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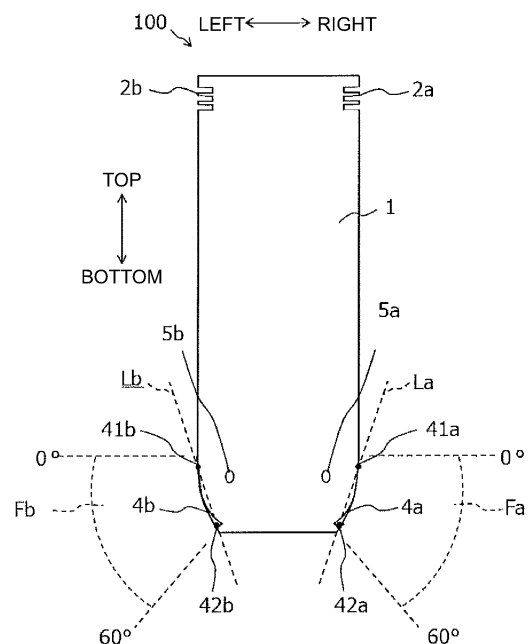
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(54) **HAND-DRYING DEVICE**

(57) The present invention relates to a hand drying apparatus that dries wet hands in a washroom, a toilet, or the like. The hand drying apparatus in the present invention includes a housing, a blower provided inside the housing, and a nozzle part for ejecting air delivered from the blower, out of the housing such that the ejected air is in a shape of a sector of a circle, the nozzle part being provided at one of left and right side parts of the housing when viewed from a user facing the housing. A problem with a conventional hand drying apparatus is that its structure blocks a part of the user's view, which results in the user failing to dry the hands checking the entire hands visually. In contrast, the hand drying apparatus in the present invention enables the user to dry the hands checking the entire hands visually.

**FIG.2**



## Description

## Field

**[0001]** The present disclosure relates to a hand drying apparatus that dries wet hands in a washroom, a toilet, or the like.

## Background

**[0002]** Patent Literature 1 discloses a hand drying apparatus that includes a hand drying chamber having an opening that allows a user to insert hands therethrough. As the user's hands are inserted into the hand drying chamber, air outlets provided in an upper part of the hand drying chamber ejects air toward the downward located hands. Patent Literature 2 discloses a hand dryer that includes nozzle sections configured to eject air downward. As a user's hands are inserted underneath the nozzle sections, the air is ejected toward the downward located hands. The hand dryer disclosed in Patent Literature 2 has the two nozzle sections that correspond to the left and right hands, respectively. Each of the nozzle sections spans a width of the user's open hand so that the air blows against an entire palm or back of each hand.

## Citation List

## Patent Literatures

**[0003]**

Patent Literature 1: Japanese Patent Application Laid-open No. 2011-130944  
Patent Literature 2: Japanese Patent Application Laid-open No. 2013-039379

## Summary

## Technical Problem

**[0004]** The above hand drying apparatus disclosed in Patent Literature 1 requires the user to insert the hands under the air outlets in the hand drying chamber in drying the hands. This poses a problem of such a structure as the air outlets blocking a part of the user's view, which results in the user failing to dry the hand checking the entire hands visually.

**[0005]** The above hand dryer described in Patent Literature 2, also requires the user to insert the hands underneath the nozzle sections in drying the hands. This poses a problem of such a structure as the nozzle sections blocking a part of the user's view, which results in the user failing to dry the hands checking the entire hands visually.

**[0006]** An object of the present disclosure is to provide a hand drying apparatus that enables a user to dry hands checking entire hands visually.

## Solution to Problem

**[0007]** A hand drying apparatus according to the present disclosure comprises: a housing; a blower provided inside the housing; and a nozzle part to eject air delivered from the blower, out of the housing such that the ejected air fans out, the nozzle part being provided at one of left and right side parts of the housing when viewed from a user facing the housing.

## Advantageous Effect of Invention

**[0008]** The hand drying apparatus according to the present disclosure enables the user to dry the hands checking the entire hands visually.

## Brief Description of Drawings

**[0009]**

FIG. 1 is a perspective view of a hand drying apparatus according to a first embodiment.

FIG. 2 is a front view of the hand drying apparatus according to the first embodiment.

FIG. 3 is a right side view of the hand drying apparatus according to the first embodiment.

FIG. 4 is a right side view of a hand drying apparatus according to a second embodiment.

FIG. 5 is a front view of the hand drying apparatus according to the second embodiment.

FIG. 6 is a right side view of a hand drying apparatus according to a third embodiment.

