagram of the inhaler device according to the second configuration example. As illustrated in Fig. 2, an inhaler device 100B according to the present configuration example includes a power supply 111B, a sensor 112B, a notifier 113B, a memory 114B, a communicator 115B, a controller 116B, a heater 121B, a holder 140, and a heat insulator 144.

[0046] The power supply 111B, the sensor 112B, the notifier 113B, the memory 114B, the communicator 115B, and the controller 116B are substantially the same as the respective corresponding structural elements included in the inhaler device 100A according to the first configuration example.

[0047] The holder 140 has an internal space 141, and holds a stick substrate 150 in a manner partially accommodated in the internal space 141. The holder 140 has an opening 142 that allows the internal space 141 to communicate with outside. The holder 140 holds the stick

substrate 150 that is inserted into the internal space 141 through the opening 142. For example, the holder 140 may be a tubular body having the opening 142 and a bottom 143 on its ends, and may define the pillar-shaped internal space 141. The holder 140 can also define a flow path of air to be supplied to the stick substrate 150. For example, the bottom 143 has an air inlet hole that is an inlet of air into the flow path. The opening 142 serves as an air outlet hole that is an outlet of the air from the flow path.

[0048] The stick substrate 150 includes a substrate 151 and an inhalation port 152. The substrate 151 includes an aerosol source. The aerosol source according to the present configuration example is not limited to a liquid. The aerosol source may be a solid. The stick substrate 150 held by the holder 140 includes the substrate 151 at least partially accommodated in the internal space 141 and the inhalation port 152 at least partially protruding from the opening 142. When the user inhales with the inhalation port 152 protruding from the opening 142 in his/her mouth, air flows into the internal space 141 through the air inlet hole (not illustrated), and the air and an aerosol generated from the substrate 151 reach inside the mouth of the user.

[0049] The heater 121B have the same configuration as the heater 121A according to the first configuration example. In the example illustrated in Fig. 2, however, the heater 121B has a film-like shape and surrounds the outer circumference of the holder 140. Subsequently, heat produced from the heater 121B heats the substrate 151 of the stick substrate 150 from the outer circumference, generating the aerosol.

[0050] The heat insulator 144 prevents heat from transferring from the heater 121B to the other structural elements. For example, the heat insulator 144 may be a vacuum heat insulator or an aerogel heat insulator.

[0051] The configuration example of the inhaler device 100B has been described above. The inhaler device 100B is not limited to the above configuration, and may be configured in various ways as exemplified below.

[0052] In an example, the heater 121B may have a blade-like shape, and may be disposed so that the heater 121B protrudes from the bottom 143 of the holder 140 toward the internal space 141. In this case, the heater 121B having the blade-like shape is inserted into the substrate 151 of the stick substrate 150 and heats the substrate 151 of the stick substrate 150 from its inside. In another example, the heater 121B may be disposed so that the heater 121B covers the bottom 143 of the holder 140. In still another example, the heater 121B may be implemented as a combination of two or more selected from a first heater that covers the outer circumference of the holder 140, a second heater having the blade-like shape, and a third heater that covers the bottom 143 of the holder 140.

[0053] In another example, the holder 140 may include an opening/closing mechanism that at least partially opens and closes an outer shell defining the internal space 141. Examples of the opening/closing mechanism include a hinge. In addition, the holder 140 may sandwich the stick substrate 150 inserted into the internal space 141 by opening and closing the outer shell. In this case, the heater 121B may be at the sandwiching position of the holder 140 and may produce heat while pressing the stick substrate 150.

[0054] In addition, means for atomizing the aerosol source is not limited to heating by the heater 121B. For example, the means for atomizing the aerosol source may be induction heating.

[0055] In addition, the inhaler device 100B may also include the heater 121A, the liquid guide 122, the liquid storage 123, and the airflow path 180 according to the first configuration example. The air outlet hole 182 of the airflow path 180 may also serve as an air inlet hole to the internal space 141. In this case, a mixture fluid of air and an aerosol generated by the heater 121A flows into the internal space 141, mixes further with an aerosol generated by the heater 121B, and then reaches the oral cavity of the user.

<<2. Technical problems>>

[0056] Patent Literature 1 discloses a sensor provided in a recess in an inhaler device and a technique for detecting biological information regarding a user from a contact part of the recess when one of the user's fingers comes into contact with the recess.

[0057] Since biological information is detected from the contact part, however, biological information cannot be detected unless one of the user's fingers comes into contact with the sensor. Furthermore, in Patent Literature 1, the recess in which the sensor is provided is provided at a position unrelated to an operation necessary for a puff. The user may be urged to touch the sensor with one of his/her fingers to detect biological information, but in this case the user is requested to perform an operation unnecessary for a puff, which is not appropriate in terms of usability.

[0058] In order to solve the above problem, a mechanism according to the present embodiment is provided.

<<3. Technical features>>

(1) Supplement to configuration of inhaler device 100

[0059] The inhaler device 100 is a device that generates a substance to be inhaled by the user. An operation performed, using the inhaler device 100, by the user to inhale the substance generated by the inhaler device 100 will be simply referred to as inhalation (puff) or an inhalation operation. An example of a puff is inhalation with the mouthpiece 124 of the inhaler device 100A held in the user's mouth. Another example of a puff is inhalation with the inhalation port 152 of the stick substrate 150 inserted into the inhaler device 100B held in the user's mouth. The user can inhale, through a puff, the substance

generated by the inhaler device 100.

[0060] The inhaler device 100 consumes content of a substrate to generate the substance to be inhaled by the user. The cartridge 120, the flavor imparting cartridge 130, and the stick substrate 150 are examples of the substrate. The aerosol source stored in the liquid storage 123, the flavor source 131 included in the flavor imparting cartridge 130, and the aerosol source included in the stick substrate 150 are examples of the content of the substrate. The aerosol is an example of the substance to be inhaled by the user.

[0061] In the present embodiment, the inhaler device 100 can employ any of the above-described first and second configuration examples. That is, the inhaler device 100 according to the present embodiment has the same configuration as that of the inhaler device 100A or the inhaler device 100B, or a configuration according to a modification of one of these configuration examples.

[0062] In the following description, information for supplementing or highlighting the configuration of the inhaler device 100 according to the present embodiment, that is, the configuration of the inhaler device 100A and the inhaler device 100B described in the above configuration examples, more specifically, will be mainly described.

[0063] In the first configuration example, the power supply unit 110 and the cartridge 120 are electrically and/or mechanically (includes physically) connectable to each other. The power supply unit 110 and the cartridge 120 are removably attached to each other. Similarly, the cartridge 120 and the flavor imparting cartridge 130 are electrically and/or mechanically (includes physically) connectable to each other. The cartridge 120 and the flavor imparting cartridge 130 are removably attached to each other.

