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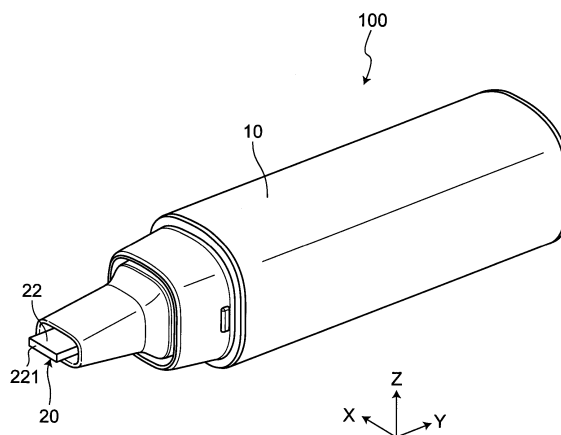
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(54) **CLEANING DEVICE**

(57) A cleaning device includes a main body (10) having a rod shape, a vibration generator (21) which is provided in the main body (10) and generates vibration, a vibration transmission member (22) which is provided in the main body (10) with a part of the vibration transmission member (22) exposed from one end of the main body (10) and which transmits the vibration generated by the vibration generator (21) to an object to be cleaned, and a power supply unit (30) which is provided in the main body (10) and supplies electric power for generating vibration to the vibration generator (21). The main body (10) and the vibration transmission member (22) each have a polygonal shape in a cross-section in a direction intersecting with a direction in which the main body (10) extends, and one side of the polygonal shape of the main body (10) and one side of the polygonal shape of the vibration transmission member (22) are parallel to each other.

Fig. 1



EP 3 488 940 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a cleaning device.

BACKGROUND ART

[0002] Patent Document 1 describes a cleaning device including a main body and a vibration generator attached to a front end of the main body. In this cleaning device, a vibration generator is provided with a vibration transmission member, and a user uses the cleaning device by gripping a main body and pressing the vibration transmission member against an object to be cleaned such as clothes.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0003] Patent Document 1: Japanese Patent No. 3768978

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] However, since the main body of the above cleaning device is bent in a V-shape and a cross-section of the main body in a direction intersecting with the direction in which the main body extends is approximately circular, when a user grips the main body, the user cannot precisely orient the vibration transmission member in some cases.

[0005] An object of the present invention is therefore to provide a cleaning device in which the vibration transmission member can be precisely oriented.

SOLUTIONS TO THE PROBLEMS

[0006] In order to solve the above problem, a cleaning device of an aspect of the present invention includes: a main body having a rod shape; a vibration generator which is provided in the main body and generates vibration; a vibration transmission member which is provided in the main body with a part of the vibration transmission member exposed from one end of the main body and which transmits the vibration generated by the vibration generator to an object to be cleaned; and a power supply unit which is provided in the main body and supplies electric power for generating vibration to the vibration generator. The main body and the vibration transmission member each have a polygonal shape in a cross-section in a direction intersecting with a direction in which the main body extends, and one side of the polygonal shape of the main body and one side of the polygonal shape of

the vibration transmission member are parallel to each other.

EFFECTS OF THE INVENTION

[0007] According to the above aspect of the present invention, the main body has a rod shape, the main body and the vibration transmission member each have a polygonal shape in a cross-section in a direction intersecting with the direction in which the main body extends, and one side of the polygonal shape of the main body and one side of the polygonal shape of the vibration transmission member are parallel to each other. Therefore, it is possible to orient the vibration transmission member by using the main body, and it is thus possible to precisely orient the vibration transmission member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a perspective view showing a cleaning device according to a first embodiment of the present invention.

Fig. 2 is a front view of the cleaning device of Fig. 1. Fig. 3 is a top view of the cleaning device of Fig. 1. Fig. 4 is a bottom view of the cleaning device of Fig. 1. Fig. 5 is a cross-sectional view taken along line V-V in Fig. 2.

Fig. 6 is a perspective view showing a cleaning device according to a second embodiment of the present invention.

Fig. 7 is a perspective view showing the cleaning device of Fig. 6 with a lid member detached.

Fig. 8 is a front view showing a cleaning device according to a third embodiment of the present invention.

Fig. 9 is a front view showing a cleaning device according to a fourth embodiment of the present invention.

Fig. 10 is a perspective view showing a washing machine on which a cleaning device according to a fifth embodiment of the present invention is mounted.

EMBODIMENTS OF THE INVENTION

[0009] Hereinafter, an embodiment of the present invention will be described with reference to the accompanying drawings. In the following description, terms (for example, terms including "upper", "lower", "right", and "left") indicating specific directions or positions are used as necessary, but these terms are used to facilitate understanding of the invention with reference to the drawings; therefore, the meanings of these terms do not limit the technical scope of the present invention. Also, the following description is just an example in nature and is not intended to limit the present invention, an application of the present invention, or use of the present invention.

Further, since the drawings are schematically drawn, the ratios of dimensions and the like do not necessarily agree with the actual ones.

FIRST EMBODIMENT

[0010] As shown in Figs. 1 to 3, a cleaning device 100 according to a first embodiment of the present invention includes a main body 10 having a rod shape, an ultrasonic horn 20 provided inside the main body 10, and a rechargeable battery 30 (shown only in Fig. 5) as an example of a power supply unit provided inside the main body 10.

[0011] Note that directions are defined as follows: the direction in which the main body 10 extends is the Y direction; the direction parallel to one side of a cross-section in the direction intersecting with the Y direction is the X direction; and the direction intersecting the X direction and the Y direction is the Z direction.

[0012] As shown in Figs. 2 and 3, the main body 10 is configured with a grip part 11 to be gripped by a user and a front end part 12 in which the ultrasonic horn 20 is located therein, and the main body 10 has a quadrangular cross-section in a direction intersecting with the Y direction. The main body 10 is provided to be symmetric with respect to a center line CL extending in the Y direction.

[0013] The grip part 11 is made of metal such as aluminum, and as shown in Figs. 2 and 3, a base member 13 of a front end part 12 (to be described later) is connected to an end part on the upper side of the grip part 11 in the Y direction. Packing 111 is attached to the end part on the upper side, in the Y direction, of the grip part 11, thereby sealing between the grip part 11 and the base member 13 of the front end part 12.

[0014] As shown in Figs. 4 and 5, the grip part 11 has, in a plan view along the Y direction, a regular quadrangular shape in which each corner part is chamfered, and a push-button switch 16 is provided on the end part on the lower side in the Y direction (the end part opposite to the end part to which the front end part 12 is attached). As shown in Fig. 3, the push-button switch 16 has elasticity, and this elasticity seals a gap between the grip part 11 and the push-button switch 16.

[0015] As shown in Fig. 3, a housing part 112 is provided in the central part of the grip part 11, and the battery 30 is stored in the housing part 112. A main circuit board 17 having a microcomputer is provided on the right side of the housing part 112 in the Z direction, and a transformer 18 is provided on the lower side in the Y direction. The ultrasonic horn 20, the battery 30, the transformer 18, and the push-button switch 16 are each connected to the main circuit board 17 and are controlled by the microcomputer (not shown).

[0016] As shown in Figs. 2 and 3, the front end part 12 is made of insulating resin and has the base member 13 connected to the grip part 11 and a tapered member 14 connected to the base member 13.

[0017] As shown in Fig. 2, the base member 13 is in-

clined to be closer to the center line CL toward the front end (toward the upper side in the Y direction). As shown in Fig. 3, in the front end part of the base member 13, there is provided a groove 131 to which the tapered member 14 is attached and a through hole 132 through which a horn member 22 (to be described later) of the ultrasonic horn 20 protrudes.

[0018] Protrusions 15 protruding from the surface of the base member 13 are provided on the side, of the base member 13, close to the grip part 11 (the lower side in the Y direction). Via the protrusions 15, a lid member (not shown) which covers the ultrasonic horn 20 can be attached. Further, as shown in Fig. 4, the base member 13 has, in a plan view along the Y direction, a regular quadrangular shape in which each corner part is chamfered, and the peripheral edge of the base member 13 is located inside the peripheral edge of the grip part 11.