## Description of Embodiments

## [First Embodiment]

**[0010]** A description is hereinafter made as to a hand drying apparatus 100 according to a first embodiment.

FIG. 1 is a perspective view of the hand drying apparatus 100. FIG. 2 is a front view of the hand drying apparatus 100. FIG. 3 is a right side view of the hand drying apparatus 100. As illustrated in FIGS. 1 to 3, the hand drying apparatus 100 includes a housing 1, a blower 3, and nozzle parts 4a and 4b. The housing 1 defines a contour of the apparatus. The blower 3 is provided inside the housing 1. The nozzle parts 4a and 4b each eject air delivered from the blower 3, out of the housing 1 such that the ejected air fans out. The hand drying apparatus 100 also includes hand detection units 5a and 5b and a control unit 7. The hand detection units 5a and 5b detect insertion of a user's hands into outside spaces of the housing, toward which spaces the nozzle parts 4a and 4b eject the air. The control unit 7 controls the operation of the blower 3 on the basis of results of detection by the hand detection units 5a and 5b.

**[0011]** When viewed from the user who faces the hand drying apparatus 100 according to the present disclosure,

sure, a side near the user is defined as "front", a side far from the user is defined as "back", an upper side is defined as "top", a lower side is defined as "bottom", a right-hand side is defined as "right", and a left-hand side is defined as "left".

[0012] The housing 1 has a vertically extending cylindrical outer contour, and has its back attached to a wall surface W. The housing 1 has a left-to-right width less than a breadth of the user's shoulders. The left-to-right width of the housing 1 can be, for example, less than or equal to 150 mm. Setting the left-to-right width of the housing 1 less than or equal to the specified value enables the user to bring the hands to the outside on the left and the right of the housing 1 without the hands touching the housing 1 when the user extends the hands forward, facing the housing 1.

[0013] The housing 1 has a front-to-back width of more than or equal to 75 mm. This prevents the user's hands extended to the outside on the left and the right of the housing 1 from touching the wall surface W.

[0014] Air intakes 2a and 2b through which ambient air is drawn into the housing 1 are provided in left and right sides of an upper part of the housing 1. An air passage inside the housing 1 extends from the air intakes 2a and 2b to the blower 3. Provided in the air passage is an air filter 9 for preventing entry of dust or water droplets. Examples of the air filter 9 to be used include a resin net, a metal mesh, and a high-efficiency particulate air

[0015] (HEPA) filter. The air filter 9 is preferably disposed such that an air intake face of the air filter 9 is located above the air intakes 2a and 2b. The air filter 9 is disposed in this manner in order to prevent water droplets from falling onto or adhering to the air filter 9 even if the water droplets enter through the air intakes 2a and 2b.

[0016] The blower 3 includes a motor and a turbofan or another fan rotated by the motor. The blower 3, which has its operation controlled by the control unit 7, pressurizes the air flowing in through the air filter 9 from the air intakes 2a and 2b, and discharges the air to the nozzle parts 4a and 4b.

[0017] The housing 1 has its lower part having the nozzle parts 4a and 4b provided at left and right side parts thereof for ejecting the air delivered from the blower 3, out of the housing 1 such that the ejected air fans out. The nozzle part 4a for the user's right hand is provided at the right side part of the housing 1, and the nozzle part 4b for the user's left hand is provided at the left side part of the housing 1.

[0018] Each of the nozzle parts 4a and 4b includes an air outlet that is an elongate slit-shaped opening through which the inside of the housing communicates with the outside of the housing 1. The side parts of the housing 1 including the nozzle parts 4a and 4b have curved external surfaces that are convex in an outward direction of the housing 1. The air outlets of the nozzle parts 4a and 4b are flush with the external surfaces of the housing 1. Thus, the air outlets are in substantially arc-shapes between uppermost edges 41a, 41b of the air outlets and

lowermost edges 42a, 42b of the air outlets, the arc-shapes being convex in the outward direction of the housing 1, relative to straight lines La, Lb interconnecting the uppermost edges 41a, 41b and the lowermost edges 42a, 42b. This shape allows each of the nozzle parts 4a, 4b to eject the air in the shape of a fan out of the housing 1 as indicated by a dotted line Fa or Fb in FIG. 2. In other words, sheet-shaped airflows widening downstream are formed. The airflows supplied from the nozzle parts 4a and 4b form hand drying spaces outside the right and the left of the housing 1, and the hand drying spaces can dry the hands.

[0019] The air outlet of each nozzle part 4a or 4b does not necessarily have to be flush with the external surface of the housing 1 as long as the air outlet is at least partially in the substantially arc-shape between the uppermost edge 41a or 41b and the lowermost edge 42a or 42b, the substantially arc-shape being convex in the outward direction of the housing 1, relative to the straight line La or Lb interconnecting the uppermost edge 41a or 41b and the lowermost edge 42a or 42b. The substantially arc-shaped portion does not necessarily have to be formed as a curved line (or a curved surface). For example, the substantially arc-shaped portion may be formed as a combination of straight lines (or plane surfaces) or a combination of a straight line and a curved line (or a combination of a plane surface and a curved surface).