[0064] The user typically inhales with the power supply unit 110 and the cartridge 120 connected to each other and the cartridge 120 and the flavor imparting cartridge 130 connected to each other. When the aerosol source included in the cartridge 120 runs out, the old cartridge 120 is replaced by a new cartridge 120. When the flavor component included in the flavor imparting cartridge 130 runs out, the old flavor imparting cartridge 130 is replaced by a new flavor imparting cartridge 130.

(2) Detection mechanism for information regarding inhaler device 100

[0065] The inhaler device 100 includes an inhalation-related information detector that detects information regarding the inhaler device 100. The inhalation-related information detector is included in, for example, a sensor 112. An example of the information detected by the inhalation-related information detector will be described hereinafter.

[0066] The inhalation-related information detector may detect an input of a user operation performed on the inhaler device 100 as information regarding the inhaler device 100. The inhaler device 100 includes an operation unit that receives an operation performed by the user. The inhalation-related information detector then detects the operation performed on the operation unit. The substrate in the first configuration example is the cartridge 120 and the flavor imparting cartridge 130. The substrate in the second configuration example is the stick substrate 150. An example of the operation unit is a button. An example of the operation performed by the user is pressing of the button.

[0067] The inhalation-related information detector may detect, as information regarding the inhaler device 100, an attempt by the user to inhale the aerosol generated by the inhaler device 100, that is, a puff. For example, the inhalation-related information detector detects a puff on the basis of a value obtained, as a result of the user's inhalation, by a pressure sensor such as a microphone condenser, a flowrate sensor, a temperature sensor, or the like.

[0068] The inhalation-related information detector may detect, as information regarding the inhaler device 100, information regarding a substrate used by the inhaler device 100 to generate an aerosol. In an example, the inhalation-related information detector detects setting of the substrate in the inhaler device 100. The setting of the substrate in the inhaler device 100 refers to connection of the power supply unit 110, the cartridge 120, and the flavor imparting cartridge 130 to each other in the first configuration example and insertion of the stick substrate 150 into the inhaler device 100B in the second configuration example. In another example, the inhalation-related information detector detects cancellation of setting of the substrate in the inhaler device 100. The cancellation of setting of the substrate refers to disconnection of the power supply unit 110, the cartridge 120, and the flavor imparting cartridge 130 from each other in the first configuration example and removal of the stick substrate 150 from the inhaler device 100B in the second configuration example. In another example, the inhalation-related information detector detects identification information regarding a substrate set in the inhaler device 100. An example of the identification information regarding a substrate is information indicating a type of substrate. The inhalation-related information detector may include a camera, and detect setting, or cancellation of setting, of the substrate on the basis of whether a captured image includes the substrate or detect identification information regarding a substrate by analyzing an image including the substrate.

(3) Detection mechanism for biological information

[0069] The inhaler device 100 includes a biological information detector that detects biological information regarding the user. The biological information detector is included in, for example, the sensor 112. The biological information refers to general information regarding a body. For example, the biological information includes at least blood pressure, heart rate (pulse), a blood oxygen

level, and/or oxygen saturation. The biological information may also include any other piece of information such as body temperature or a respiratory rate. In addition, the biological information may include secondarily obtained information, such as sleepiness, obtained by processing primarily obtained information such as blood pressure. The secondarily obtained information may include mental information, such as the user's feelings, estimated from physical information such as blood pressure.

[0070] The biological information detector transmits transmission waves, receives reflected waves, which are the transmitted transmission waves reflected from the user's body, and detects biological information on the basis of the received reflected waves. More specifically, the biological information detector detects biological information on the basis of reflected waves alone or a relationship between reflected waves and transmission waves. For example, the biological information detector detects information regarding blood vessels, such as blood pressure, on the basis of temporal changes in the diameter of blood vessels indicated by temporal changes in reflected waves. The biological information detector may also include an infrared camera and detect body temperature as temperature on a surface of skin.

[0071] An example of the transmission waves is light. The transmission waves may be visible light or invisible light such as infrared radiation or ultraviolet radiation. The biological information detector may transmit a plurality of types of transmission wave. It is needless to say that the transmission waves may be waves of any other type with which biological information can be obtained on the basis of reflected waves reflected from the user's body. In an example, the transmission waves may be radio waves.

[0072] The biological information detector is provided at or near the operation unit. With this configuration, biological information can be detected at a timing at which the user uses the operation unit. That is, the biological information detector can detect biological information at a timing at which the user uses the inhaler device 100. Biological information, therefore, can be naturally detected without requesting the user to perform an unnecessary operation and compromising usability.

[0073] The inhaler device 100 includes, at least at and/or near the operation unit, a passing part that passes the transmission waves and the reflected waves. In an example, the passing part may be transparent or translucent. With this configuration, the biological information detector can transmit the transmission waves, receive the reflected waves, and detect biological information.

[0074] An example of arrangement of the biological information detector will be described with reference to Figs. 3 and 4.

[0075] Fig. 3 is a diagram illustrating an example of the arrangement of the biological information detector according to the present embodiment. As illustrated in Fig. 3, an operation unit 160 is a button, and the user presses the operation unit 160 with his/her finger F. In the example illustrated in Fig. 3, a biological information detector 170 is incorporated into, that is, provided at, the button, which is the operation unit 160. A surface of the operation unit 160 is a passing part 161, and the passing part 161 passes transmission waves W_T transmitted from the biological information detector 170 and reflected waves W_R, which are the transmission waves W_T reflected from the user's finger F.

[0076] Fig. 4 is a diagram illustrating another example of the arrangement of the biological information detector according to the present embodiment. As illustrated in Fig. 4, the operation unit 160 is a button, and the user presses the operation unit 160 with his/her finger F. In the example illustrated in Fig. 4, the biological information detector 170 is provided at a base of the button, which is the operation unit 160, that is, provided near the operation unit 160. A peripheral part of the operation unit 160 at the base of the operation unit 160 is the passing part 161, and the passing part 161 passes the transmission waves W_T transmitted from the operation unit 160 and the reflected waves W_R, which are the transmission waves W_T reflected from the user's finger F.

(4) Other features relating to detection of biological information

[0077] A controller 116 controls the operation of the generation unit that generates an aerosol in accordance with an operation received by the operation unit 160. The generation unit in the present embodiment is a heater 121. In an example, the controller 116 generates an aerosol by starting to supply electric power to the heater 121 from the power supply 111 and the heating of the heater 121. In another example, the controller 116 establishes a state where generation of an aerosol can be started by establishing a state where the power supply 111 can supply electric power to the heater 121. If an additional operation is performed in this state, the controller 116 generates an aerosol by starting to supply electric power to the heater 121 from the power supply 111 and heat the heater 121. An example of the additional operation is a puff. The starting of the generation of an aerosol and the establishment of the state where the generation of an aerosol can be started will also be collectively referred to as an aerosol generation start operation. The user can inhale the aerosol through a puff after the aerosol generation start operation is performed.

