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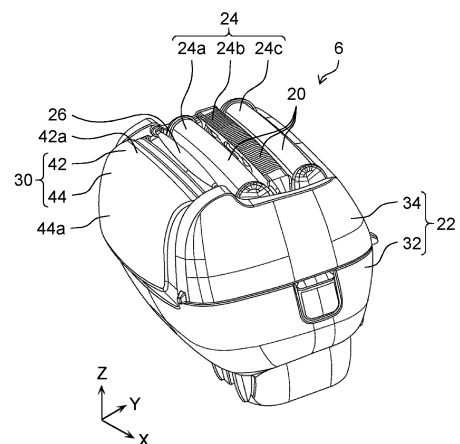
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(54) **ELECTRIC SHAVER**

(57) An electric shaver according to the present disclosure includes an outer blade that comes into contact with a skin surface, an inner blade that linearly reciprocates with respect to the outer blade to cut body hair on the skin surface in cooperation with the outer blade, and an electrode that comes into contact with the skin surface to supply a weak current to the skin surface. The electrode comprises a first electrode part in which a first electrode surface disposed side by side with the outer blade is formed and a second electrode part in which a second electrode surface hanging down from the first electrode surface in a direction intersecting the first electrode surface is formed.

FIG. 2



Description

TECHNICAL FIELD

[0001] The present disclosure relates to an electric shaver.

BACKGROUND ART

[0002] There is known an electric shaver having both a shaving function for shaving body hair and a skin care function for skin surface care (see, e.g., Patent Literature 1). A blade head of this type of electric shaver includes an outer blade, an inner blade linearly reciprocating with respect to the outer blade, and an electrode part for supplying a weak current to a skin surface. The outer blade includes a pair of net outer blades, and a slit blade disposed between the pair of net outer blades. The electrode part is disposed between one of the pair of net outer blades and the slit blade.

[0003] In a state where the outer blade is in contact with the skin surface, the inner blade reciprocates linearly with respect to the outer blade, so that body hair inserted into a blade hole of the outer blade is pinched between the inner blade and the outer blade and cut. In addition, in a state where the electrode part is in contact with the skin surface, it is possible to care for a skin surface by supplying a weak current from the electrode part to the skin surface.

Citation List

Patent Literature

[0004] PTL 1: Unexamined Japanese Patent Publication No. 2006-343322

SUMMARY OF THE INVENTION

[0005] However, since in the above-described conventional electric shaver, even in a case where a user wants to perform only skin surface care, the outer blade and the electrode part come into contact with the skin surface at the same time, there arises a problem that the skin surface might be damaged by the outer blade.

[0006] The present disclosure has been made in view of such problem, and an object of the present disclosure is to provide an electric shaver capable of effectively performing skin surface care while suppressing damage to a skin surface by an outer blade.

[0007] In order to solve the above problem, an electric shaver according to one aspect of the present disclosure includes: an outer blade that comes into contact with a skin surface; an inner blade that linearly reciprocates with respect to the outer blade to cut body hair on the skin surface in cooperation with the outer blade; and an electrode that comes into contact with the skin surface to supply a weak current to the skin surface. the electrode

comprises a first electrode part in which a first electrode surface disposed side by side with the outer blade is formed; and a second electrode part in which a second electrode surface hanging down from the first electrode surface in a direction intersecting the first electrode surface is formed.

[0008] In the electric shaver according to one aspect of the present disclosure, it is possible to effectively perform skin surface care while suppressing damage to the skin surface by the outer blade.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1A is a perspective view illustrating an electric shaver according to an exemplary embodiment.

Fig. 1B is a front view illustrating the electric shaver according to the exemplary embodiment.

Fig. 1C is a side view illustrating the electric shaver according to the exemplary embodiment.

Fig. 1D is a rear view illustrating the electric shaver according to the exemplary embodiment.

Fig. 2 is a perspective view illustrating a blade head according to the exemplary embodiment.

Fig. 3 is a front view illustrating the blade head according to the exemplary embodiment.

Fig. 4 is a top view illustrating the blade head according to the exemplary embodiment.

Fig. 5 is a side view illustrating the blade head according to the exemplary embodiment.

Fig. 6 is a cross-sectional view of a main part of the blade head according to the exemplary embodiment taken along line VI-VI in Fig. 4.

Fig. 7A is a rear view illustrating the blade head according to the exemplary embodiment in a state where an outer blade cassette has been removed.

Fig. 7B is a top view illustrating the blade head according to the exemplary embodiment in a state where the outer blade cassette has been removed.

Fig. 8A is a view for explaining arrangement of a first temperature sensor and a second temperature sensor in the blade head according to the exemplary embodiment.

Fig. 8B is a perspective view illustrating the first temperature sensor according to the exemplary embodiment.

Fig. 9 is a block diagram showing a functional configuration of the electric shaver according to the exemplary embodiment.

Fig. 10 is a diagram showing an example of an application pattern of a voltage applied to an electrode of the electric shaver according to the exemplary embodiment.

Fig. 11 is a diagram showing an example of an application pattern of a voltage applied to the electrode of the electric shaver according to the exemplary embodiment.