[0019] As shown in Fig. 2, the tapered member 14 has a wide part 141 connected to the base member 13 and a narrow part 142 extending from the wide part 141 along the center line CL, and each of the both ends of the tapered member 14 is opened as shown in Fig. 3.

[0020] As shown in Fig. 3, the lower part of the wide part 141 in the Y direction is fitted in the groove 131 of the base member 13. A curved surface is provided on the upper part of the wide part 141 in the Y direction, and the curved surface is closer to the center line CL toward the front end (toward the upper side in the Y direction). As shown in Fig. 2, the width of the narrow part 142 in the X direction is approximately the same, and as shown in Fig. 3, the width of the narrow part 142 in the Z direction is inclined to be closer to the center line CL toward the front end (toward the upper side in the Y direction).

[0021] As shown in Fig. 4, the tapered member 14 has, in a plan view along the Y direction, a rectangular shape in which each corner part is chamfered, and the peripheral edge is located inside the peripheral edge of the base member 13.

[0022] As shown in Fig. 3, the ultrasonic horn 20 has a vibration generator 21 and a horn member 22 as an example of the vibration transmission member.

[0023] The vibration generator 21 has a piezoelectric element and is electrically connected to the battery 30 so that a predetermined voltage can be applied to the piezoelectric element. When a predetermined voltage is applied to the piezoelectric element, the piezoelectric element generates ultrasonic vibration with a set frequency and amplitude. In the cleaning device 100 of the present embodiment, the vibration generator 21 is set to generate a frequency from 30 kHz to 40 kHz suitable for cleaning clothes.

[0024] Further, as shown in Fig. 3, the vibration generator 21 is located inside the base member 13 of the front end part 12. Packing 211 is provided around the vibration generator 21 to seal between the vibration generator 21 and the base member 13 of the front end part 12.

[0025] The horn member 22 is made of metal, and a front end 221 of the horn member 22 is brought into con-

tact with an object to be cleaned to transmit the vibration generated by the vibration generator 21 to the object to be cleaned. As shown in Fig. 3, the horn member 22 extends from the vibration generator 21 toward the upper side in the Y direction along the center line CL, and the front end 221 passes through the through hole 132 provided in the base member 13 of the front end part 12 and protrudes from the opening 143 on the upper side, in the Y direction, of the tapered member 14 of the front end part 12 to the outside of the main body 10. That is, the horn member 22 provided in the main body 10 is disposed such that a part of the horn member 22 is exposed from one end of the main body 10.

[0026] Further, as shown in Fig. 4, the horn member 22 has a rectangular shape in a plan view along the Y direction. In a plan view along the Y direction, each side of the rectangular shape of the horn member 22 is arranged approximately parallel to each side of the regular quadrangular shape of the grip part 11 of the main body 10, where each corner part of the grip part 11 is chamfered.

[0027] Next, it will be described how the cleaning device 100 is used.

[0028] First, a place (cleaning part) of an object to be cleaned where dirt or stain is attached is made to absorb a cleaning medium. The cleaning medium may be ordinary water or water containing a detergent component.

[0029] Next, the push-button switch 16 is operated to turn on the power supply of the cleaning device 100. By this operation, electric power is supplied to the ultrasonic horn 20, and the vibration generator 21 thus generates ultrasonic vibration. The ultrasonic vibration generated by the vibration generator 21 is transmitted from the vibration generator 21 to the horn member 22.

[0030] Subsequently, the grip part 11 of the cleaning device 100 whose power supply is turned on is gripped to press the front end 221 of the horn member 22 against the cleaning part of the object to be cleaned. The ultrasonic vibration transmitted to the horn member 22 is transmitted to the cleaning part of the object to be cleaned so that the attached dirt or stain comes off and elutes into the cleaning medium. Thus, the dirt or stain attached to the object to be cleaned is removed.

[0031] In the cleaning device 100 of the first embodiment, the main body 10 has a rod shape, the main body 10 and the horn member 22 have quadrangular shapes in a cross-section in a direction intersecting with the direction in which the main body 10 extends, and one side of the quadrangular shape of the main body 10 and one side of the quadrangular shape of the horn member 22 are parallel to each other. That is, the horn member 22 can be used to orient the main body 10, and the horn member 22 can thus be precisely oriented.

[0032] In addition, since the main body 10 has a rod shape, the user can operate the cleaning device 100 by gripping the cleaning device 100 in the same manner as a pencil, a pen, or the like. Therefore, the cleaning device 100 can be easily operated.

[0033] In addition, the grip part 11 of the main body 10 has a quadrangular cross-section in the direction intersecting with the direction in which the main body 10 extends; therefore, compared with the case where the main body 10 has a polygonal cross-section different from a quadrangular cross-section, it is easier for a user to orient and grip the main body 10, and the main body 10 is less likely to roll.

[0034] In addition, the main body 10 has the grip part 11 to be gripped by a user, and the center of gravity of the cleaning device 100 coincides with the center P of the grip part 11. As a result, the distance between the position of the grip part 11 gripped by the user and the center of gravity of the cleaning device 100 can be made short; thus, the operability of the horn member 22 can be improved.

[0035] A push-button switch 16 for turning on and off the supply of electric power from the battery 30 to the vibration generator 21 of the ultrasonic horn 20 is provided at the other end opposite to the end from which the horn member 22 of the main body 10 protrudes. With this arrangement, it is possible to reduce the possibility that the user's finger or the like comes into contact with the push-button switch 16 during operation of the cleaning device 100, thereby preventing erroneous operation.

[0036] The shapes of the main body 10 and the horn member 22 in a cross-section in the direction intersecting with the direction in which the main body 10 extends are not limited to quadrangular shapes and only have to be polygonal shapes. In this case, it is sufficient that at least one side of the polygonal shape of the main body 10 and one side of the polygonal shape of the horn member 22 are parallel to each other. In this case, the longest sides of the respective polygonal shapes of the main body 10 and the horn member 22 are preferably parallel to each other. With this arrangement, the shape of the horn member 22 is related to the shape of the main body 10; therefore, the horn member 22 can be precisely oriented.

[0037] Further, the battery 30 is not limited to a rechargeable battery and may be a non-rechargeable battery if possible.

SECOND EMBODIMENT

[0038] As shown in Fig. 6, a cleaning device 200 of a second embodiment of the present invention is different from the cleaning device 100 of the first embodiment in that the cleaning device 200 is provided with a lid member 40 which is detachably attached to one end of a main body 10 and covers a horn member 22 of an ultrasonic horn 20. In the second embodiment, the same parts as in the first embodiment are assigned the same reference signs and are not described again, and the points different from the first embodiment will be described.

[0039] As shown in Fig. 6, the lid member 40 has a rod shape and has a quadrangular shape identical to the grip part 11 of the main body 10, in a cross-section in a direction intersecting with the direction in which the lid

member 40 extends. As shown in Fig. 7, the lid member 40 has an opening 41 which can be fitted in a base member 13 of a front end part 12 of the main body 10 at one end in the longitudinal direction (Y direction), and a recess 42 in which the horn member 22 of the ultrasonic horn 20 can be stored through the opening 41. In an edge part of the opening of the recess 42, there are provided grooves 43 which can fit with protrusions 15 provided on the base member 13 of the front end part 12 of the main body 10. Each of the grooves 43 is disposed approximately at the center of each of the edge parts of the quadrangular opening of the recess 42.

[0040] Further, as shown in Fig. 6, a flat surface 44 is provided on the other end of the lid member 40, which is on the side opposite to the opening 41 in the Y direction. When the lid member 40 is placed with the flat surface 44 facing downward and the opening 41 facing upward, the lid member 40 can be used as a stand for the main body 10. That is, the lid member 40 allows the main body 10 to be placed in a so-called vertical storage state.

[0041] As described above, the lid member 40 also serves as a stand on which the main body 10 is placed. Thus, for example, a dedicated stand for the main body 10 is not necessary, and it is more convenient to carry the cleaning device 200.