[0020] The user who uses the hand drying apparatus 100 extends the hands in such a manner as to hold the hands over the left and right side parts of the housing 1, thus inserting the hands into the hand drying spaces. A direction in which fingers of the user's hands inserted into the hand drying spaces points is a forward, diagonally downward direction when viewed from the user, as indicated by arrow A in FIG. 3. In view of this, the air outlet of each nozzle part 4a or 4b extends generally orthogonally to the direction in which the fingers point. Specifically, when the housing 1 is viewed from the side, the air outlet of each nozzle part 4a or 4b has the shape of an oblique line extending diagonally from a front lower position of the nozzle part to a rear upper position of the nozzle part. In other words, the air outlet is close to the front as the air outlet extends downward. As illustrated in FIG. 3, the slope of the air outlet of each nozzle part 4a or 4b provides an angle  $x$  in a range from 0 to 45° inclusive relative to a front-to-back direction. As a result, the airflow supplied from each nozzle part 4a or 4b is the sheet-shaped airflow spreading along a width of the user's hand, thereby enabling the user to efficiently remove water droplets by moving the hands back and forth.

[0021] A length of the air outlet of each nozzle part 4a or 4b between the uppermost edge 41a or 41b and the lowermost edge 42a or 42b is set so that a width of the airflow at a location slightly away from the air outlet in the outward direction of the housing 1, i.e., a location where the user actually dries the hand is equal to or greater than the widthwise length of the user's hand. Specifically, the airflow ejected from each nozzle part 4a or 4b

widens downstream. In view of this widening of the ejected airflow, the length of the air outlet is less than the width of the airflow at the position where the user actually dries the hand. For example, the width of the airflow at the position where the user actually dries the hand is about the same as the widthwise length of the user's hand, and the length of the air outlet extending from the uppermost edge 41a or 41b to the lowermost edge 42a or 42b can be less than the widthwise length of the user's hand. Consequently, the hand drying apparatus 100 can be smaller in size and easier to handle. The widthwise length of the user's hand is an average length of a hand of a male adult in a country where the hand drying apparatus 100 is used.

**[0022]** Each nozzle part 4a or 4b is formed to eject the fan-shaped air within a downward range between a horizontal direction and a vertical direction. Specifically, assuming that the horizontal direction is defined as providing 0° and the vertical direction is defined as providing 90°, each of the nozzle parts 4a and 4b ejects the fan-shaped air in the range from 0° to 60° inclusive. In other words, each of the nozzle parts 4a and 4b ejects the air in the direction of 0° at the uppermost edge 41a or 41b of the air outlet and in the direction of 60° at the lowermost edge 42a or 42b, thus allowing air to be ejected from the entirety of the air outlet in the range from 0° to 60° inclusive.

**[0023]** A transverse width of the air outlet of each nozzle part 4a or 4b can be, for example, less than or equal to 2 mm. Moreover, an output of the blower 3 can be set so that the air is ejected from the air outlet at a velocity of, for example, more than or equal to 80 m/s. The water droplets on the user's hands can be effectively scraped off by the sheet-shaped airflows.

**[0024]** The housing 1 includes, near the nozzle parts 4a and 4b, the hand detection units 5a and 5b that detect the insertion of the user's hands into the hand drying spaces formed by the nozzle parts 4a and 4b. Using a single or plural optical or capacitive sensors, each of the hand detection units 5a and 5b monitors whether or not the user's hand is inserted into the hand drying space and detects the insertion of the hand. The hand detection unit 5a is provided forwardly of the nozzle part 4a in the housing 1 and detects the insertion of the user's hand into the hand drying space set on the right of the housing 1. The hand detection unit 5b is provided forwardly of the nozzle part 4b in the housing 1 and detects the insertion of the user's hand into the hand drying space set on the left of the housing 1. In the example illustrated in FIGS. 1 to 3, the hand detection unit 5a is provided in front of and above the nozzle part 4a, and the hand detection unit 5b is provided in front of and above the nozzle part 4b.

**[0025]** The control unit 7 controls the operation of the blower 3 on the basis of the results of detection by the hand detection units 5a and 5b to ensure that the air is ejected from the nozzle parts 4a and 4b when the hands are detected. When at least one of the hand detection units 5a and 5b detects the hand, the control unit 7 allows

both the nozzle parts 4a and 4b to eject the air. Alternatively, when only one of the hand detection units 5a and 5b detects the hand, the air may be ejected only from the nozzle part on the side where the hand has been detected.

**[0026]** The control unit 7 is disposed inside or adjacent to the air passage disposed inside the housing 1 and extending from the air intakes 2a and 2b to the blower 3. When the hand drying apparatus 100 is in operation, thus, the control unit 7 is cooled by an airflow in the air passage to thereby reduce an increase in temperature of the control unit 7. Moreover, exhaust heat from the control unit 7 can be used to warm up the air ejected from the nozzle parts 4a and 4b.