[0078] The user can thus cause the inhaler device 100 to perform the aerosol generation start operation using the operation unit 160 and inhale the aerosol through a puff. That is, the biological information detector can detect biological information at a timing at which the user uses the operation unit 160, which is an operation necessary to inhale the aerosol. Biological information, therefore, can be naturally detected without requesting the user to perform an operation unnecessary for inhaling the aerosol and compromising usability.

[0079] The biological information detector 170 may de-

tect biological information before the heater 121 starts the generation of an aerosol. With this configuration, biological information before the user takes the aerosol into his/her body, that is, before the aerosol is taken into the user's body through a puff, can be detected.

[0080] If the operation unit 160 receives a first operation, which is a certain operation continuously performed for a certain period of time, the controller 116 may control the heater 121 such that the heater 121 performs an operation corresponding to the first operation. In this case, the biological information detector 170 detects biological information during the period for which the first operation is performed. An example of the certain operation is pressing of the operation unit 160, which is a button. That is, an example of the first operation is a press and hold of the button. An example of the operation corresponding to the first operation is the aerosol generation start operation. With this configuration, biological information can be naturally detected without compromising usability while the user is pressing and holding the button, which is an operation necessary to inhale the aerosol.

[0081] If the operation unit 160 receives a second operation, which is a certain number of times of a certain operation performed successively, the controller 116 may control the heater 121 such that the heater 121 performs an operation corresponding to the second operation. In this case, the biological information detector 170 detects biological information during a period for which the second operation is performed. An example of the certain operation is pressing of the operation unit 160, which is a button. That is, an example of the first operation is successive pressing of the button. An example of the operation corresponding to the second operation is the aerosol generations start operation. With this configuration, biological information can be naturally detected without compromising usability while the user is successively pressing the button, which is an operation necessary to inhale the aerosol.

[0082] Here, accuracy of detecting biological information based on the reflected waves tends to increase as a period for which the reflected waves have been obtained becomes longer and the number of reflected waves obtained in the period increases. In the case of a technique for detecting information regarding blood vessels, such as blood pressure, on the basis of temporal changes in the diameter of the blood vessels indicated by temporal changes in reflected waves, for example, data regarding the temporal changes in a certain period of time (e.g., several seconds) might be required in order to achieve minimum detection accuracy. When biological information is detected in a period for which the button is pressed and held or successively pressed, on the other hand, a period for which reflected waves are obtained becomes long and the number of reflected waves increases, which improves the accuracy of detecting biological information.

[0083] If the biological information detector 170 detects biological information, the controller 116 may perform a type of control corresponding to an operation received by the operation unit 160. When biological information is detected, for example, the controller 116 may perform the aerosol generation start operation. When biological information is not detected, on the other hand, the controller 116 need not perform the aerosol generation start operation. With this configuration, biological information can be certainly detected from the user who is using the inhaler device 100.

[0084] The biological information detector 170 may detect biological information after the heater 121 starts the generation of an aerosol, instead. The biological information detector 170 detects biological information, for example, if the user continues to touch the button with his/her finger even during a puff after pressing the button to perform the aerosol generation start operation. Alternatively, the biological information detector 170 may detect biological information each time a puff is detected. With this configuration, biological information after the user takes the aerosol into his/her body, that is, after the aerosol taken into the user's body through a puff has affected the user's body, can be detected.

(5) Execution of certain type of control

[0085] If a difference between first biological information detected before the heater 121 starts the generation of an aerosol and second biological information detected after the heater 121 starts the generation of the aerosol satisfies a certain condition, the controller 116 may perform a certain type of control. The difference may be, for example, a difference in blood pressure, a difference in heart rate, or the like, or may be a secondary difference, such as a relax level, obtained by processing a primary difference, such as a difference in blood pressure or a difference in heart rate. The larger the amount of decrease in blood pressure or heart rate, for example, the higher the estimated relax level. An example of the certain condition is the difference between the first biological information and the second biological information larger than the certain threshold. With this configuration, a certain type of control can be performed if the aerosol taken into the user's body through a puff has affected the user's body.

[0086] The certain type of control may include a change to an operation profile that defines the operation of the heater 121. The operation profile defines, for example, time elapsed since a start of heating and the temperature of the heater 121 with the elapsed time. By changing the operation profile, for example, the amount of aerosol generated, the amount of flavor component contained in the aerosol, and the like can be changed. By changing the operation profile, therefore, an effect upon the user's body, such as an increased relaxing effect, can be changed.

[0087] The certain type of control may include imposition of a restriction on a function of generating an aerosol. An example of the imposition of a restriction on the func-

tion of generating an aerosol is absence of heating performed by the heater 121 for a certain period of time. Another example of the imposition of a restriction on the function of generating an aerosol is absence of processing corresponding to an operation performed on the operation unit 160. Another example of the imposition of a restriction on the function of generating an aerosol is turning off of the inhaler device 100. When the inhaler device 100 is off, only part of functions of the inhaler device 100 can be executed. When the inhaler device 100 is off, for example, only a function of detecting an operation for activating the inhaler device 100 (e.g., an operation performed on the operation unit 160) may be executable among functions of the sensor 112. When the inhaler device 100 is activated, all the functions of the inhaler device 100 can be executed. With this configuration, a restriction can be imposed on the function of generating an aerosol if the aerosol taken into the user's body through a puff has given the user a certain effect.

[0088] When the certain type of control is performed, a notifier 113 may notify of information indicating that the certain type of control has been performed. In an example, the notifier 113 emits light in a light emission pattern or vibrates in a vibration pattern corresponding to an operation profile after a change or a restriction imposed on the function of generating an aerosol. A smartphone or another device may notify of the information, instead. With this configuration, the user can understand that the certain type of information has been performed.

[0089] The controller 116 may set a certain condition relating to the difference between the first biological information and the second biological information in accordance with a user input, the certain condition being used to determine whether to perform the certain type of control. For example, the user sets the certain condition in advance using a smartphone or the like. With this configuration, the certain condition can be set in accordance with the user's preference.

(6) Transmission of biological information

[0090] A communicator 115 is an example of a wireless communication unit that wirelessly communicates with another device. The communicator 115 may transmit biological information to another apparatus. An example of the other device is a terminal device associated with the inhaler device 100, such as a smartphone. With this configuration, processing according to biological information regarding the user can be performed using a smartphone or the like.

[0091] The communicator 115 may transmit information relating to biological information and the biological information while associating the information and the biological information with each other. The information relating to biological information includes, for example, at least a time at which the biological information has been detected, identification information regarding a substrate used by the heater 121 to generate an aerosol, and/or identification information regarding the inhaler device 100. With this configuration, an apparatus on a reception side can analyze a relationship between information relating to biological information and the biological information.

[0092] A memory 114 may store biological information. With this configuration, biological information can be accumulated in the inhaler device 100. Furthermore, the memory 114 may store information relating to biological information and the biological information while associating the information and the biological information with each other. With this configuration, a relationship between information relating to biological information and the biological information can be analyzed later on the basis of accumulated information.