[0042] In addition, by placing the main body 10 in a vertical storage state, it is possible to store the cleaning device 200 in a smaller space.

[0043] Note that the lid member 40 is not limited to a lid member in which the main body 10 can be placed in a vertical storage state, and, for example, a lid member may be used in which the main body can be placed at a predetermined angle with respect to an installation surface of the cleaning device.

THIRD EMBODIMENT

[0044] As shown in Fig. 8, a cleaning device 300 of a third embodiment of the present invention is different from the cleaning device 200 of the second embodiment in that the cleaning device 300 has a charging unit 50 which can charge a battery 30 of a main body 10 when a lid member 40 is placed on the main body 10. In the third embodiment, the same parts as in the first and second embodiments are assigned the same reference signs and are not described again, and the points different from the first and second embodiments will be described.

[0045] As shown in Fig. 8, the charging unit 50 has a charger main body 51, a power cord 52 connected to the charger main body 51, and a charging terminal 53 disposed to be exposed on an inner peripheral surface of a recess 42 of the lid member 40. The charger main body 51 and the charging terminal 53 are electrically connected.

[0046] Further, a base member 13 of the main body 10 is provided with a main body terminal 133 disposed to be exposed from the front surface. The main body

terminal 133 is electrically connected to the battery 30.

[0047] When the main body 10 is vertically placed with the lid member 40 attached to the main body 10, the main body terminal 133 of the main body 10 and the charging terminal 53 of the charging unit 50 of the lid member 40 come into contact with each other to make an electric connection, whereby the battery 30 can be charged.

[0048] As described above, the lid member 40 has a charging unit 50 which can charge the battery 30 of the main body 10 when the main body 10 is placed on the lid member 40. Therefore, the cleaning device 300 can be repeatedly used by charging the battery 30, and the maintenance cost of the cleaning device 300 can be accordingly reduced.

[0049] Not that the charging unit 50 may perform not only contact charging as described above but also non-contact charging using an electromagnetic induction system.

FOURTH EMBODIMENT

[0050] As shown in Fig. 9, a cleaning device 400 of a fourth embodiment of the present invention is different from the cleaning device 300 of the third embodiment in that a lid member 40 has a water storage 60 which stores water to be used to clean an object to be cleaned. In the fourth embodiment, the same parts as in the first to third embodiments are assigned the same reference signs and are not described again, and the points different from the first to third embodiments will be described.

[0051] As shown in Fig. 9, the water storage 60 is provided at the end part (lower end part in Fig. 9) on the flat surface 44 side of the lid member 40. The water storage 60 has a water storage chamber 61 opened on the flat surface 44 and a cover 62 for covering the opening of the water storage chamber 61. The water storage chamber 61 stores water to be used for cleaning an object to be cleaned. The cover 62 is detachably attached to the lid member 40. Packing (not shown) is attached to the cover 62 to seal between the water storage chamber 61 and the cover 62.

[0052] As described above, since the lid member 40 is provided with the water storage 60, the cleaning device 400 can be used to remove dirt or stain on an object to be cleaned even in an environment where water is not available.

[0053] Note that the water to be used for cleaning an object to be cleaned may be stored by storing water in the water storage chamber 61 or by storing a puff or the like containing water in the water storage chamber 61.

FIFTH EMBODIMENT

[0054] As shown in Fig. 10, a cleaning device 500 of a fifth embodiment of the present invention is different from the cleaning device 300 of the third embodiment in that a lid member 40 constitutes a part of a washing machine 1. In the fifth embodiment, the same parts as in the

first to third embodiments are assigned the same reference signs and are not described again, and the points different from the first to third embodiments will be described.

[0055] As described above, the lid member 40 constitutes a part of the washing machine 1; therefore, for example, if the cleaning device 500 is used for noticeable partial dirt or stain on an object to be cleaned before washing by the washing machine 1, it is possible to remove the dirt or stain on the object to be cleaned by washing only once. That is, usability of the cleaning device 500 can be improved.

SIXTH EMBODIMENT

[0056] As shown in Fig. 10, a cleaning device 500 of a sixth embodiment of the present invention has a structure in which a lid member 40 constitutes a part of the washing machine 1, and the inside of the lid member 40 is structured as shown Fig. 8. The lid member 40 has a charger main body 51 and a charging terminal 53 disposed to be exposed on an inner peripheral surface of a recess 42 of the lid member 40. The charger main body 51 and the charging terminal 53 are electrically connected.

[0057] Further, a base member 13 of a main body 10 is provided with a main body terminal 133 disposed to be exposed from the front surface. The main body terminal 133 is electrically connected to a battery 30.

[0058] When the main body 10 is vertically placed with the lid member 40 attached to the main body 10, the main body terminal 133 of the main body 10 and the charging terminal 53 of the charging unit 50 of the lid member 40 come into contact with each other to make an electric connection, whereby the battery 30 can be charged.

[0059] As described above, the lid member 40 has a charging unit 50 which can charge the battery 30 of the main body 10 when the main body 10 is placed on the lid member 40. Therefore, the cleaning device 500 can be repeatedly used by charging the battery 30. That is, usability of the cleaning device 500 can be improved.

[0060] Note that the washing machine 1 may be of a vertical type or a drum type.

[0061] The present invention and the embodiments are summarized as follows.

[0062] The cleaning device 100, 200, 300, 400, and 500 according to a first aspect of the present invention includes: a main body 10 having a rod shape; a vibration generator 21 which is provided in the main body 10 and generates vibration; a vibration transmission member 22 which is provided in the main body 10 with a part of the vibration transmission member 22 exposed from one end of the main body 10 and which transmits the vibration generated by the vibration generator 21 to an object to be cleaned; and a power supply unit 30 which is provided in the main body 10 and supplies electric power for generating vibration to the vibration generator 21. The main body 10 and the vibration transmission member 22 each

have a polygonal shape in a cross-section in a direction intersecting with a direction in which the main body 10 extends, and one side of the polygonal shape of the main body 10 and one side of the polygonal shape of the vibration transmission member 22 are parallel to each other.

[0063] With the cleaning device according to the first aspect, the main body 10 can be used to orient the vibration transmission member 22, and it is thus possible to precisely orient the vibration transmission member 22.

[0064] Further, in the cleaning device 100, 200, 300, 400, and 500 according to a second aspect of the present invention, the main body 10 has the grip part 11 to be gripped by a user, and the center of gravity of each of the cleaning devices coincides with the center of the grip part 11.

[0065] The cleaning device according to the second aspect makes it possible to shorten the distance between the positions of the grip part 11 gripped by the user and the center of gravity of the cleaning device 100, 200, 300, 400, and 500; thus, the operability of the vibration transmission member 22 can be improved.

[0066] Further, in the cleaning device 100, 200, 300, 400, 500 according to a third aspect of the present invention, the main body 10 has, at the other end, the push-button switch 16 for turning on and off the supply of electric power from the power supply unit 30 to the vibration generator 21.

[0067] The cleaning device according to the third aspect make it possible to reduce the possibility that the user's finger or the like comes into contact with the push-button switch 16 during operation of the cleaning device 100, 200, 300, 400, and 500, thereby preventing erroneous operation.

[0068] Further, in the cleaning device 100, 200, 300, 400, and 500 according to a fourth aspect of the invention, each of the cross-sections of the main body and the vibration transmission member has a quadrangular shape in a direction intersecting with the direction in which the main body extends.

[0069] In the cleaning device according to the fourth aspect, compared with the case where the main body 10 has a polygonal cross-section different from a quadrangular cross-section, it is easier for a user to orient and grip the main body 10, and the main body 10 is less likely to roll.

[0070] Further, the cleaning device 200, 300, 400, and 500 according to a fifth aspect of the present invention further includes the lid member 40 which is detachably attached to one end of the main body 10 and covers the vibration generator, and the lid member 40 also serves as a stand on which the main body is placed.

[0071] With the cleaning device according to the fifth aspect, for example, a dedicated stand for the main body 10 is not necessary, and it is more convenient to carry the cleaning device 200.