Fig. 12 is a diagram showing an example of an application pattern of a voltage applied to the electrode of the electric shaver according to the exemplary embodiment.

Fig. 13 is a diagram showing an example of an application pattern of a voltage applied to the electrode of the electric shaver according to the exemplary embodiment.

Fig. 14A is a view for explaining a method of using the electric shaver in a first mode according to the exemplary embodiment.

Fig. 14B is a view for explaining a method of using the electric shaver in a second mode according to the exemplary embodiment.

DESCRIPTION OF EMBODIMENT

[0010] The exemplary embodiment will be specifically described below with reference to the drawings.

[0011] Note that the exemplary embodiment to be described below provides comprehensive or specific examples of the present disclosure. Numerical values, shapes, materials, components, arrangement positions and connection modes of the components, steps, an order of the steps, and the like shown in the following exemplary embodiment are examples only, and are not intended to limit the present disclosure. Further, among the components in the following exemplary embodiment, those not recited in independent claims representing the most superordinate concept will be described herein as optional components.

[0012] Each drawing is a schematic view and is not necessarily strictly illustrated. In addition, in each drawing, substantially the same configurations are denoted by the same reference marks to eliminate or simplify overlapped description.

(Exemplary embodiment)

[1. Overall structure of electric shaver]

[0013] First, an overall structure of electric shaver 2 according to the exemplary embodiment will be described with reference to Figs. 1A to 1D. Fig. 1A is a perspective view illustrating electric shaver 2 according to the exemplary embodiment. Fig. 1B is a front view illustrating electric shaver 2 according to the exemplary embodiment. Fig. 1C is a side view illustrating electric shaver 2 according to the exemplary embodiment. Fig. 1D is a rear view illustrating electric shaver 2 according to the exemplary embodiment.

[0014] In Figs. 1A to 1D, a left-right direction of electric shaver 2 is defined as an X-axis direction, a front-rear direction of electric shaver 2 is defined as a Y-axis direction, and an up-down direction of electric shaver 2 is defined as a Z-axis direction.

[0015] Electric shaver 2 according to the exemplary embodiment is an electric shaver having both a shaving

function for shaving body hair (beard) grown on a skin surface of a human body and a skin care function for caring for the skin surface of the human body. As shown in Figs. 1A to 1D, electric shaver 2 includes shaver main body 4 and blade head 6.

[0016] Shaver main body 4 includes grip part 8 and coupling part 10. Grip part 8 is formed in a substantially bottomed cylindrical shape, and is formed in an elongated shape in the up-down direction (Z-axis direction). Grip part 8 is made, for example, of resin. When using electric shaver 2, a user grips grip part 8 by hand. Note that a secondary battery (not shown) for supplying electric power to each electronic component or the like is disposed inside grip part 8.

[0017] As illustrated in Figs. 1A and 1B, power switch 12, changeover switch 14, and temperature selector switch 16 are disposed on front surface 8a of grip part 8. Power switch 12 is a switch for switching on and off of a power source of electric shaver 2. Changeover switch 14 is a switch for switching a weak current supplied from electrode 30, which will be described later, to the skin surface in, for example, three stages ("strong", "weak", and "off"). Temperature selector switch 16 is a switch for switching the temperature of electrode 30 in, for example, three stages ("high", "low", and "off").

[0018] As shown in Figs. 1C and 1D, counter electrode part 18 made of, for example, metal, is disposed on back surface 8b of grip part 8. Counter electrode part 18 is formed in an elongated shape in a longitudinal direction (Z-axis direction) of grip part 8. Counter electrode part 18 preferably has an arrangement, a shape, and a size such that a palm or a finger of a user reliably touches counter electrode part 18 when the user holds grip part 8 with hand. A material of counter electrode part 18 is not limited to metal, and may be, for example, a conductive resin or an insulating resin coated with metal plating.

[0019] Coupling part 10 is disposed at one end portion of grip part 8 in the longitudinal direction. Coupling part 10 couples blade head 6 to grip part 8 so as to be swingable in the front-rear direction (Y-axis direction), the left-right direction (X-axis direction), or both the directions.

[0020] Blade head 6 has blade surface 20 for shaving body hair grown on a skin surface in a state of being in contact with the skin surface. Blade head 6 swings in the front-rear direction, the left-right direction, or both the direction with respect to shaver main body 4. As a result, when the user holds grip part 8 by hand and moves blade surface 20 of blade head 6 on the skin surface while pressing the blade surface against the skin surface, blade surface 20 comes into close contact with the skin surface while following a shape of the skin surface.

[2. Structure of blade head]

[0021] Next, structure of blade head 6 will be described with reference to Figs. 2 to 8B. Fig. 2 is a perspective view illustrating blade head 6 according to the exemplary embodiment. Fig. 3 is a front view illustrating blade head

6 according to the exemplary embodiment. Fig. 4 is a top view illustrating blade head 6 according to the exemplary embodiment. Fig. 5 is a side view illustrating blade head 6 according to the exemplary embodiment. Fig. 6 is a cross-sectional view of a main part of blade head 6 according to the exemplary embodiment taken along line VI-VI in Fig. 4. Fig. 7A is a rear view illustrating blade head 6 according to the exemplary embodiment in a state where outer blade cassette 34 has been removed. Fig. 7B is a top view illustrating blade head 6 according to the exemplary embodiment in a state where outer blade cassette 34 has been removed. Fig. 8A is a diagram for explaining arrangement of first temperature sensor 48 and second temperature sensor 50 in blade head 6 according to the exemplary embodiment. Fig. 8B is a perspective view illustrating first temperature sensor 48 according to the exemplary embodiment.