**[0027]** A description is made as to how the hand drying apparatus 100 operates. When the user puts the hands in the hand drying spaces formed outside the right and the left of the housing, the hand detection units 5a and 5b detect the hands, and the control unit 7 activates the blower 3. The air around the housing 1 is drawn into the housing 1 through the air intakes 2a and 2b. The air drawn in flows into the blower 3 through the air filter 9, is pressurized by the blower 3, and is delivered to the nozzle parts 4a and 4b. The nozzle parts 4a and 4b eject the air delivered from the blower 3, out of the housing such that the ejected air fans out. The airflows supplied from the nozzle parts 4a and 4b strike the user's hands, thus blowing off the water droplets on the wet hands.

**[0028]** As described above, the hand drying apparatus 100 includes the housing 1, the blower 3 provided inside the housing 1, and the nozzle parts 4a and 4b provided at the left and right side parts of the housing 1 when viewed from the user facing the housing 1, the nozzle parts 4a, 4b each ejecting the air delivered from the blower 3, out of the housing 1 such that the ejected air fans out. This enables the user to dry user's hands outside the left and the right of the housing 1. Since no structure between the user and the hands blocks a user's view, the user can dry the hands, checking the entire hands visually. Since the user can dry the entire hands checking the hands visually, the user can leave no part of the hands undried without the hands unintentionally touching the housing 1. As a result, it becomes possible to hygienically and efficiently dry the user's hand.

[Second Embodiment]

**[0029]** A description is hereinafter made as to a hand drying apparatus 200 according to a second embodiment. FIG. 4 is a right side view of the hand drying apparatus 200. FIG. 5 is a front view of the hand drying apparatus 200. The hand drying apparatus 200 differs from that of the first embodiment in that a housing 201 has a hexahedral external form whose vertical and front-to-back lengths are substantially the same. The housing 201 of the hand drying apparatus 200 houses a control unit 207 and a blower 203, etc. The housing 201 has its lower part having nozzle parts 204a and 204b provided

at left and right side parts thereof for ejecting air delivered from the blower 203, out of the housing 201 such that the ejected air fans out. Each of the nozzle parts 204a and 204b includes an air outlet that is an elongate slit-shaped opening through which the inside of the housing 201 communicates with the outside of the housing 201. As illustrated in FIG. 5, the air outlets have lower portions located more inwardly away from an external face of the housing 201. The air outlets are in substantially arc-shapes between uppermost edges 241a, 241b of the air outlets and lowermost edge 242a, 242b of the air outlets, the arc-shapes being convex in an outward direction of the housing 201, relative to the straight lines La, Lb interconnecting the uppermost edges 241a, 241b and the lowermost edges 242a, 242b. The hand drying apparatus 200 also includes an air intake, an air filter, and a hand detection unit, among others. The hand drying apparatus 200 thus configured operates similarly to the hand drying apparatus 100.

[Third Embodiment]

**[0030]** A description is hereinafter made as to a hand drying apparatus 300 according to a third embodiment. FIG. 6 is a right side view of the hand drying apparatus 300. The hand drying apparatus 300 differs from that of the first embodiment in that a housing 301 has a spherical external form. The housing 301 of the hand drying apparatus 300 houses a control unit 307 and a blower 303, etc. The housing 301 has its lower part having nozzle parts 304 provided at left and right side parts thereof for ejecting air delivered from the blower 303, out of the housing 301 such that the ejected air fans out. Each of the nozzle parts 304 is provided with an air outlet that is an elongate slit-shaped opening through which the inside of the housing 301 communicates with the outside of the housing 301. The air outlets are flush with an external surface of the housing 301. Thus, the air outlets are in substantially arc-shapes between uppermost edges of the air outlets and lowermost edges of the air outlets, the arc-shapes being convex in an outward direction of the housing 301, relative to straight lines interconnecting the uppermost edges and the lowermost edges. The hand drying apparatus 300 also includes an air intake, an air filter, and a hand detection unit, among others. The hand drying apparatus 300 thus configured operates similarly to the hand drying apparatus 100.

**[0031]** While the external form of the housing is cylindrical, hexahedral, or spherical in each of the above embodiments, the external form of the housing may be a prism, a semicylinder, a polyhedron other than the prism, a hemisphere, or any shape that is a complex combination of plane and curved surfaces.

**[0032]** While the air outlet of the nozzle part is the elongate slit-shaped opening in each of the above embodiments, the air outlet of the nozzle part may be defined by a plurality of small openings arranged in a line. The air outlet of the nozzle part may be defined by plural slit-

shaped openings or plural lines of small openings. The air outlet of the nozzle part may include a dividing wall for reinforcement, such as an elongate rib.

**[0033]** While the above air outlet of the nozzle part in each of the above embodiments is of substantially uniform width from the uppermost edge to the lowermost edge, the air outlet of the nozzle part can have a greater opening width at its upper part than an opening width at its lower part to provide an increased air quantity from the upper part. Consequently, when the user holds palms of the hands over the nozzle parts, thumbs, which tend to have much remaining water droplets because of their relatively great surface areas can be exposed to a greater air quantity than the other portions of the hands, which results in efficient hand drying.