[0072] Incidentally, when placing the cleaning device disclosed in Patent Document 1, it is considered to use

a dedicated stand on which the cleaning device can be placed. However, in the case where a dedicated stand is used for placing the above cleaning device, for example, if the cleaning device is used away from home, it is necessary to carry a dedicated stand in addition to the cleaning device, and it is thus inconvenient to carry around.

[0073] The cleaning device 200, 300, 400, and 500 according to a sixth aspect of the present invention includes: a main body 10 having a rod shape; a vibration generator 21 which is provided in the main body 10 and generates vibration; a vibration transmission member 22 which is provided in the main body 10 with a part of the vibration transmission member 22 exposed from one end of the main body 10 and which transmits the vibration generated by the vibration generator 21 to an object to be cleaned; a power supply unit 30 which is provided in the main body 10 and supplies electric power for generating vibration to the vibration generator 21; and a lid member 40 which is detachably attached to one end of the main body 10 and covers the vibration generator 21. The lid member 40 also serves as a vertical stand on which the main body 10 can be placed along the direction in which the main body 10 extends.

[0074] With the cleaning device according to the sixth aspect, for example, a dedicated stand for the main body 10 is not necessary, and it is more convenient to carry the cleaning device 200.

[0075] Further, in the cleaning device 300, 400, and 500 according to a seventh aspect of the present invention, the power supply unit 30 is rechargeable, and the lid member 40 has a charging unit 50 which can charge the power supply unit 30 of the main body 10 when the main body 10 is placed on the lid member 40.

[0076] The cleaning device according to the seventh aspect make it possible to repeatedly use the cleaning device 300, 400, and 500 by charging the power supply unit 30, and the maintenance cost of the device 300, 400, and 500 can be thus be reduced.

[0077] Further, in the cleaning device 400 according to an eighth aspect of the present invention, the lid member 40 has the water storage 60 which stores the water to be used to clean the object to be cleaned.

[0078] The cleaning device according to the eighth aspect makes it possible to use the cleaning device 400 to remove dirt or stain on an object to be cleaned even in an environment where water is not available.

[0079] Further, in the cleaning device 500 according to a ninth aspect of the present invention, the lid member 40 constitutes a part of the washing machine 1.

[0080] With the cleaning device according to the ninth aspect, for example, if the cleaning device 500 is used against noticeable partial dirt or stain on an object to be cleaned before washing by the washing machine 1, it is possible to remove the dirt or stain on the object to be cleaned by washing only once. That is, usability of the cleaning device 500 can be improved.

[0081] It is needless to say that the components de-

scribed in the first to sixth embodiments may be appropriately combined or may be appropriately selected, replaced, or removed.

5 DESCRIPTION OF REFERENCE SIGNS

[0082]

	10: Main body
10	11: Grip part
	111: Packing
	112: Housing part
	12: Front end part
	13: Base member
15	131: Groove
	132: Through hole
	133: Main body terminal
	14: Tapered member
	141: Wide part
20	142: Narrow part
	143: Opening
	15: Protrusion
	16: Push-button switch
	17: Main circuit board
25	18: Transformer
	20: Ultrasonic horn
	21: Vibration generator
	211: Packing
	22: Horn member (example of vibration transmission member)
30	221: Front end
	30: Battery (example of power supply unit)
	40: Lid member
	41: Opening
35	42: Recess
	43: Groove
	50: Charging unit
	51: Charger main body
	52: Power cord
40	53: Charging terminal
	60: Water storage
	61: Water storage chamber
	62: Cover
	100, 200, 300, 400, 500: Cleaning device
45	CL: Center line

Claims

50 1. A cleaning device comprising:

- a main body having a rod shape;
- a vibration generator which is provided in the main body and generates vibration;
- 55 a vibration transmission member which is provided in the main body with a part of the vibration transmission member exposed from one end of the main body and which transmits the vibration

- generated by the vibration generator to an object to be cleaned; and
a power supply unit which is provided in the main body and supplies electric power for generating vibration to the vibration generator, wherein the main body and the vibration transmission member each have a polygonal shape in a cross-section in a direction intersecting with a direction in which the main body extends, and one side of the polygonal shape of the main body and one side of the polygonal shape of the vibration transmission member are parallel to each other.
2. The cleaning device according to claim 1, wherein the main body has a grip part to be gripped by a user, and a center of gravity of the cleaning device coincides with the center of the grip part.
3. The cleaning device according to claim 1 or 2, wherein the main body has, at the other end, a push-button switch for turning on and off the supply of electric power from the power supply unit to the vibration generator.
4. The cleaning device according to any one of claims 1 to 3, wherein each of the cross-sections of the main body and the vibration transmission member has a quadrangular shape in a direction intersecting with the direction in which the main body extends.
5. The cleaning device according to any one of claims 1 to 4, further comprising a lid member which is detachably attached to one end of the main body and covers the vibration generator, wherein the lid member also serves as a stand on which the main body is placed.
6. A cleaning device comprising:
- a main body having a rod shape;
 - a vibration generator which is provided in the main body and generates vibration;
 - a vibration transmission member which is provided in the main body with a part of the vibration transmission member exposed from one end of the main body and which transmits the vibration generated by the vibration generator to an object to be cleaned;
 - a power supply unit which is provided in the main body and supplies electric power for generating vibration to the vibration generator; and
 - a lid member which is detachably attached to one end of the main body and covers the vibra-
- tion generator, wherein the lid member also serves as a vertical stand on which the main body can be placed along the direction in which the main body extends.
7. The cleaning device according to claim 6, wherein the power supply unit is rechargeable, and the lid member has a charging unit which can charge the power supply unit of the main body when the main body is placed on the lid member.
8. The cleaning device according to claim 6 or 7, wherein the lid member has a water storage which stores a water to be used to clean the object to be cleaned.
9. The cleaning device according to any one of claims 6 to 8, the lid member constitutes a part of a washing machine.
10. The cleaning device according to claim 9, wherein the lid member constituting the part of the washing machine has a charging unit which can charge the power supply unit of the main body when the main body is placed on the lid member.