[0022] As illustrated in Figs. 2 to 5, blade head 6 has blade frame 22, outer blade 24, roller 26, inner blade 28, and electrode 30.

[0023] Blade frame 22 has frame body 32 and outer blade cassette 34. Frame body 32 is coupled to one end portion in the longitudinal direction of grip part 8 via coupling part 10 so as to be swingable in the front-rear direction, or the left-right direction, or both the directions. Outer blade cassette 34 is detachably attached to frame body 32.

[0024] Outer blade 24 is supported by outer blade cassette 34. Outer blade 24 has three outer blades, i.e., first net outer blade 24a, slit blade 24b, and second net outer blade 24c. First net outer blade 24a, slit blade 24b, and second net outer blade 24c are disposed in this order in the front-rear direction. First net outer blade 24a, slit blade 24b, and second net outer blade 24c define blade surface 20 described above. Each of first net outer blade 24a, slit blade 24b, and second net outer blade 24c may be made of metal such as stainless steel, or of resin, for example. Further, although in the present exemplary embodiment, outer blade 24 has three outer blades, the present disclosure is not limited thereto, and outer blade 24 may have any number of outer blades.

[0025] As shown in Figs. 2 and 4, first net outer blade 24a and second net outer blade 24c are each formed in an elongated shape in the left-right direction (X-axis direction) (an example of a predetermined direction), and are disposed substantially parallel to each other. In XZ front view shown in Fig. 3, first net outer blade 24a and second net outer blade 24c are each formed in a curved shape curved in the longitudinal direction (X-axis direction) so as to protrude upward (toward a plus side of the Z-axis). In YZ side view shown in Fig. 5, first net outer blade 24a and second net outer blade 24c are each formed to be curved in an inverted U shape in a lateral direction (Y-axis direction) so as to protrude upward. A plurality of blade holes (not shown) are formed each in first net outer blade 24a and second net outer blade 24c.

[0026] As shown in Figs. 2 and 4, slit blade 24b is formed in an elongated shape in the left-right direction,

and is disposed substantially parallel to each of first net outer blade 24a and second net outer blade 24c. In YZ side view shown in Fig. 5, slit blade 24b is formed in a substantially inverted U-shape in the lateral direction (Y-axis direction). In other words, an upper surface (surface defining blade surface 20) of slit blade 24b is formed with a flat surface. A plurality of slit-shaped blade holes 36 (see Fig. 4) are formed in slit blade 24b.

[0027] As shown in Figs. 2 and 4, roller 26 is rotatably supported by outer blade cassette 34. Roller 26 is formed in an elongated shape in the left-right direction, and is disposed between first net outer blade 24a and first electrode part 42, which will be described later, of electrode 30. As shown in Fig. 6, roller 26 projects more toward a skin surface side (the plus side of the Z-axis) than blade surface 20 of outer blade 24 and first electrode surface 42a, which will be described later, of first electrode part 42. In other words, roller 26 projects more toward the skin surface than plane 38 (indicated by a chain line in Fig. 6) including blade surface 20 and first electrode surface 42a.

[0028] As shown in Fig. 7A, inner blade 28 is supported by frame body 32 via inner blade driver 40, and is disposed between outer blade 24 and frame body 32. As shown in Fig. 7B, inner blade 28 has three inner blades, i.e., first inner blade 28a, slit inner blade 28b, and second inner blade 28c. First inner blade 28a, slit inner blade 28b, and second inner blade 28c are disposed so as to be opposed to first net outer blade 24a, slit blade 24b, and second net outer blade 24c, respectively.

[0029] When inner blade driver 40 is driven, first inner blade 28a, slit inner blade 28b, and second inner blade 28c reciprocate linearly with a predetermined amplitude in the left-right direction with respect to first net outer blade 24a, slit blade 24b, and second net outer blade 24c, respectively. As a result, body hair inserted into blade holes of first net outer blade 24a and second net outer blade 24c and blade holes 36 of slit blade 24b is pinched and cut by cooperation of first net outer blade 24a, slit blade 24b, and second net outer blade 24c, and first inner blade 28a, slit inner blade 28b, and second inner blade 28c.

[0030] Electrode 30 is for performing skin surface care by supplying a weak current to a skin surface in a state of being in contact with the skin surface. As shown in Figs. 2 to 5, electrode 30 is made of metal, for example, and is supported by outer blade cassette 34. The electrode 30 has first electrode part 42 and second electrode part 44, and is formed in a substantially inverted J-shaped plate as a whole in YZ cross-sectional view. A material of electrode 30 is not limited to metal, and may be, for example, a conductive resin or an insulating resin coated with metal plating.