[0093] The inhaler device 100 may switch between transmission and storing of biological information in accordance with whether the communicator 115 is wirelessly connected to another device. When the biological information detector 170 detects biological information with the communicator 115 and another device wirelessly connected to each other, for example, the communicator 115 may transmit the biological information. When the biological information detector 170 detects biological information without the communicator 115 and another device wirelessly connected to each other, on the other hand, the memory 114 may store the biological information. When the communicator 115 and another device are wirelessly connected to each other thereafter, the communicator 115 may transmit the biological information accumulated in the memory 114. It is needless to say that, in the switching, information relating to biological information and the biological information may be transmitted or stored while being associated with each other. With this configuration, biological information is immediately transmitted when wireless connection is available, and biological information is accumulated and then transmitted afterward when wireless connection is unavailable.

(7) Procedure of process

[0094] Fig. 5 is a flowchart illustrating an example of a procedure of a process performed by the inhaler device 100 according to the present embodiment.

[0095] As illustrated in Fig. 5, first, the inhaler device 100 determines whether an operation on the operation unit 160 has started (step S102). For example, the inhaler device 100 determines whether a press and hold of the button or successive pressing of the button has started. If determining that an operation on the operation unit 160 has not started (step S102: NO), the inhaler device 100 waits until an operation on the operation unit 160 starts.

[0096] If the inhaler device 100 determines that an operation on the operation unit 160 has started (step S102: YES), the inhaler device 100 detects biological information (step S104).

[0097] Next, the inhaler device 100 determines wheth-

er biological information has been successfully detected (step S106). In order to detect biological information with a certain level of accuracy, the button is desirably pressed and held for a certain period of time or longer or the button is desirably successively pressed a certain number of times or more. The inhaler device 100, therefore, determines that biological information has been successfully detected if the button has been pressed and held for the certain period of time or longer or the button has been successively pressed the certain number of times or more. If not, the inhaler device 100 may determine that biological information has not been successfully detected.

[0098] If determining that biological information has not been successfully detected (step S106: NO), the inhaler device 100 determines that the operation on the operation unit 160 has ended (step S108). If the inhaler device 100 determines that the operation on the operation unit 160 has not ended (step S108: NO), the process returns to step S104 again, and the inhaler device 100 continues to detect biological information. If the inhaler device 100 determines that the operation on the operation unit 160 has ended (step S108: YES), the process ends.

[0099] If determining that biological information has been successfully detected (step S106: YES), the inhaler device 100 causes the power supply 111 to supply electric power to the heater 121 to start generation of an aerosol (step S110). The process then ends.

<<4. Appendix>>

[0100] Although a preferred embodiment of the present invention has been described in detail with reference to the accompanying drawings, the present invention is not limited to this example. It is obvious that those skilled in the technical field of the present invention can arrive at various modifications and corrections within the scope of the technical idea described in the claims, and these modifications and corrections are naturally understood to belong to the technical scope of the present invention.

[0101] Although an example where the operation unit 160 is a button has been described in the above embodiment, for example, the present invention is not limited to this example. The operation unit 160 may be a touch panel, a switch, or any other input device, instead.

[0102] Although an example where the inhaler device 100 detects biological information (step S104) if it is determined that an operation on the operation unit 160 has started (step S102: YES) has been described in the above embodiment, for example, the present invention is not limited to this example. For example, a touch sensor may be provided for the operation unit 160 (e.g., on a button surface). At a moment when a finger touches the operation unit 160 (i.e., before it is determined that an operation on the operation unit 160 has started), the biological information detector may start detection of biological information by transmitting transmission waves using contact detection by the touch sensor as a trigger, instead. With this configuration, detection time of biological information can be increased compared to when detection of biological information starts after the button is pressed, and more accurate data can be obtained. The user may determine whether pressing of the button or contact detection is to be used as a trigger for the detection of biological information.

[0103] A series of processing performed by each apparatus described herein may be achieved by software, hardware, or a combination of software and hardware. Programs constituting software are stored in advance, for example, in storage media (non-transitory media) provided inside or outside corresponding apparatuses. When executed by a computer, for example, each program is read by a RAM and executed by a processor such as a CPU. The storage media are, for example, magnetic disks, optical discs, magneto-optical disks, flash memories, or the like. The computer programs may be distributed over a network, instead, for example, without using storage media.

[0104] The process described using a flowchart or a sequence diagram herein need not necessarily be performed in illustrated order. Some processing steps may be performed in parallel with each other. Additional processing steps may be employed, or some processing steps may be omitted.

[0105] The following configurations also belong to the technical scope of the present invention.

(1) An inhaler device including:

an operation unit that receives an operation performed by a user; and
a biological information detector that detects biological information regarding the user,
in which the biological information detector is provided at or near the operation unit.

(2) The inhaler device according to (1),
in which the biological information detector transmits a transmission wave, receives a reflected wave, which is the transmission wave reflected from the user's body, and detects the biological information on a basis of the received reflected wave.

(3) The inhaler device according to (2), further including:
a passing part that passes the transmission wave and the reflected wave and that is provided at least at and/or near the operation unit.

(4) The inhaler device according to any of (1) to (3), in which the biological information includes at least blood pressure, heart rate, a blood oxygen level, and/or oxygen saturation.

(5) The inhaler device according to any of (1) to (4), further including:
a controller that controls, in accordance with the operation received by the operation unit, operation of

a generation unit, which generates an aerosol to be inhaled by the user.

(6) The inhaler device according to (5),
in which the biological information detector detects the biological information before the generation unit starts the generation of the aerosol.

(7) The inhaler device according to (6),

in which, if the operation unit receives a first operation, which is a certain operation continuously performed for a certain period of time, the controller controls the generation unit such that the generation unit performs an operation corresponding to the first operation, and
in which the biological information detector detects the biological information in a period for which the first operation is performed.

(8) The inhaler device according to (6),

in which, if the operation unit receives a second operation, which is a certain number of times of a certain operation performed successively, the controller controls the generation unit such that the generation unit performs an operation corresponding to the second operation, and
in which the biological information detector detects the biological information in a period for which the second operation is performed.

(9) The inhaler device according to any of (5) to (8),
in which the biological information detector detects the biological information after the generation unit starts the generation of the aerosol.

(10) The inhaler device according to (9),
in which the controller performs a certain type of control if a difference between a first piece of the biological information detected before the generation unit starts the generation of the aerosol and a second piece of the biological information detected after the generation unit starts the generation of the aerosol satisfies a certain condition.

(11) The inhaler device according to (10),
in which the certain type of control includes at least a change to an operation profile that defines the operation of the generation unit and/or imposition of a restriction on a function of generating the aerosol.

(12) The inhaler device according to (10) or (11), further including:
a notifier that notifies of information indicating that the certain type of control has been performed.

(13) The inhaler device according to any of (5) to (12),
in which the controller performs control according to the operation received by the operation unit on condition that the biological information detector has detected the biological information.