Fig. 1

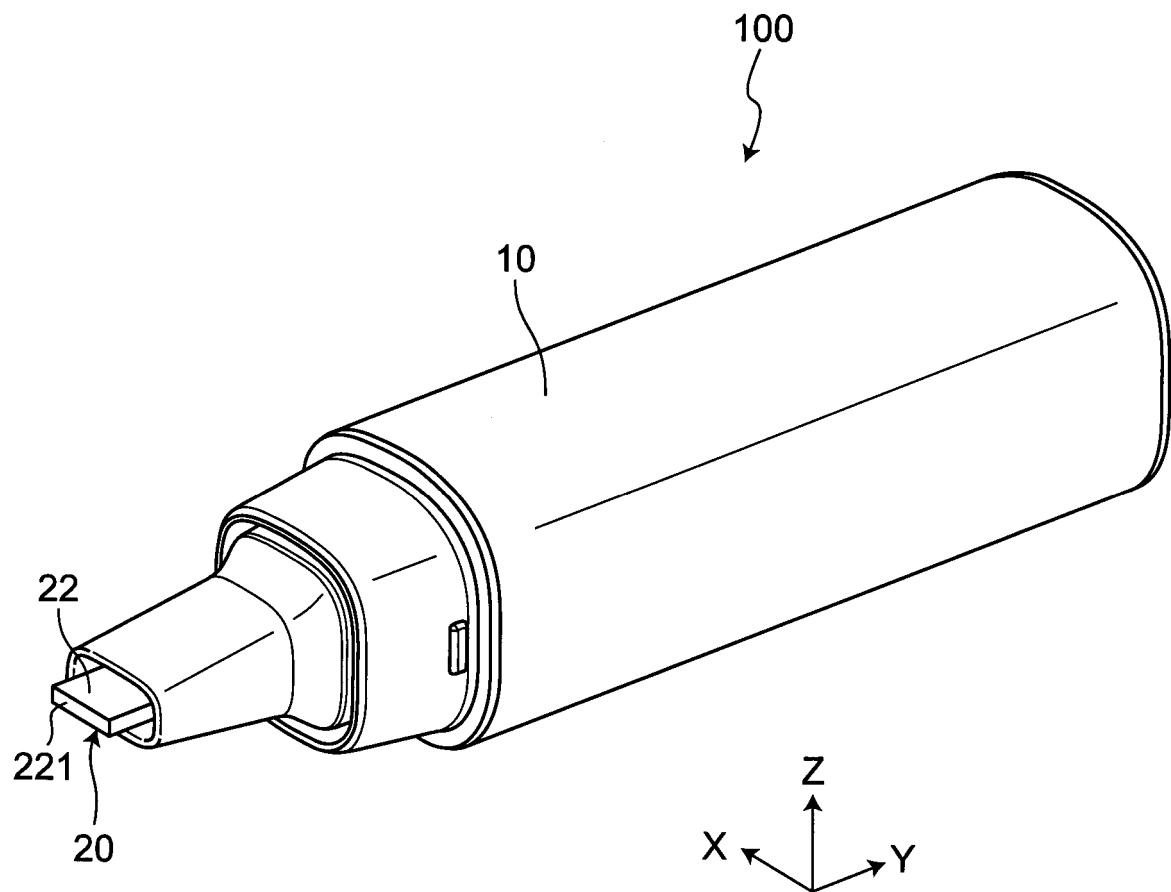


Fig. 2

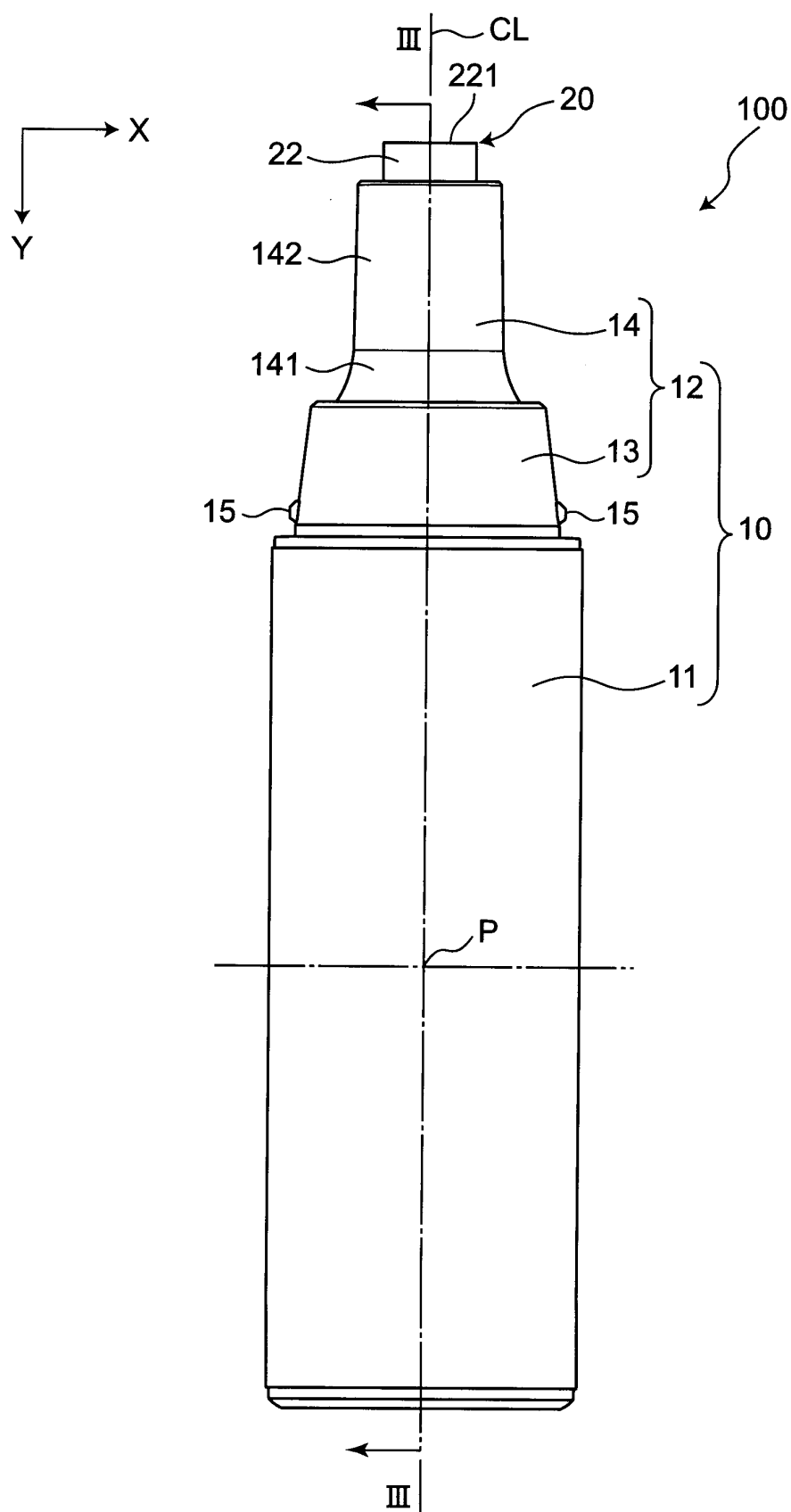


Fig.3

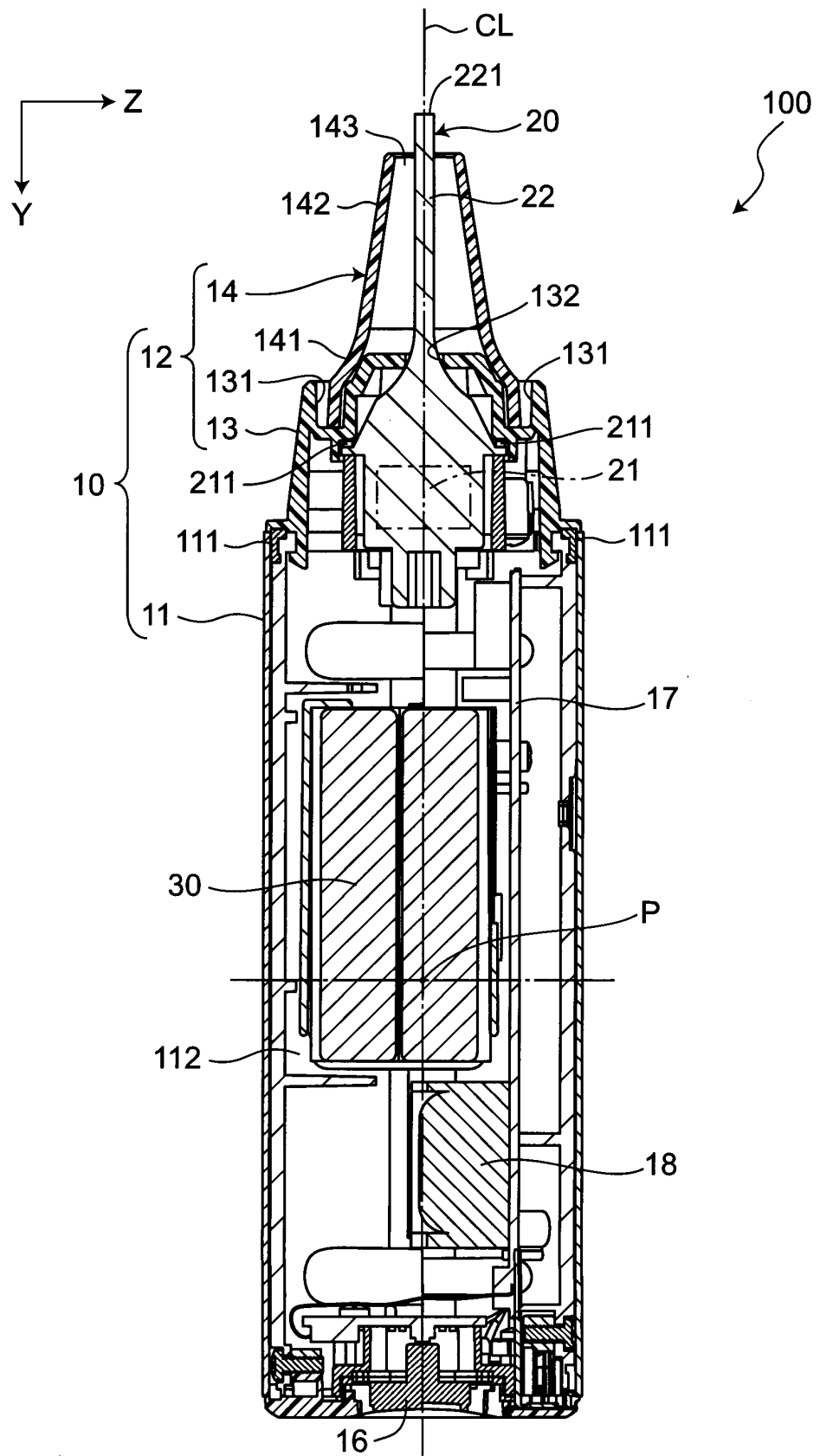


Fig.4

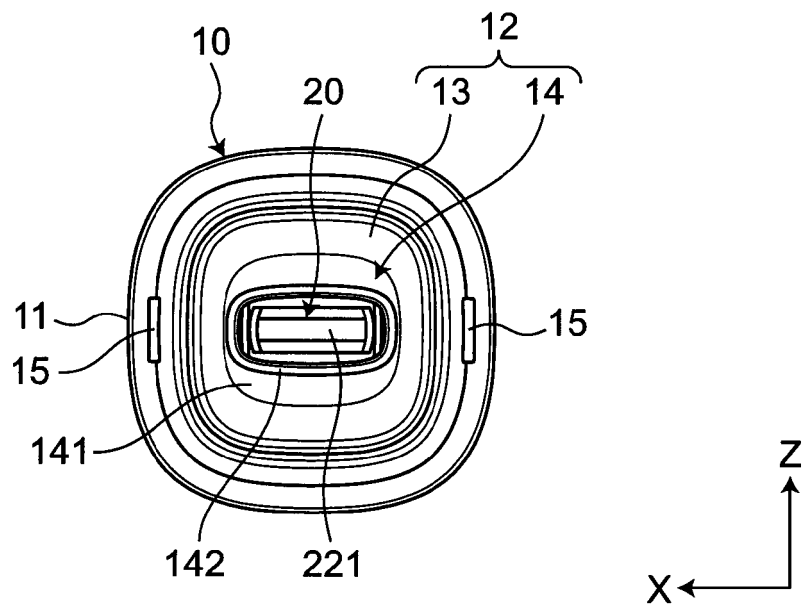


Fig.5

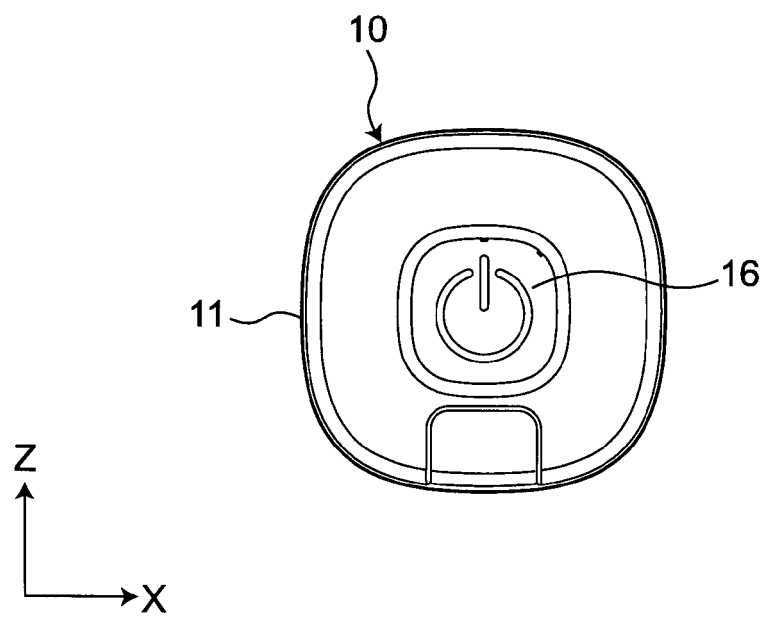


Fig.6

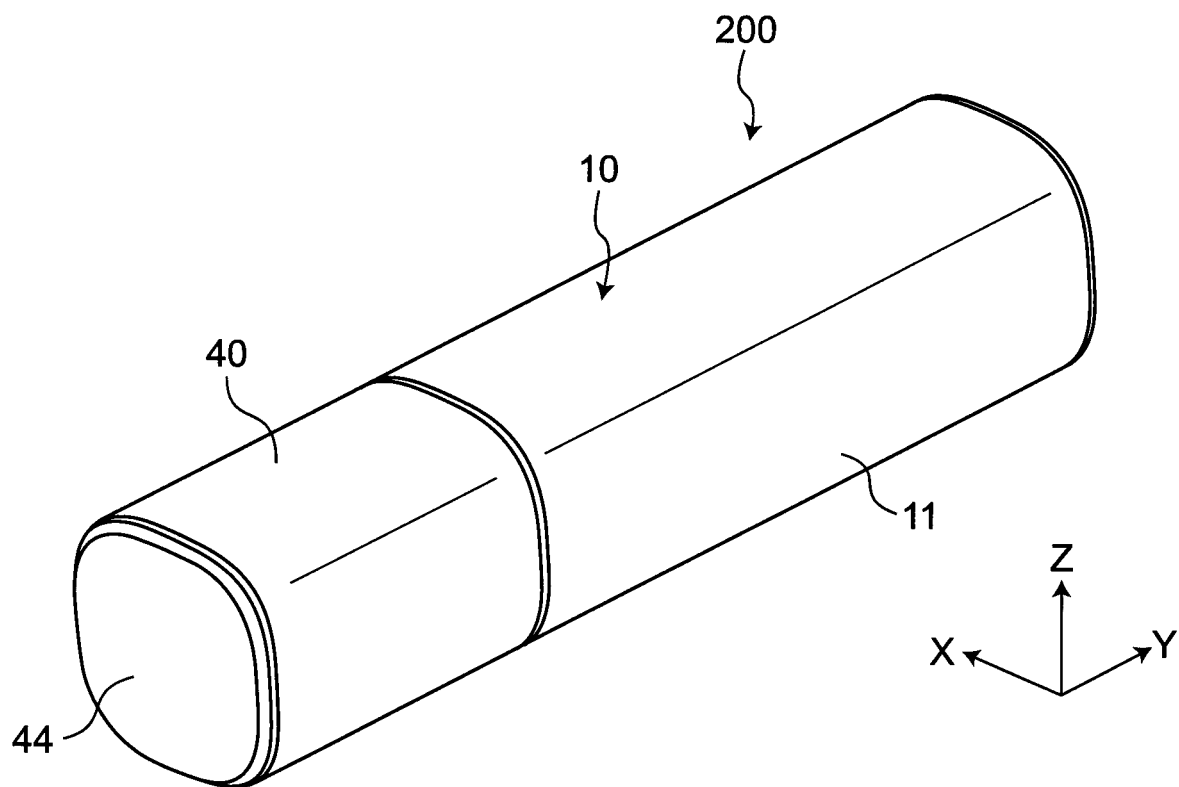


Fig.7

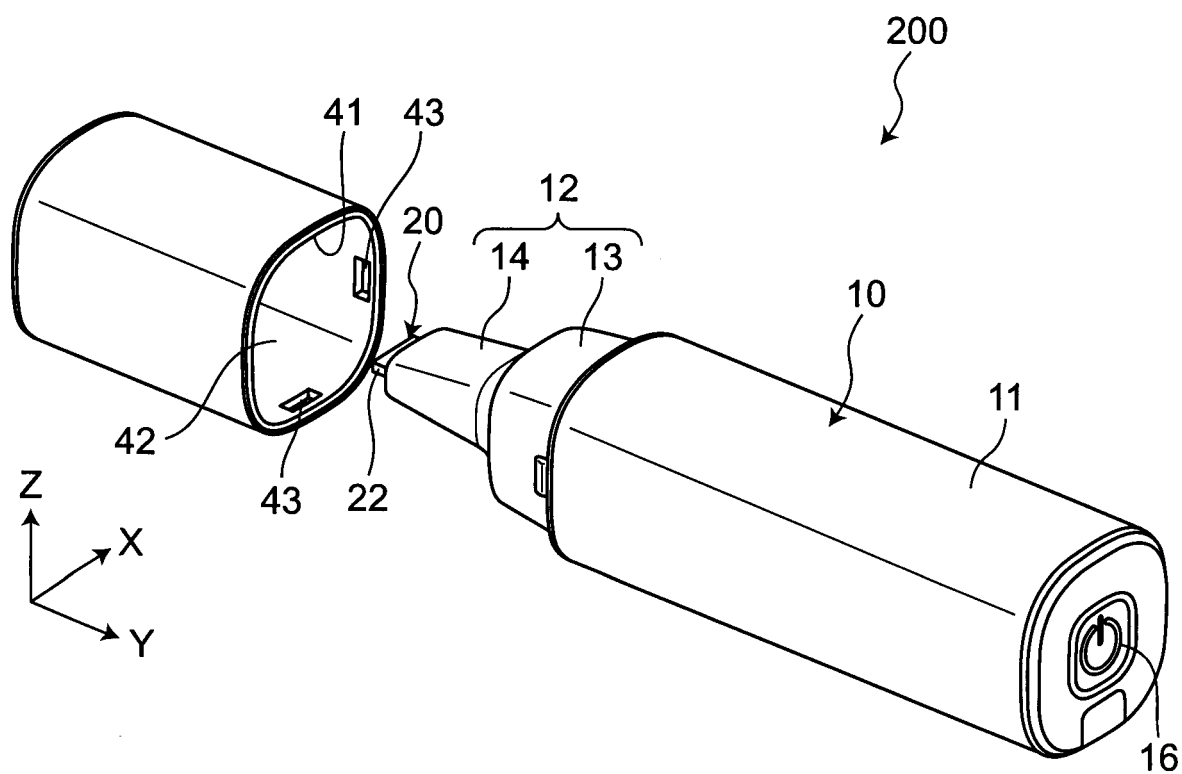


Fig. 8

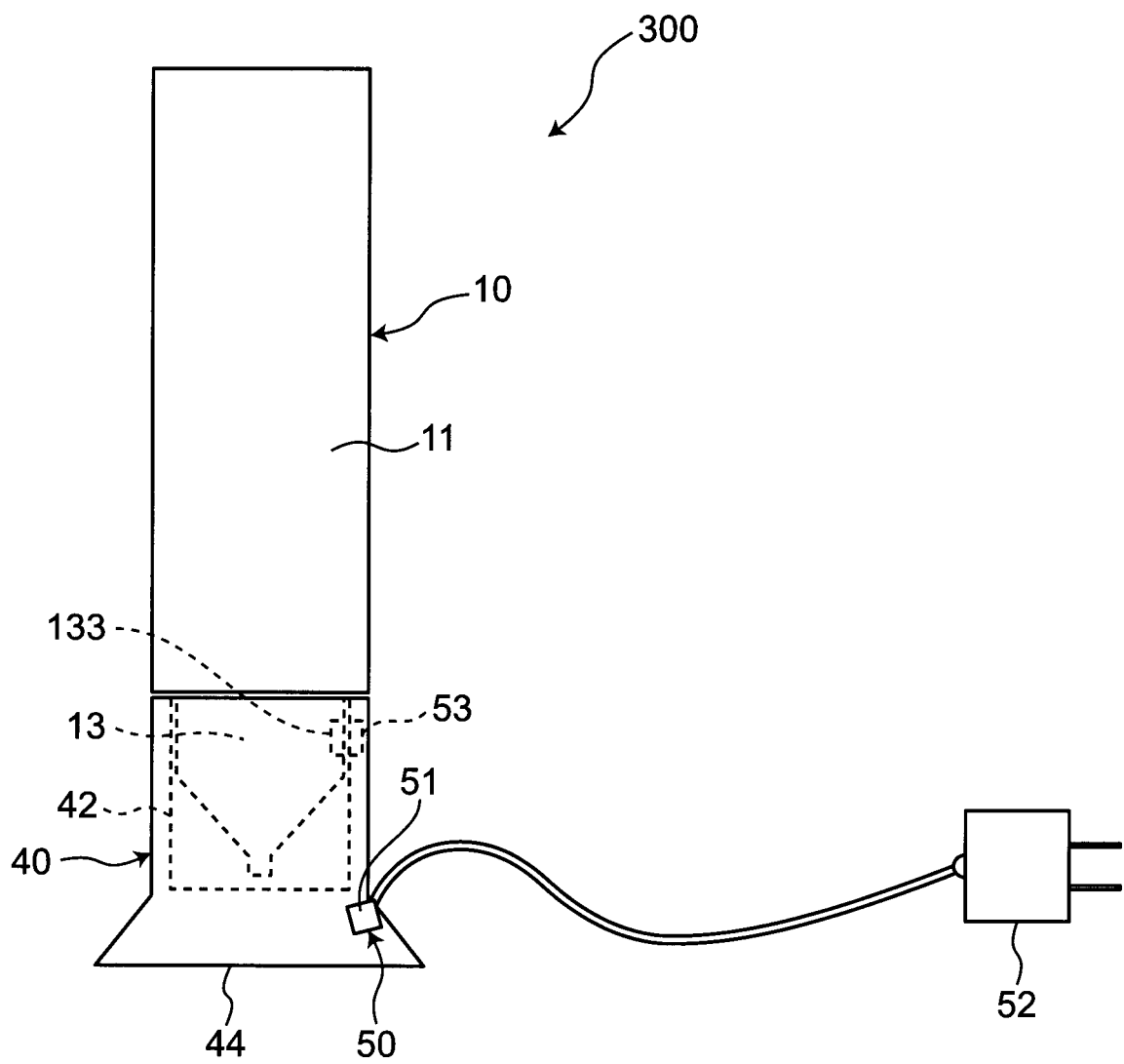


Fig.9

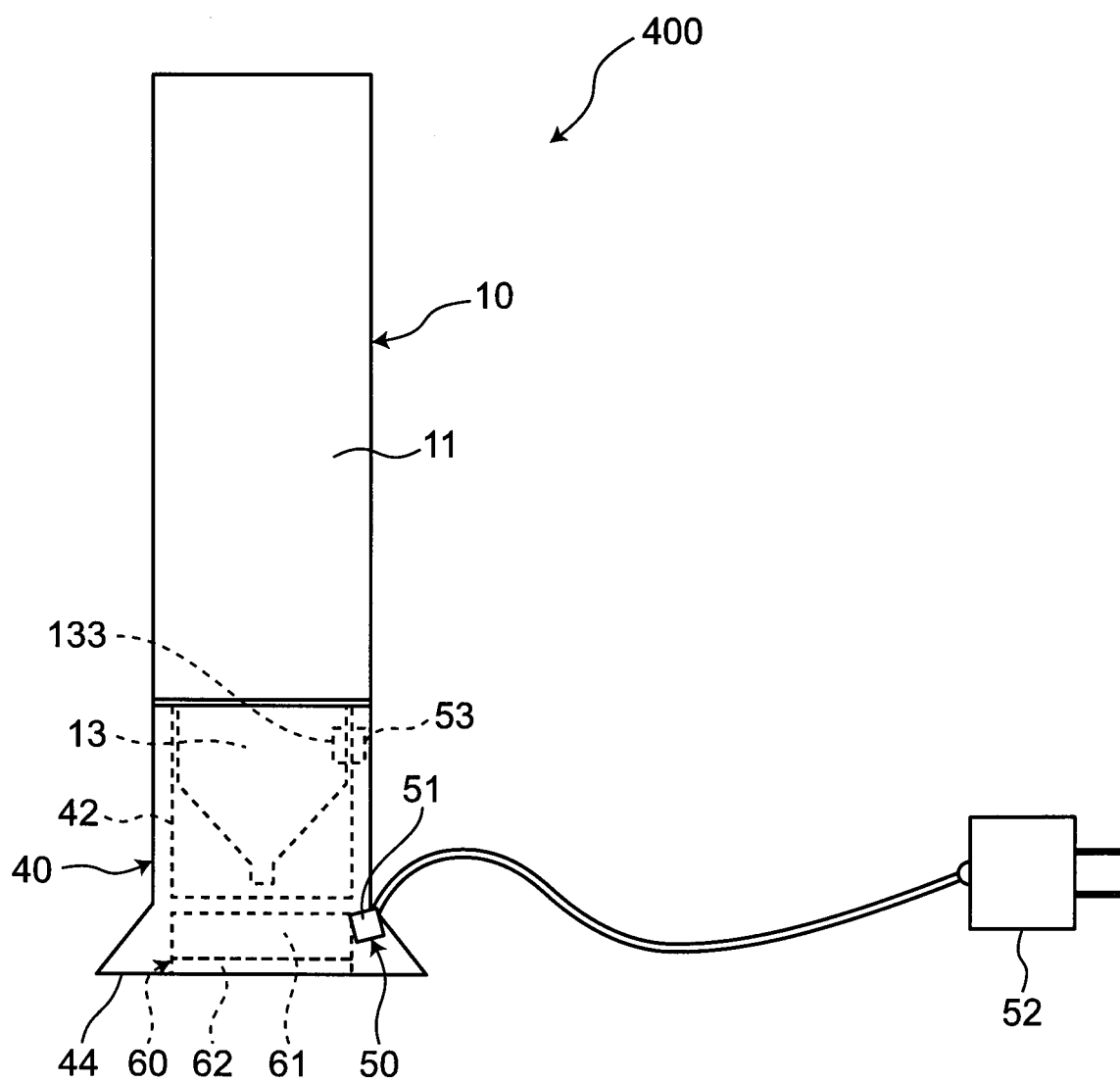
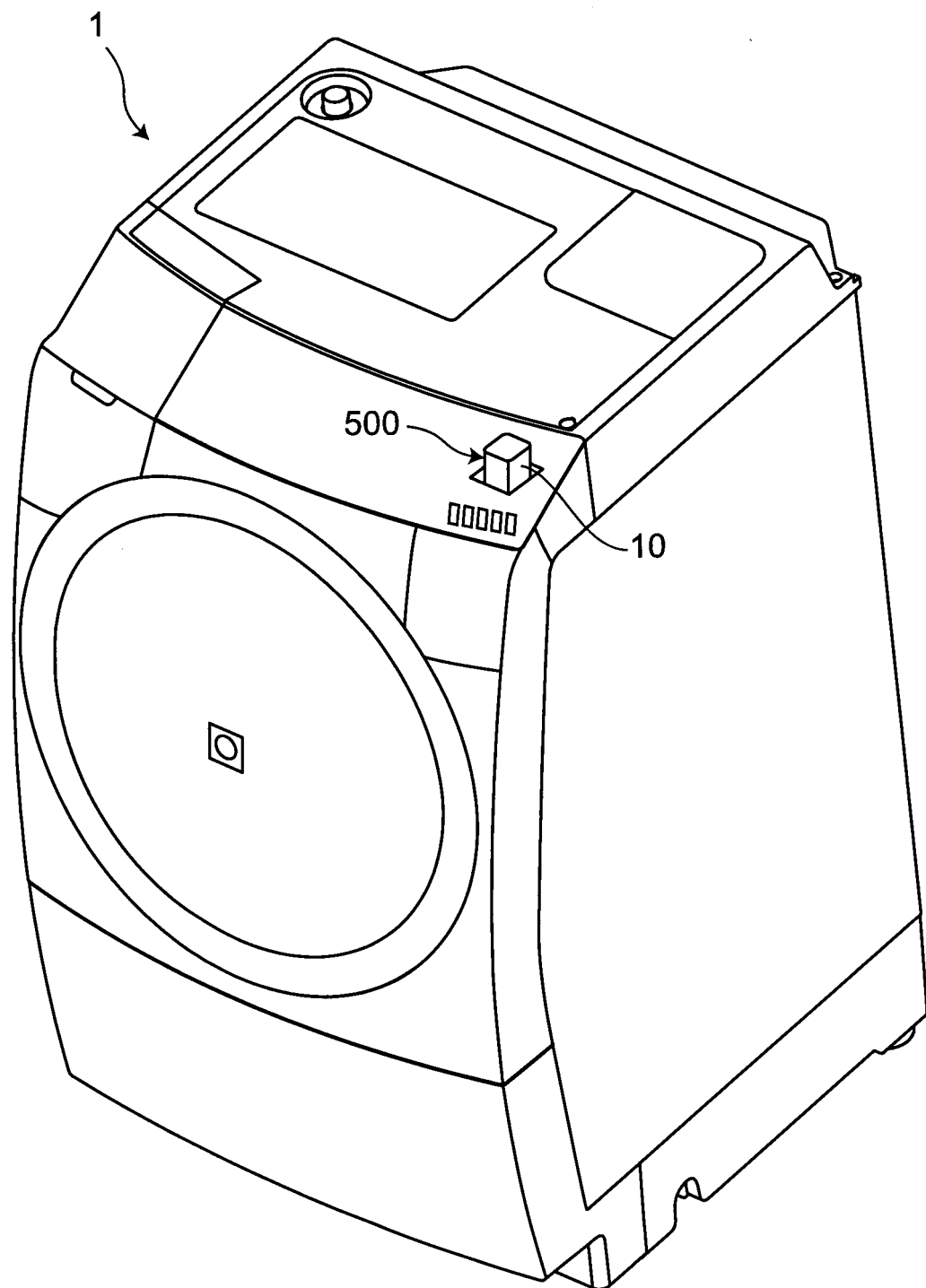


Fig.10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/003113

A. CLASSIFICATION OF SUBJECT MATTER