[0031] As illustrated in Figs. 2 to 5, first electrode part 42 is disposed on a top surface (surface on which blade surface 20 is disposed) of blade head 6. First electrode surface 42a is formed on a periphery of first electrode part 42. First electrode surface 42a is disposed side by

side with blade surface 20 in the front-rear direction (direction substantially perpendicular to the left-right direction).

[0032] As illustrated in Fig. 3, first electrode surface 42a is formed in a curved shape curved in the left-right direction so as to protrude upward. At this time, a curvature of the curved shape of first electrode surface 42a is the same (including substantially the same) as a curvature of each curved shape of first net outer blade 24a and second net outer blade 24c. This enables blade surface 20 and first electrode surface 42a to be pressed against the skin surface with substantially the same pressure when blade surface 20 and first electrode surface 42a are simultaneously brought into contact with the skin surface in a first mode, which will be described later. As a result, since it is possible to prevent only blade surface 20 from being strongly pressed against the skin surface, the skin surface can be gently cared. In addition, since it is also possible to prevent only first electrode surface 42a from being strongly pressed against the skin surface, blade surface 20 can be firmly brought into close contact with the skin surface, and shaving can be effectively performed.

[0033] As illustrated in Figs. 2 to 5, second electrode part 44 is disposed on a front of blade head 6 (a surface hanging down toward front surface 8a of grip part 8 from the top surface of blade head 6). Second electrode surface 44a is formed on a periphery of second electrode part 44. Second electrode surface 44a continuously extends from first electrode surface 42a. Specifically, second electrode surface 44a hangs down from first electrode surface 42a in a direction (a minus side of the Z-axis) intersecting first electrode surface 42a. Second electrode surface 44a has an area larger than that of first electrode surface 42a.

[0034] As shown in Fig. 4, second electrode surface 44a is formed in a curved shape curved in the left-right direction so as to protrude forward (a minus side of the Y-axis) when blade surface 20 is viewed in an XY plane. This enables second electrode surface 44a to be efficiently fitted to a recessed surface of a face, for example, when second electrode surface 44a is brought into contact with the skin surface in a second mode, which will be described later.

[0035] As illustrated in Figs. 5 and 6, boundary part 46 between first electrode surface 42a and second electrode surface 44a is formed in a curved shape. As a result, when blade surface 20 and first electrode surface 42a are simultaneously brought into contact with the skin surface in the first mode, which will be described later, and when second electrode surface 44a is brought into contact with the skin surface in the second mode, which will be described later, a large contact area of first electrode surface 42a or second electrode surface 44a with the skin surface can be secured.

[0036] As illustrated in Fig. 8A, first temperature sensor 48 and second temperature sensor 50 (an example of a temperature sensor) are embedded in first electrode sur-

face 42a and second electrode surface 44a, respectively. First temperature sensor 48 detects temperature of the skin surface in contact with first electrode surface 42a. Second temperature sensor 50 detects temperature of the skin surface in contact with second electrode surface 44a. As illustrated in (a) and (b) of Fig. 8B, first temperature sensor 48 has temperature detection block 52 and heat insulating sheet 54. Temperature detection block 52 detects the temperature of the skin surface in contact with first electrode surface 42a, and outputs temperature data indicating the detected temperature to controller 62, which will be described later. Heat insulating sheet 54 is disposed so as to cover a surface of temperature detection block 52, and blocks heat transfer from first electrode part 42 to temperature detection block 52. Since a configuration of second temperature sensor 50 is the same as the configuration of first temperature sensor 48, description thereof will be omitted.

[3. Functional configuration of electric shaver]

[0037] Next, with reference to Figs. 9 to 13, a functional configuration of electric shaver 2 according to the exemplary embodiment will be described. Fig. 9 is a block diagram illustrating the functional configuration of electric shaver 2 according to the exemplary embodiment. Each of Figs. 10 to 13 is a diagram showing an example of an application pattern of a voltage applied to electrode 30 of electric shaver 2 according to the exemplary embodiment.

[0038] As shown in Fig. 9, electric shaver 2 includes, as a functional configuration, first temperature sensor 48, second temperature sensor 50, drive unit 56, voltage supply unit 58, heater 60, and controller 62.

[0039] First temperature sensor 48 detects temperature of a skin surface in contact with first electrode surface 42a, and outputs temperature data indicating the detected temperature to controller 62. Second temperature sensor 50 detects temperature of a skin surface in contact with second electrode surface 44a, and outputs temperature data indicating the detected temperature to controller 62.

[0040] Drive unit 56 is a motor for driving inner blade driver 40. Although not shown in Figs. 1A to 1D, drive unit 56 is disposed, for example, inside shaver main body 4.

[0041] Voltage supply unit 58 is a voltage supply source for applying a predetermined voltage to electrode 30. Although not shown in Figs. 1A to 1D, voltage supply unit 58 is disposed inside shaver main body 4, for example. When voltage supply unit 58 applies a predetermined voltage to electrode 30, a weak current of, for example, about several μA is supplied to the skin surface which has been in contact with electrode 30. Note that a biological current of 100 μA to 200 μA flows through a human body, and it has been demonstrated that natural healing power is enhanced by causing a weak current close to the biological current to flow through the human body from the outside of the body.