**[0034]** The housing includes the left and right nozzle parts in a bilaterally symmetric manner in each of the above embodiments, but does not necessarily have to include such nozzle parts. Only one of the right and left side parts of the housing may include the nozzle part. The left and right nozzle parts may be connected together at the front or the bottom of the housing. For example, the left and right nozzle parts may be connected to form one nozzle. A wider hand drying space with the left and right nozzle parts connected together can efficiently dry not only the hands but also arms.

**[0035]** While the nozzle part ejects air in the range from 0° to 60° inclusive in each of the above embodiments, this range may be changed as required. For example, the range may be from 0° to 90° inclusive or from 0° to 45° inclusive. The range may be from 0° to 30° inclusive. The range may be from -30° to 30° inclusive or from -45° to 0° inclusive.

**[0036]** While the air intake is provided in the side of the housing's upper part in each of the above embodiments, the air intake may be provided in any position other than a top face of the housing. In that case, the air intake is disposed above the nozzle part to prevent water droplets from entering the housing through the air intake when the hand is dried near the nozzle part.

**[0037]** While the hand detection unit is provided forwardly of the nozzle part in the housing in each of the above embodiments, the hand detection unit does not necessarily have to be disposed in front of the nozzle part as long as the hand detection unit is disposed in such a position as to enable timely detection of the hand that approaches the hand drying space. While the hand detection units are two in number in the description of each of the above embodiments, one or at least three hand detection units may be provided.

**[0038]** While the housing is attached to the wall surface in each of the above embodiments, the housing may be disposed above a washstand including a washbowl.

**[0039]** While the described air outlet of the nozzle part is substantially arc-shaped in each of the above embodiments, the air outlet does not necessarily have to be substantially arc-shaped in its entirety, from the uppermost edge to the lowermost edge, as long as the air outlet

substantially has the substantially arc-shaped portion between the uppermost edge and the lowermost edge.

#### Reference Signs List

**[0040]** 1, 201, 301 housing; 2a, 2b air intake; 3, 203, 303 blower; 7, 207, 307 control unit; 9 air filter; 4a, 4b, 204a, 204b, 304 nozzle part; 5a, 5b hand detection unit; 100, 200, 300 hand drying apparatus; W wall surface.

#### Claims

##### 1. A hand drying apparatus comprising:

a housing;  
a blower provided inside the housing; and  
a nozzle part to eject air delivered from the blower, out of the housing such that the ejected air fans out, the nozzle part being provided at one of left and right side parts of the housing when viewed from a user facing the housing.

2. The hand drying apparatus according to claim 1, wherein the nozzle part ejects the air in a shape of a fan downwardly in a range defined between a horizontal direction and a vertical direction.

3. The hand drying apparatus according to claim 2, wherein the nozzle part ejects the air in the shape of the fan in a range from 0° to 60° inclusive when the horizontal direction is defined as providing 0° and the vertical direction is defined as providing 90°.

4. The hand drying apparatus according to claim 2, wherein the nozzle part ejects the air in the shape of the fan in a range from 0° to 30° inclusive when the horizontal direction is defined as providing 0° and the vertical direction is defined as providing 90°.

5. The hand drying apparatus according to any one of claims 1 to 4, wherein

the nozzle part includes an air outlet that is an opening through which an inside of the housing communicates with an outside of the housing, and  
the air outlet includes a substantially arc-shaped portion between an uppermost edge of the air outlet and a lowermost edge of the air outlet, the arc-shaped portion being convex in an outward direction of the housing, relative to a straight line interconnecting the uppermost edge and the lowermost edge.

6. The hand drying apparatus according to claim 5, wherein the air outlet has a shorter length extending from the uppermost edge to the lowermost edge than

a widthwise length of a hand of a user.

7. The hand drying apparatus according to claim 5 or 6, wherein the air outlet is close to a front of the housing as the air outlet extends downward, the front of the housing being near the user when viewed from the user facing the housing.

8. The hand drying apparatus according to any one of claims 5 to 7, wherein the air outlet is flush with an external surface of the housing.

9. The hand drying apparatus according to any one of claims 5 to 8, wherein the air outlet has a greater opening width at an upper part of the air outlet than an opening width at a lower part of the air outlet.

10. The hand drying apparatus according to any one of claims 1 to 9, further comprising

a hand detection means to detect an insertion of an user's hand into an outside space of the housing, toward which space the nozzle part ejects the air, wherein  
the hand detection means is provided in front of the nozzle part in the housing, the front being near the user when viewed from the user facing the housing.

11. The hand drying apparatus according to any one of claims 1 to 10, wherein the housing is in a shape of a cylinder, a prism, a semicylinder, a polyhedron other than the prism, a sphere, or a hemisphere.

12. The hand drying apparatus according to any one of claims 1 to 11, wherein the housing is in a shape of a vertically extending pillar and the nozzle part is provided at a lower part of the housing.