B08B3/12(2006.01)i, B06B1/02(2006.01)i, B06B1/06(2006.01)i, D06F7/04
(2006.01)i, D06F35/00(2006.01)i

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)

B08B3/12, B06B1/02, B06B1/06, D06F7/04, D06F35/00

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

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 2000-308788 A (Sharp Corp.), 07 November 2000 (07.11.2000), paragraphs [0017] to [0041]; fig. 1 to 4 (Family: none)	1-10
Y	JP 2001-310094 A (Kao Corp.), 06 November 2001 (06.11.2001), paragraph [0008]; fig. 1 & US 2001/0037537 A1 paragraph [0047]; fig. 1 & EP 1149637 A2 & DE 60126857 T2	1-10
Y	JP 2005-7215 A (Kumazaki Aim Corp.), 13 January 2005 (13.01.2005), paragraph [0011]; fig. 1 & US 2004/0250844 A1 paragraph [0033]; fig. 1	1-10



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"&"

document member of the same patent family

Date of the actual completion of the international search

13 February 2017 (13.02.17)

Date of mailing of the international search report

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Name and mailing address of the ISA/

Japan Patent Office

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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/003113

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 8-282717 A (Chuo Denki Sangyo Kabushiki Kaisha), 29 October 1996 (29.10.1996), fig. 1 to 3 (Family: none)	5
Y	JP 2003-164888 A (Kabushiki Kaisha Ekoru), 10 June 2003 (10.06.2003), fig. 1 (Family: none)	5
Y	JP 2003-513798 A (The Procter & Gamble Co.), 15 April 2003 (15.04.2003), fig. 11 & US 2002/0189634 A1 fig. 11 & US 2005/0199261 A1 & WO 2001/036117 A1 & EP 1232026 A1 & DE 60019790 T2 & AU 1613601 A & BR 15611 A & AT 294031 T & ES 2241673 T3 & MX PA02004889 A	7-8, 10

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REFERENCES CITED IN THE DESCRIPTION

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- JP 3768978 B [0003]