[0042] The voltage supply unit 58 can apply, as the predetermined voltage to be applied to electrode 30, a) a DC voltage of constant voltage value L1 as shown in Fig. 10, b) a DC voltage of rectangular wave L2 as shown in Fig. 11, c) an AC voltage of sinusoidal wave L3 as shown in Fig. 12, or d) an AC voltage of rectangular wave L4 as shown in Fig. 13, or the like. Although not illustrated, voltage supply unit 58 may apply an AC voltage of a triangular wave as the predetermined voltage to be applied to electrode 30. In the example shown in Fig. 10, voltage supply unit 58 preferably applies a DC voltage having constant voltage value V1 within a range from 0.01 V to 20 V to electrode 30 in order to activate skin tissue of the skin surface. When constant voltage value L1 is lower than 0.01 V, the skin surface cannot be maintained in a normal potential state. On the other hand, when constant voltage value L1 exceeds 20 V, an excessive current may flow through the skin surface to decrease number of cells on the skin surface by electrolysis.

[0043] The predetermined voltage applied by voltage supply unit 58 may be any kind of voltage such as a constant voltage, a pulse voltage, or a voltage having a value that periodically varies. For example, in a case where the predetermined voltage is a DC voltage that has a voltage value varying such as a pulse voltage (60 Hz to 1 MHz), an average voltage value or a peak voltage value is preferably within the above range from 0.01 V to 20 V. When constant current control is performed, the average voltage value of the predetermined voltage is preferably within the range from 0.01 V to 20 V. On the other hand, when the predetermined voltage is an AC voltage, the peak voltage value of the predetermined voltage is preferably within the above range from 0.01 V to 20 V. Here, in a case where the predetermined voltage is an AC voltage, a weak current can be supplied to the skin surface even if the voltage value is relatively low, and electrical pain given to a user can be decreased by increasing a frequency even if the voltage value is relatively high.

[0044] Although in the present exemplary embodiment, the description has been made of the case where voltage supply unit 58 performs constant voltage control, the present disclosure is not limited thereto, and the constant current control may be performed. Since in this case, the voltage value varies depending on conditions and the like, the average voltage value or the peak voltage value is preferably within the range from 0.01 V to 20 V also in this case.

[0045] Heater 60 is a heat source for heating electrode 30. Although not illustrated in Figs. 1A to 1D, heater 60 is disposed inside blade head 6, for example.

[0046] Controller 62 controls drive unit 56 on the basis of operation of power switch 12 by the user. Specifically, when the user operates power switch 12 to turn on electric shaver 2, controller 62 controls drive unit 56 to drive inner blade driver 40. When the user operates power switch 12 to turn off electric shaver 2, controller 62 controls drive unit 56 to stop driving of inner blade driver 40.

[0047] Note that controller 62 may control drive unit 56

on the basis of a detection result of first temperature sensor 48 or second temperature sensor 50. Specifically, when the temperature of the skin surface detected by first temperature sensor 48 or second temperature sensor 50 is more than or equal to a threshold value, controller 62 determines that inflammation has occurred on the skin surface, and controls drive unit 56 to decrease the amplitude of inner blade 28. Accordingly, it is possible to suppress putting of a burden on the skin surface during shaving. On the other hand, when the temperature of the skin surface detected by first temperature sensor 48 or second temperature sensor 50 is less than the threshold, controller 62 determines that the state of the skin surface is good, and controls drive unit 56 to increase the amplitude of inner blade 28. This enables deep shaving of body hair during shaving.

[0048] In addition, controller 62 controls voltage supply unit 58 on the basis of the operation of changeover switch 14 by the user. Specifically, when the user operates changeover switch 14 to switch the weak current which is supplied from electrode 30 to the skin surface to "strong", controller 62 controls voltage supply unit 58 so that the weak current which is supplied from electrode 30 to the skin surface has a first current value. In a case where the user operates changeover switch 14 to switch the weak current which is supplied from electrode 30 to the skin surface to "weak", controller 62 controls voltage supply unit 58 so that the weak current which is supplied from electrode 30 to the skin surface has a second current value smaller than the first current value. In a case where the user operates the changeover switch 14 to switch the weak current which is supplied from electrode 30 to the skin surface to "off", controller 62 controls voltage supply unit 58 such that the supply of the weak current from electrode 30 to the skin surface is stopped.

[0049] Furthermore, controller 62 controls drive unit 56 and voltage supply unit 58 to switch from one of the first mode and the second mode to the other. In the first mode, shaving and skin surface care are simultaneously performed. In the second mode, only skin surface care is performed. In the first mode, controller 62 controls drive unit 56 to drive inner blade driver 40, and controls voltage supply unit 58 to supply a weak current from electrode 30 to the skin surface. In the second mode, controller 62 controls drive unit 56 to stop driving of inner blade driver 40, and controls voltage supply unit 58 to supply a weak current from electrode 30 to the skin surface.

[0050] Furthermore, controller 62 controls energization of heater 60 on the basis of user's operation of temperature selector switch 16. Specifically, when the user operates temperature selector switch 16 to switch the temperature of electrode 30 to "high", controller 62 controls energization of heater 60 such that the temperature of electrode 30 becomes a first temperature. When the user operates temperature selector switch 16 to switch the temperature of electrode 30 to "low", controller 62 controls energization of heater 60 such that the temperature of electrode 30 becomes a second temperature

which is lower than the first temperature. When the user operates temperature selector switch 16 to switch the temperature of electrode 30 to "off", controller 62 stops energization of heater 60 so that electrode 30 is not heated by heater 60.