13. The hand drying apparatus according to any one of claims 1 to 12, wherein the housing includes the nozzle part at each of the left and right side parts of the housing.

14. The hand drying apparatus according to any one of claims 1 to 13, wherein the housing is disposed above a washstand including a washbowl.

FIG.1

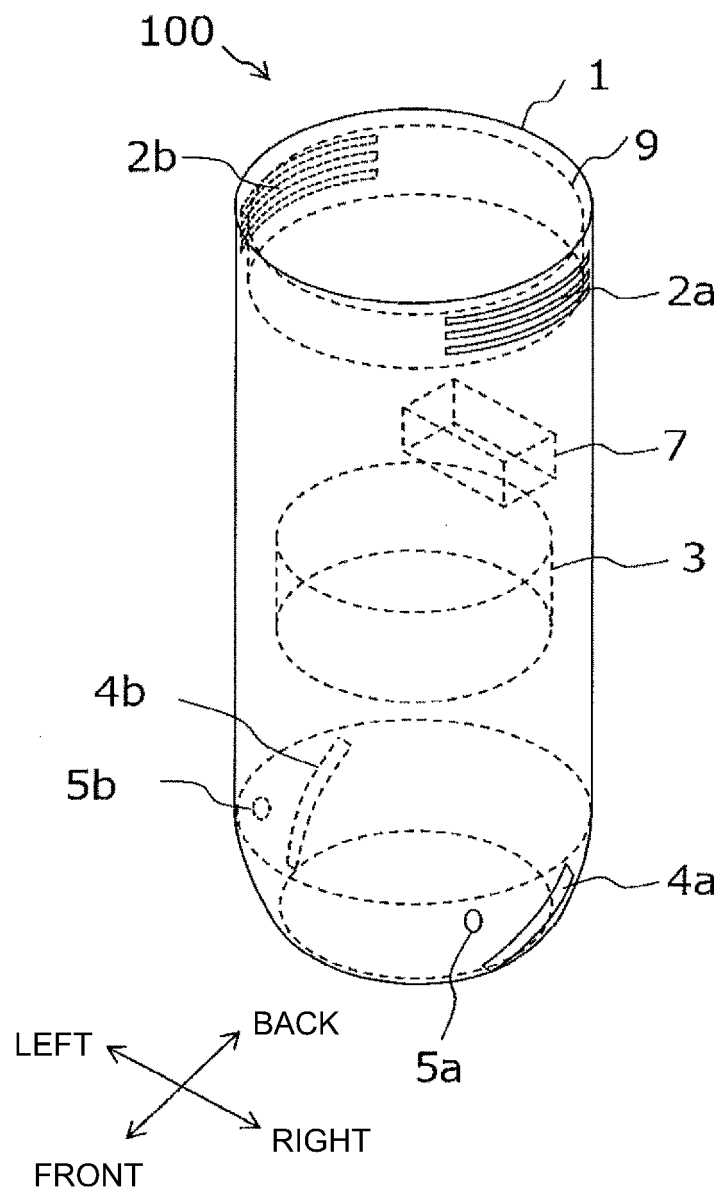


FIG.2

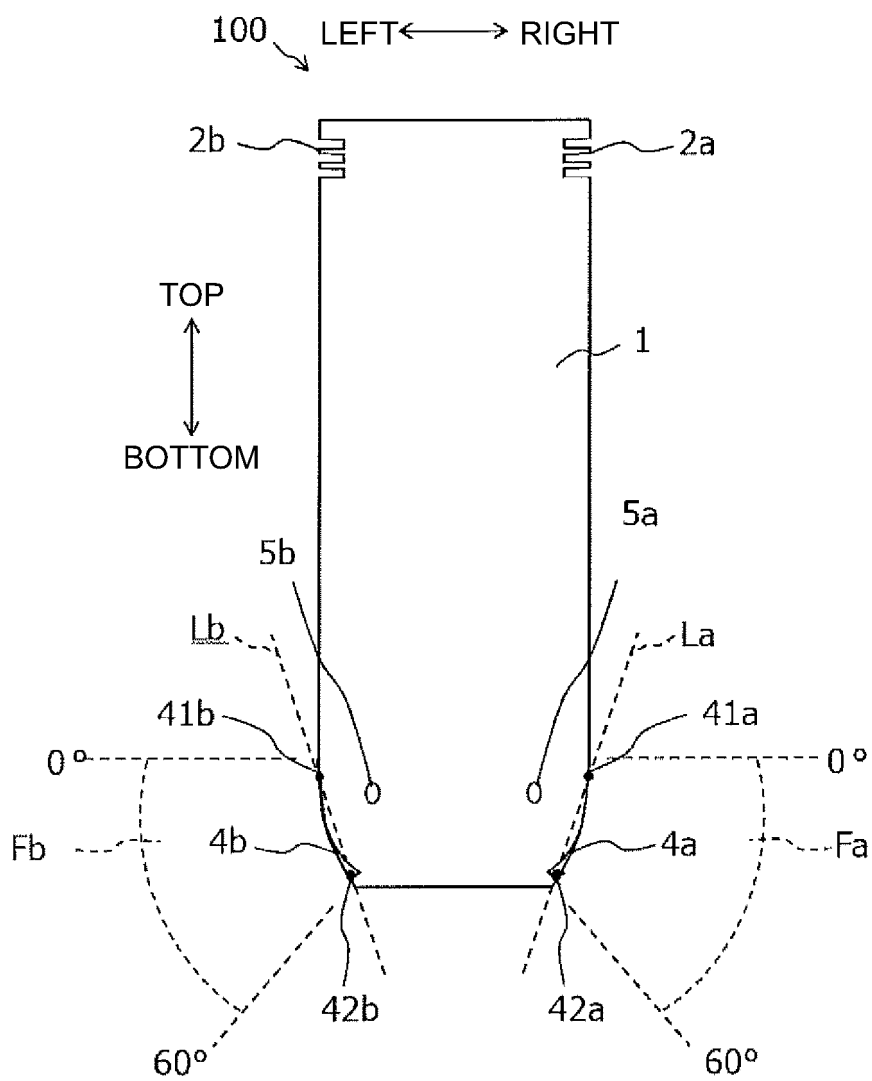


FIG.3

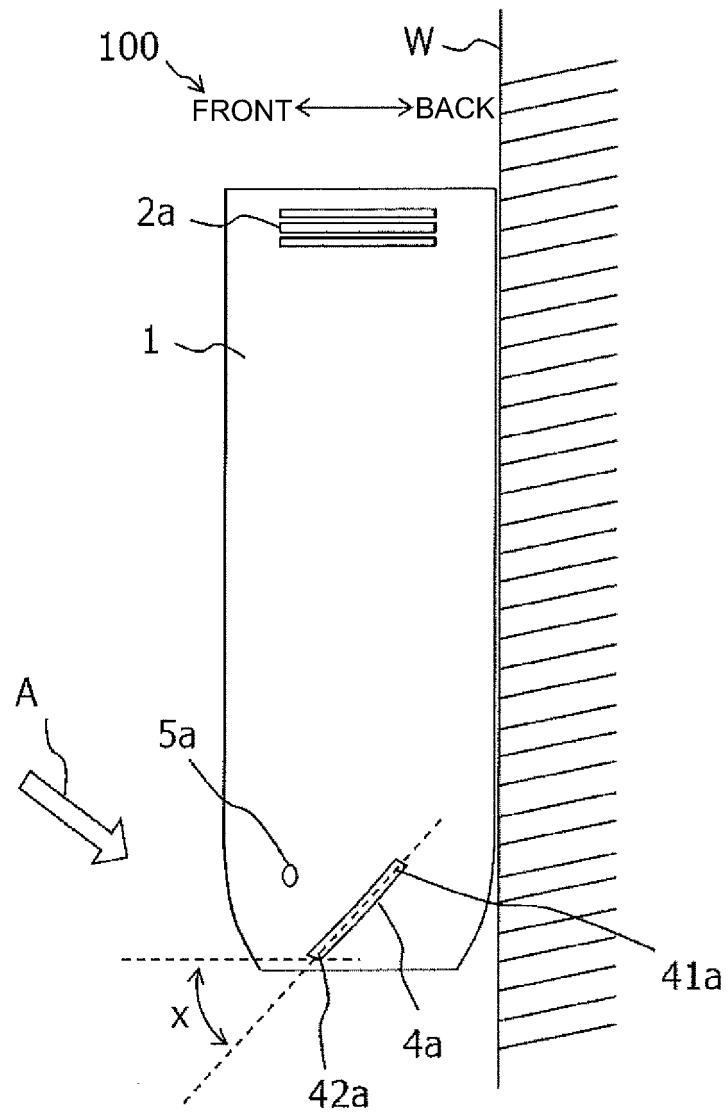


FIG.4

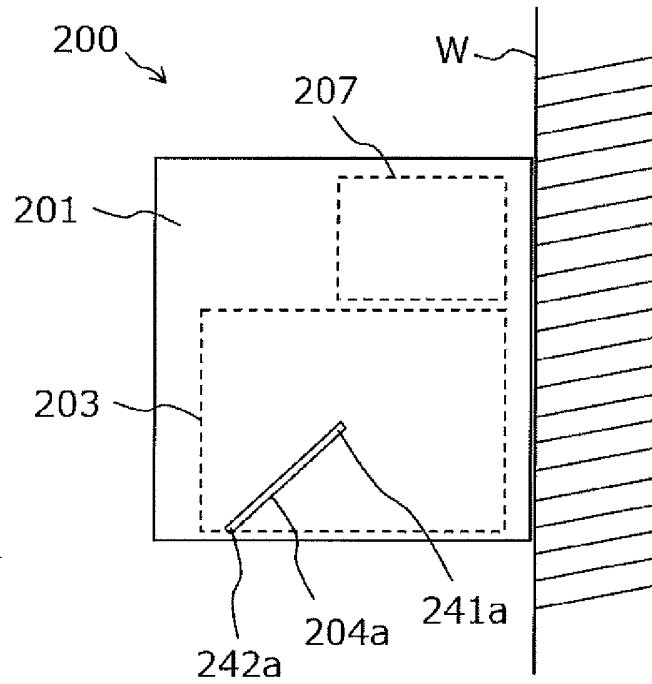


FIG.5

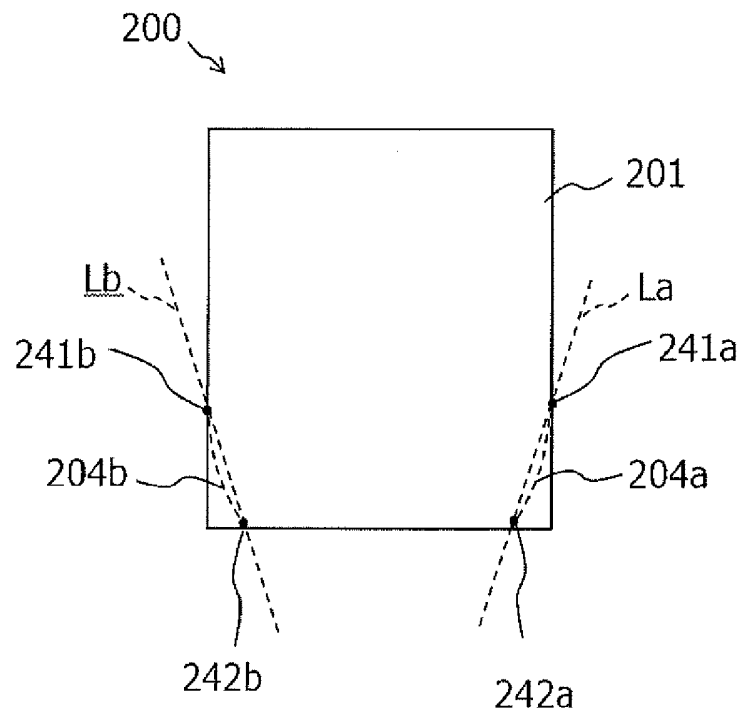
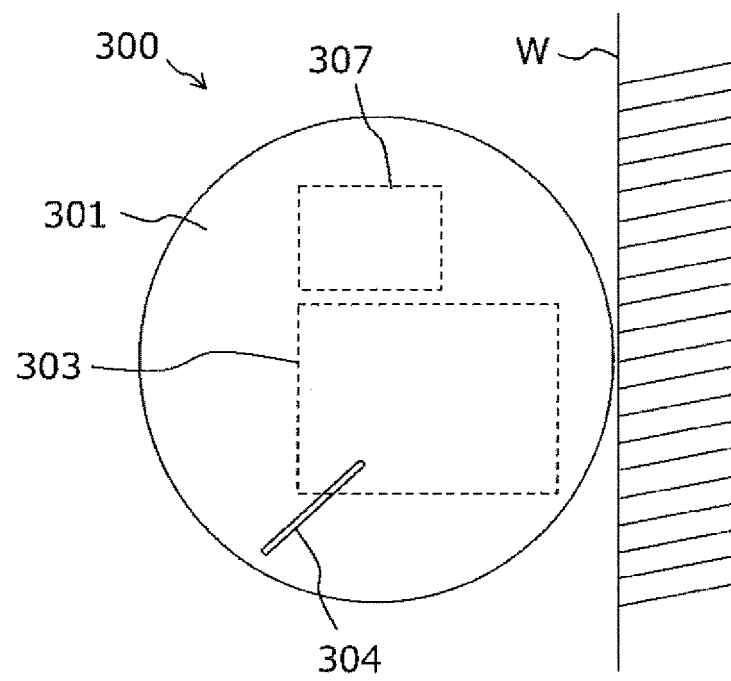


FIG.6



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/044301

## A. CLASSIFICATION OF SUBJECT MATTER

A47K 10/48 (2006.01) i

FI: A47K10/48 A

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)

A47K10/48

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. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Y         | JP 2019-176973 A (KOITO ELECTRIC INDUSTRIES, LTD.) 17 October 2019 (2019-10-17) paragraphs [0020]-[0025], [0068]-[0069], fig. 2, 10 | 1, 10-11, 13-14       |
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| Y         | CN 205136778 U (CAO, Weiguo) 06 April 2016 (2016-04-06) paragraphs [0035], [0039], fig. 1-2                                         | 10                    |
| A         |                                                                                                                                     | 1-9, 11-14            |



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

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"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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

14 January 2021 (14.01.2021)

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| Patent Documents<br>referred in the<br>Report | Publication<br>Date | Patent Family  | Publication<br>Date |
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**REFERENCES CITED IN THE DESCRIPTION**

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