(14) The inhaler device according to any of (5) to (13), further including:

a wireless communication unit that wirelessly communicates with another device; and
a memory that stores information,
in which, if the biological information detector detects the biological information with the wireless communication unit and the other device wirelessly connected to each other, the wireless communication unit transmits the biological information, and
in which, if the biological information detector detects the biological information without the wireless communication unit and the other device wirelessly connected to each other, the memory stores the biological information.

(15) The inhaler device according to (14),

in which the wireless communication unit transmits at least a detection time of the biological information, identification information regarding a substrate used by the generation unit to generate the aerosol, and/or identification information regarding the inhaler device while associating at least the detection time, the identification information regarding the substrate, and/or the identification information regarding the inhaler device with the biological information, and
in which the memory stores at least the detection time of the biological information, the identification information regarding the substrate, and/or the identification information regarding the inhaler device while associating at least the detection time of the biological information, the identification information regarding the substrate, and/or the identification information regarding the inhaler device with the biological information.

(16) A control method for controlling an inhaler device including an operation unit and a biological information detector, the control method including:

detecting an operation performed by a user on the operation unit; and
detecting biological information regarding the user using the biological information detector provided at or near the operation unit.

(17) A program for causing a computer that controls an inhaler device including an operation unit and a biological information detector to perform:

detecting an operation performed by a user on the operation unit; and
detecting biological information regarding the user using the biological information detector provided at or near the operation unit.

Reference Signs List

[0106]

100	inhaler device
110	power supply unit
111	power supply
112	sensor
113	notifier
114	memory
115	communicator
116	controller
120	cartridge
121	heater
122	liquid guide
123	liquid storage
124	mouthpiece
130	flavor imparting cartridge
131	flavor source
140	holder
141	internal space
142	opening
143	bottom
144	heat insulator
150	stick substrate
151	substrate
152	inhalation port
160	operation unit
161	passing part
170	biological information detector
180	airflow path
181	air inlet hole
182	air outlet hole

Claims

1. An inhaler device comprising:

an operation unit that receives an operation performed by a user; and
a biological information detector that detects biological information regarding the user,
wherein the biological information detector is provided at or near the operation unit.

2. The inhaler device according to claim 1,
wherein the biological information detector transmits a transmission wave, receives a reflected wave, which is the transmission wave reflected from the user's body, and detects the biological information on a basis of the received reflected wave.

3. The inhaler device according to claim 2, further comprising:
a passing part that passes the transmission wave and the reflected wave and that is provided at least at and/or near the operation unit.

4. The inhaler device according to any of claims 1 to 3, wherein the biological information includes at least blood pressure, heart rate, a blood oxygen level, and/or oxygen saturation.

5. The inhaler device according to any of claims 1 to 4, further comprising:
a controller that controls, in accordance with the operation received by the operation unit, operation of a generation unit, which generates an aerosol to be inhaled by the user.

6. The inhaler device according to claim 5,
wherein the biological information detector detects the biological information before the generation unit starts the generation of the aerosol.

7. The inhaler device according to claim 6,

wherein, if the operation unit receives a first operation, which is a certain operation continuously performed for a certain period of time, the controller controls the generation unit such that the generation unit performs an operation corresponding to the first operation, and
wherein the biological information detector detects the biological information in a period for which the first operation is performed.

8. The inhaler device according to claim 6,

wherein, if the operation unit receives a second operation, which is a certain number of times of a certain operation performed successively, the controller controls the generation unit such that the generation unit performs an operation corresponding to the second operation, and
wherein the biological information detector detects the biological information in a period for which the second operation is performed.

9. The inhaler device according to any of claims 5 to 8, wherein the biological information detector detects the biological information after the generation unit starts the generation of the aerosol.

10. The inhaler device according to claim 9,
wherein the controller performs a certain type of control if a difference between a first piece of the biological information detected before the generation unit starts the generation of the aerosol and a second piece of the biological information detected after the generation unit starts the generation of the aerosol satisfies a certain condition.

11. The inhaler device according to claim 10,
wherein the certain type of control includes at least a change to an operation profile that defines the op-

eration of the generation unit and/or imposition of a restriction on a function of generating the aerosol.

12. The inhaler device according to claim 10 or 11, further comprising:
a notifier that notifies of information indicating that the certain type of control has been performed.

13. The inhaler device according to any of claims 5 to 12, wherein the controller performs control according to the operation received by the operation unit on condition that the biological information detector has detected the biological information.

14. The inhaler device according to any of claims 5 to 13, further comprising:

a wireless communication unit that wirelessly communicates with another device; and
a memory that stores information,
wherein, if the biological information detector detects the biological information with the wireless communication unit and the other device wirelessly connected to each other, the wireless communication unit transmits the biological information, and
wherein, if the biological information detector detects the biological information without the wireless communication unit and the other device wirelessly connected to each other, the memory stores the biological information.

15. The inhaler device according to claim 14,

wherein the wireless communication unit transmits at least a detection time of the biological information, identification information regarding a substrate used by the generation unit to generate the aerosol, and/or identification information regarding the inhaler device while associating at least the detection time, the identification information regarding the substrate, and/or the identification information regarding the inhaler device with the biological information, and
wherein the memory stores at least the detection time of the biological information, the identification information regarding the substrate, and/or the identification information regarding the inhaler device while associating at least the detection time of the biological information, the identification information regarding the substrate, and/or the identification information regarding the inhaler device with the biological information.

16. A control method for controlling an inhaler device including an operation unit and a biological information detector, the control method comprising:

detecting an operation performed by a user on the operation unit; and
detecting biological information regarding the user using the biological information detector provided at or near the operation unit.

17. A program for causing a computer that controls an inhaler device including an operation unit and a biological information detector to perform:

detecting an operation performed by a user on the operation unit; and
detecting biological information regarding the user using the biological information detector provided at or near the operation unit.