[0051] Controller 62 may control energization of heater 60 on the basis of a detection result of first temperature sensor 48 or second temperature sensor 50. Specifically, controller 62 may control the energization of heater 60 such that the temperature of electrode 30 becomes higher (or lower) than the temperature of the skin surface. As just described, adjustment of the temperature of electrode 30 depending on the temperature of the skin surface by controller 62 enables a user to bring electrode 30 into contact with the skin surface at a comfortable temperature during shaving or care for the skin surface. In addition, an appropriate temperature difference between the skin surface and electrode 30 can be maintained, and care for the skin surface can be performed at an appropriate temperature regardless of timing, place, or the like of using electric shaver 2.

[0052] Furthermore, controller 62 may control heater 60 so as to make the temperature of electrode 30 different between the first mode and the second mode. Specifically, for example, controller 62 may control heater 60 so that the temperature of electrode 30 in the first mode becomes higher than the temperature of electrode 30 in the second mode. This enables the user to bring electrode 30 into contact with the skin surface at a comfortable temperature in both the first mode and the second mode even when a proper temperature of electrode 30 differs in each of the first mode and the second mode.

[4. Method of using electric shaver]

[4-1. Using method in first mode]

[0053] Next, a method of using electric shaver 2 according to the exemplary embodiment will be described with reference to Fig. 14A. Fig. 14A is a view for explaining a method of using electric shaver 2 according to the exemplary embodiment in the first mode.

[0054] When the user operates power switch 12 to turn on electric shaver 2, controller 62 switches the mode to the first mode in which shaving and skin surface care are simultaneously performed.

[0055] As illustrated in Fig. 14A, the user holds grip part 8 by hand to bring blade surface 20 of blade head 6 and first electrode surface 42a of first electrode part 42 of electrode 30 into contact with the skin surface at the same time. As a result, the shaving for shaving body hair on the skin surface in contact with blade surface 20 is performed, and at the same time, the care is performed for the skin surface by supplying a weak current of, for example, about several μA from first electrode part 42 to the skin surface.

[0056] When the user holds grip part 8 by hand and presses blade head 6 against the skin surface, roller 26

most largely receives the force to press blade head 6 against the skin surface. In this way, rotating roller 26 decreases frictional resistance. Therefore, it is possible to smoothly move blade surface 20 and first electrode surface 42a on the skin surface so as to slide with less friction while firmly pressing them against the skin surface. As a result, it is possible to simultaneously perform shaving and skin surface care while suppressing a burden on the skin surface.

[0057] As described above, by simultaneously performing shaving and skin surface care, particularly when skin is rough and dry, wounded skin tissue is repaired by the weak current, resulting in enabling restoration and acceleration of a barrier function of skin cornea. As a result, the skin surface after shaving can be made moist and smooth, and the state of the skin surface can be improved. In addition, since the weak current is supplied to the skin surface, the electrical stimulation given to the user is also weak, and no electrical pain is given to the user. Furthermore, since electrode 30 is not in electrical contact with outer blade 24 of blade head 6, even in a case where outer blade 24 is made of metal, outer blade 24 is not electrically oxidized and corroded. In particular, it is possible to avoid occurrence of blade spill due to electric corrosion of a pointed portion of blade surface 20 made of metal.

[0058] When the user holds grip part 8 by hand, the user's palm or finger comes into contact with counter electrode part 18 disposed in grip part 8. Accordingly, when first electrode surface 42a is brought into contact with the skin surface subjected to shaving, a closed circuit is formed between electrode 30 and counter electrode part 18 via a user's body. As a result, a weak current easily flows through the user's body, and a voltage having the same potential is always applied to the skin surface subjected to shaving. In addition, the user's palm or finger comes into contact with counter electrode part 18 just by the user's holding of grip part 8 by hand, so that grip part 8 which is held by the user can be used to enhance a weak electrical stimulation effect.

[0059] Furthermore, when a DC voltage is applied to electrode 30, a minus potential can be applied to the skin surface subjected to shaving by using electrode 30 as a negative electrode and counter electrode part 18 as a positive electrode. This makes it possible to maintain the skin surface in the normal potential state, and to effectively care for the skin surface.

[4-2. Using method in second mode]

[0060] Next, a method of using electric shaver 2 according to the exemplary embodiment will be described with reference to Fig. 14B. Fig. 14B is a view for explaining a method of using electric shaver 2 according to the exemplary embodiment in the second mode.

[0061] The user operates changeover switch 14 to switch the weak current which is supplied from electrode 30 to the skin surface to "strong" or "weak". As a result,

controller 62 switches the mode to the second mode in which only the skin surface care is performed.

[0062] As shown in Fig. 14B, the user holds grip part 8 by hand and brings second electrode surface 44a of second electrode part 44 of electrode 30 into contact with the skin surface. At this time, blade surface 20 is not in contact with the skin surface. As a result, shaving is not performed, and only care is performed for the skin surface to which a weak current of, for example, about several μA is supplied from second electrode part 44 to the skin surface. Since controller 62 stops driving of inner blade driver 40, wasteful consumption of the secondary battery built in electric shaver 2 can be suppressed.

[5. Advantageous effects]

[0063] As described above, in the present exemplary embodiment, electric shaver 2 includes: outer blade 24 that comes into contact with a skin surface; inner blade 28 that linearly reciprocates with respect to outer blade 24 to cut body hair on the skin surface in cooperation with the outer blade 24; and electrode 30 that comes into contact with the skin surface to supply a weak current to the skin surface. Electrode 30 includes first electrode part 42 in which first electrode surface 42a disposed side by side with outer blade 24 is formed, and second electrode part 44 in which second electrode surface 44a hanging down from first electrode surface 42a in a direction intersecting first electrode surface 42a is formed.

[0064] In the above electric shaver, when, for example, a user wants to simultaneously perform shaving and skin surface care, the user brings outer blade 24 and first electrode surface 42a into contact with the skin surface simultaneously. Furthermore, in a case, for example, where the user wants to perform only skin surface care, the user brings only second electrode surface 44a into contact with the skin surface without bringing outer blade 24 into contact with the skin surface. Accordingly, in a case where the user wants to perform only skin surface care, it is possible to effectively care for the skin surface while suppressing damage to the skin surface by outer blade 24.

[0065] In addition, in the present exemplary embodiment, boundary part 46 between first electrode surface 42a and second electrode surface 44a is formed in a curved shape.

[0066] In the above case, for example, when outer blade 24 and first electrode surface 42a are simultaneously brought into contact with the skin surface, or when only second electrode surface 44a is brought into contact with the skin surface, a large contact area of first electrode surface 42a or second electrode surface 44a with respect to the skin surface can be secured.

[0067] Furthermore, in the present exemplary embodiment, outer blade 24 is formed in an elongated shape in a predetermined direction, and is formed in a curved shape in the predetermined direction. First electrode surface 42a is disposed side by side with outer blade 24 in

a direction perpendicular (including substantially perpendicular) to the predetermined direction, and is formed in the predetermined direction in a curved shape having a curvature identical (including substantially identical) to that of the curved shape of outer blade 24.

[0068] In the above case, for example, when outer blade 24 and first electrode surface 42a are simultaneously brought into contact with the skin surface, outer blade 24 and first electrode surface 42a can be pressed against the skin surface with substantially the same pressure. As a result, it is possible to prevent only outer blade 24 from being strongly pressed against the skin surface, so that the skin surface can be gently cared. Furthermore, since it is possible to prevent only first electrode surface 42a from being strongly pressed against the skin surface, outer blade 24 can be firmly brought into close contact with the skin surface, and shaving can be effectively performed.

[0069] In the present exemplary embodiment, second electrode surface 44a is formed in a curved shape in plan view of outer blade 24.

[0070] This enables second electrode surface 44a to be efficiently fitted to a recessed surface of a face, for example, when only second electrode surface 44a is brought into contact with the skin surface.

[0071] Furthermore, in the present exemplary embodiment, electric shaver 2 further includes roller 26 that is disposed between outer blade 24 and first electrode part 42 and projects more toward the skin surface than outer blade 24 and first electrode part 42.

[0072] In the above case, when the user simultaneously presses outer blade 24 and first electrode surface 42a against the skin surface, roller 26 most largely receives the force that presses outer blade 24 and first electrode surface 42a against the skin surface. In this way, rotating roller 26 decreases frictional resistance; therefore, it is possible to smoothly move outer blade 24 and first electrode surface 42a on the skin surface so as to slide with less friction while firmly pressing them against the skin surface. As a result, it is possible to simultaneously perform shaving and skin surface care while suppressing a burden on the skin surface.

[0073] Furthermore, in the present exemplary embodiment, electric shaver 2 further includes drive unit 56 that linearly reciprocates inner blade 28 with respect to outer blade 24, and controller 62 that performs control to switch from one of a first mode and a second mode to the other. In the first mode, drive unit 56 is driven and a weak current is supplied from electrode 30 to the skin surface. In the second mode, drive unit 56 is stopped driving and a weak current is supplied from electrode 30 to the skin surface.

[0074] In the above case, since the same electrode 30 is used in the two modes, electric shaver 2 can be made compact, and electrode 30 can be easily touched to a target place on the skin surface.

[0075] Furthermore, in the present exemplary embodiment, controller 62 controls the temperature of electrode 30 depending on the temperature of the skin surface.

[0076] This enables the user to bring electrode 30 into contact with the skin surface at a comfortable temperature during shaving or skin surface care.

[0077] Furthermore, in the present exemplary embodiment, controller 62 performs control such that the temperature of electrode 30 differs between the first mode and the second mode.

[0078] This enables the user to bring electrode 30 into contact with the skin surface at a comfortable temperature in both the first mode and the second mode even when a proper temperature of electrode 30 differs in each of the first mode and the second mode.

[0079] Furthermore, in the present exemplary embodiment, electric shaver 2 further includes first temperature sensor 48 (second temperature sensor 50) that detects the temperature of the skin surface in contact with electrode 30. Controller 62 controls electrode 30 or drive unit 56 on the basis of the detection result of first temperature sensor 48 (second temperature sensor 50).