FIG. 1

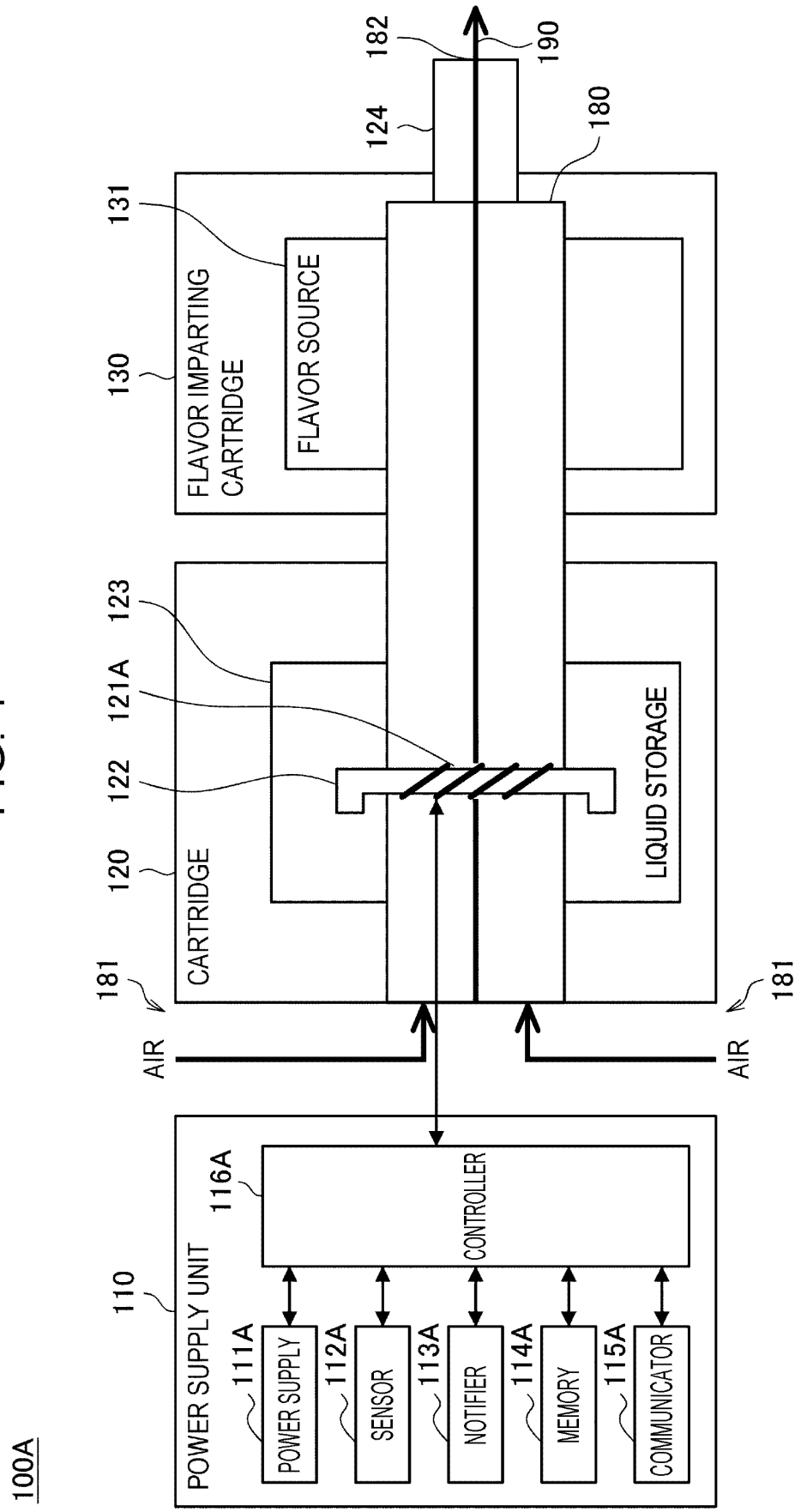

100A
110
POWER SUPPLY UNIT
116A
CONTROLLER
111A
POWER SUPPLY
112A
SENSOR
113A
NOTIFIER
114A
MEMORY
115A
COMMUNICATOR
AIR
AIR
181
181
120
CARTRIDGE
122
121A
123
LIQUID STORAGE
130
FLAVOR IMPARTING CARTRIDGE
131
FLAVOR SOURCE
124
182
190
180

FIG. 2

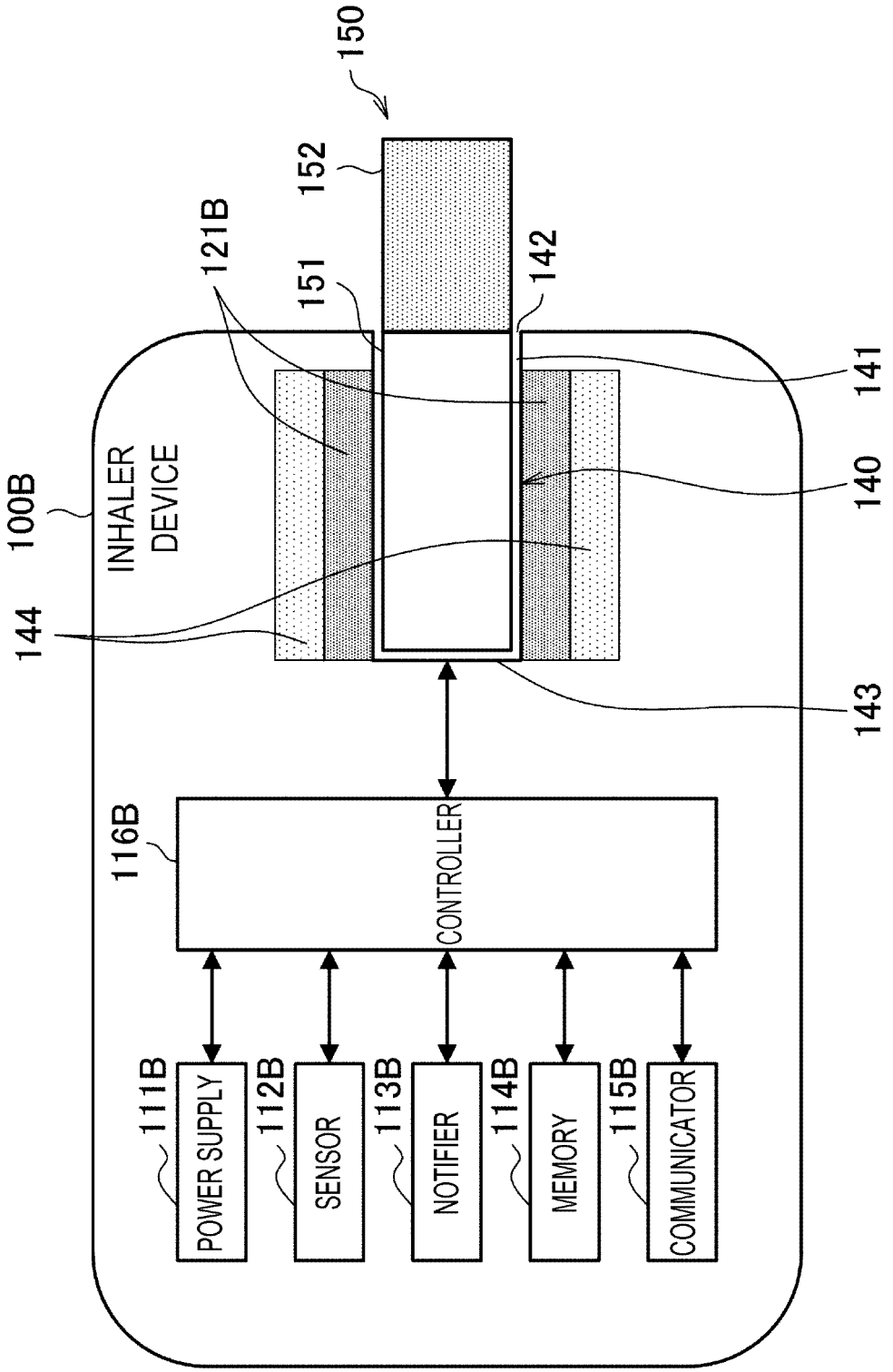

150
152
121B
151
142
141
140
100B
INHALER DEVICE
144
143
116B
CONTROLLER
111B
POWER SUPPLY
112B
SENSOR
113B
NOTIFIER
114B
MEMORY
115B
COMMUNICATOR

FIG. 3

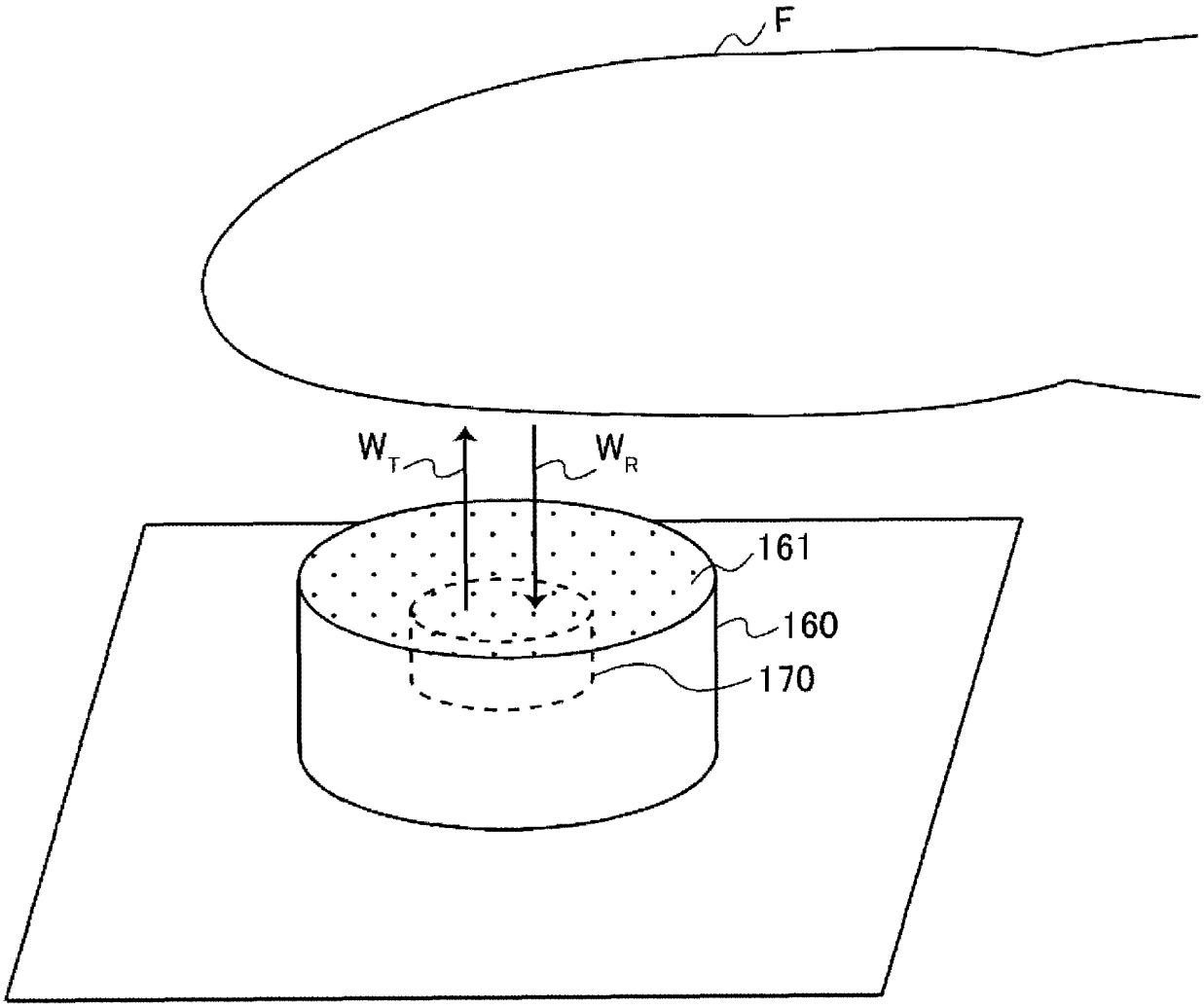


FIG. 4

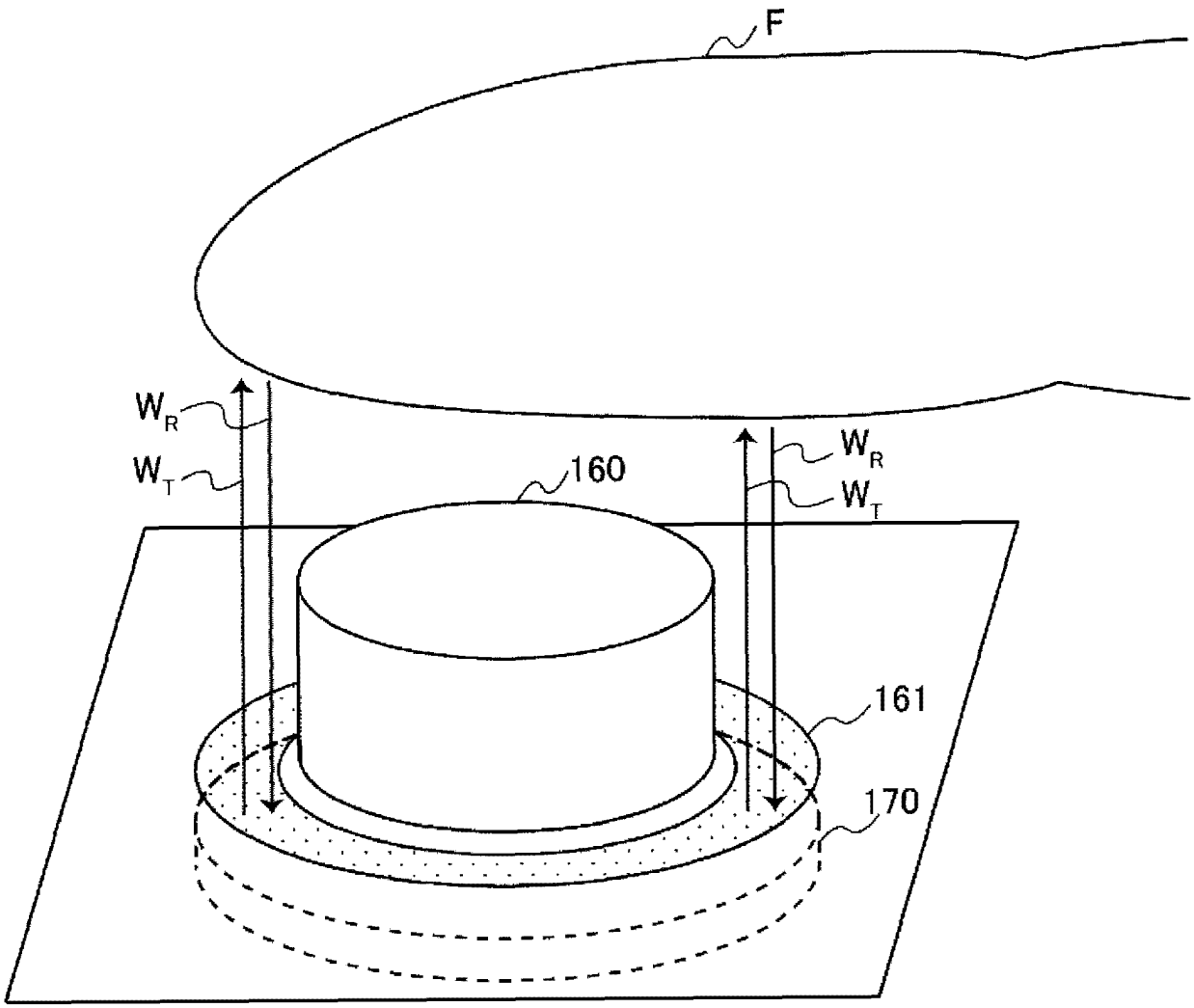
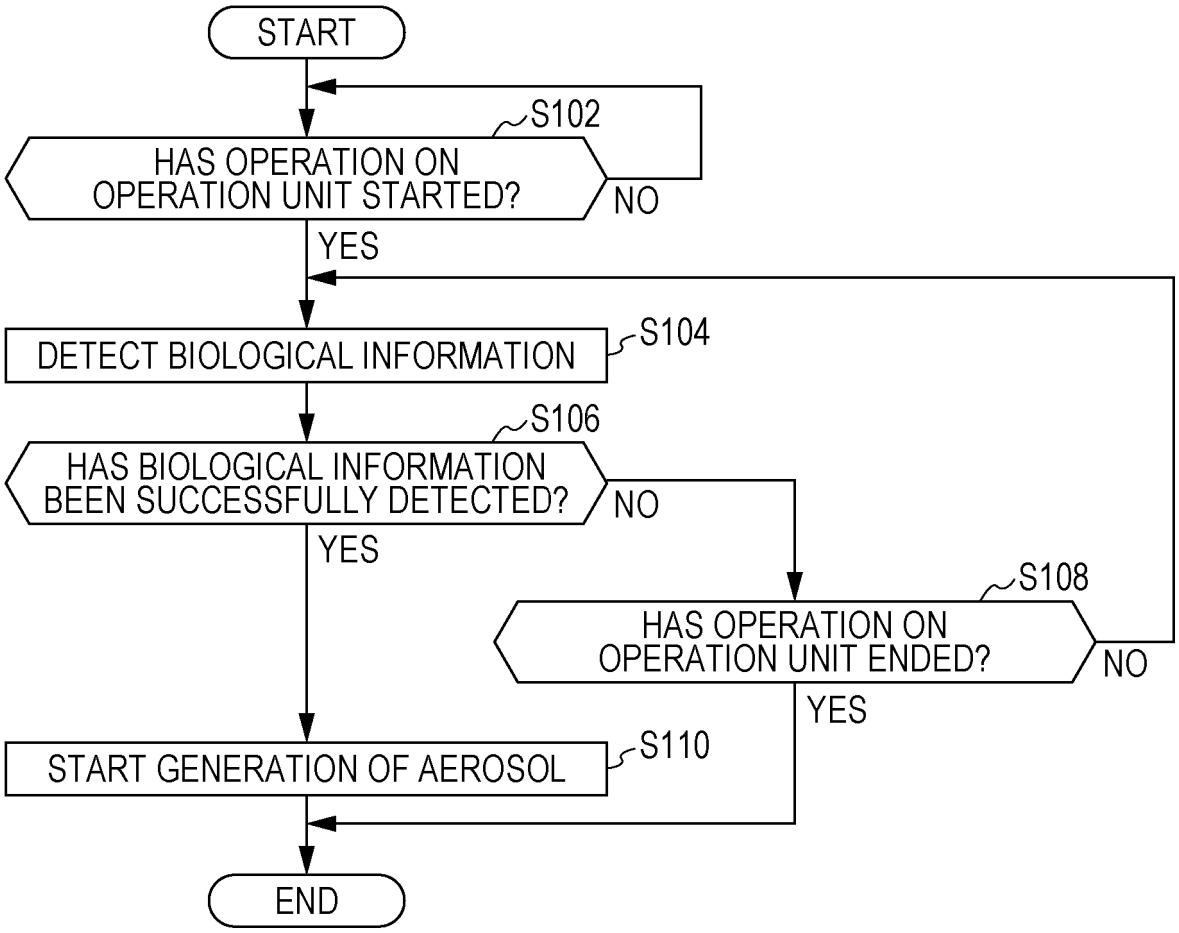


FIG. 5


START
S102
HAS OPERATION ON OPERATION UNIT STARTED?
NO
YES
DETECT BIOLOGICAL INFORMATION
S104
S106
HAS BIOLOGICAL INFORMATION BEEN SUCCESSFULLY DETECTED?
NO
YES
S108
HAS OPERATION ON OPERATION UNIT ENDED?
NO
YES
START GENERATION OF AEROSOL
S110
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/020611

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A24F40/51(2020.01)i
FI: A24F40/51

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. A24F40/51

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	WO 2019/093281 A1 (AQUA BANK CO., LTD.) 16 May 2019, paragraphs [0009], [0010], [0079], [0082], fig. 11a, b	1, 4, 16-17 1-17
Y	WO 2019/175810 A1 (PHILIP MORRIS PRODUCTS S.A.) 19 September 2019, p. 1, line 18 to p. 2, line 6, p. 5, line 24 to p. 7, line 13, p. 8, line 27 to p. 10, line 10, p . 12, line 17 to p. 13, line 25, fig. 1-4	1-17
Y	JP 2019-521739 A (JUUL LABS INC.) 08 August 2019, paragraphs [0095]-[0099]	13-15

☒ 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
20.07.2020	11.08.2020
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/020611

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2018-524971 A (RAI STRATEGIC HOLDINGS INC.) 06 September 2018, claim 16	15
A	JP 2020-068739 A (JAPAN TOBACCO INC.) 07 May 2020, entire text, all drawings	1-17

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/020611

Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
WO 2019/093281 A1	16.05.2019	(Family: none)	
WO 2019/175810 A1	19.09.2019	(Family: none)	
JP 2019-521739 A	08.08.2019	US 2018/0043114 A1 paragraphs [0124]-[0128] WO 2017/205692 A1	
JP 2018-524971 A	06.09.2018	WO 2016/187297 A2 claim 16 US 2016/0338408 A1	
JP 2020-068739 A	07.05.2020	(Family: none)	

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

- WO 2019175810 A **[0004]**