[0080] This enables electrode 30 or drive unit 56 to be appropriately controlled depending on the temperature of the skin surface.

[0081] Furthermore, in the present exemplary embodiment, controller 62 controls the amplitude of inner blade 28 on the basis of the detection result of first temperature sensor 48 (second temperature sensor 50).

[0082] This enables shaving to be appropriately performed depending on the temperature of the skin surface.

[0083] Furthermore, in the present exemplary embodiment, controller 62 controls the temperature of electrode 30 on the basis of the detection result of first temperature sensor 48 (second temperature sensor 50).

[0084] This enables skin surface care to be appropriately performed according to the temperature of the skin surface.

[0085] Furthermore, in electric shaver 2 according to the present exemplary embodiment, blade head 6 is provided with outer blade 24 and electrode 30. Electrode 30 includes first electrode surface 42a disposed side by side with outer blade 24 and second electrode surface 44a extending from first electrode surface 42a so as to hang down to the front side of blade head 6.

[0086] In the above case, when, for example, a user wants to simultaneously perform shaving and skin surface care, the user brings outer blade 24 and first electrode surface 42a into contact with the skin surface simultaneously. Furthermore, in a case, for example, where the user wants to perform only skin surface care, the user brings only second electrode surface 44a into contact with the skin surface without bringing outer blade 24 into contact with the skin surface. In this way, in a case where the user wants to perform only skin surface care, it is possible to effectively care for the skin surface while suppressing damage to the skin surface by outer blade 24.

[0087] In addition, in the present exemplary embodiment, boundary part 46 between first electrode surface 42a and second electrode surface 44a is formed in a

curved shape.

[0088] In the above case, for example, when outer blade 24 and first electrode surface 42a are simultaneously brought into contact with the skin surface, or when only second electrode surface 44a is brought into contact with the skin surface, a large contact area of first electrode surface 42a or second electrode surface 44a with respect to the skin surface can be secured.

[0089] Furthermore, in the present exemplary embodiment, outer blade 24 is formed in an elongated shape in a predetermined direction, and is formed in a curved shape in the predetermined direction. First electrode surface 42a is disposed side by side with outer blade 24 in a direction perpendicular (including substantially perpendicular) to the predetermined direction, and is formed in the predetermined direction in a curved shape having a curvature identical (including substantially identical) to that of the curved shape of outer blade 24.

[0090] In the above case, for example, when outer blade 24 and first electrode surface 42a are simultaneously brought into contact with the skin surface, outer blade 24 and first electrode surface 42a can be pressed against the skin surface with substantially the same pressure. As a result, it is possible to prevent only outer blade 24 from being strongly pressed against the skin surface, so that the skin surface can be gently cared. Furthermore, since it is possible to prevent only first electrode surface 42a from being strongly pressed against the skin surface, outer blade 24 can be firmly brought into close contact with the skin surface, and shaving can be effectively performed.

[0091] In the present exemplary embodiment, second electrode surface 44a is formed in a curved shape in plan view of outer blade 24.

[0092] This enables second electrode surface 44a to be efficiently fitted to a recessed surface of a face, for example, when only second electrode surface 44a is brought into contact with the skin surface.

[0093] Furthermore, controller 62 includes, for example, a microcontroller having one or more processors and one or more memories. The microcontroller realizes a function as controller 62 by executing a program recorded in the one or more memories by the one or more processors. The program may be recorded in a memory in advance, may be provided being recorded in a non-transitory recording medium such as a memory card, or may be provided through an electric communication line. In other words, the program is a program for causing the one or more processors to function as controller 62.

(Other modified example)

[0094] The exemplary embodiment has been described in the foregoing as an example of the technique disclosed in the present application. The technique according to the present disclosure is, however, not limited to the above exemplary embodiment, and is applicable to other exemplary embodiments having appropriate

modifications, replacements, additions, omissions, and the like. In addition, a new exemplary embodiment can be made by combining the components described in the above exemplary embodiment.

[0095] Although in the above exemplary embodiment, second electrode part 44 is disposed on the front of blade head 6, the present invention is not limited thereto, and second electrode part 44 may be disposed on a back surface of blade head 6 (the surface hanging down from the top surface of blade head 6 to the back surface 8b of grip part 8). In this case, second electrode surface 44a is disposed to hang down from first electrode surface 42a toward the back surface of blade head 6.

[0096] The present disclosure is applicable to, for example, an electric shaver having both a shaving function and a skin care function.

REFERENCE MARKS IN THE DRAWINGS

[0097]

2 electric shaver
4 shaver main body
6 blade head
8 grip part
8a front surface
8b back surface
10 coupling part
12 power switch
14 changeover switch
16 temperature selector switch
18 counter electrode part
20 blade surface
22 blade frame
24 outer blade
24a first net outer blade
24b slit blade
24c second net outer blade
26 roller
28 inner blade
28a first inner blade
28b slit inner blade
28c second inner blade
30 electrode
32 frame body
34 outer blade cassette
36 blade hole
38 plane
40 inner blade driver
42 first electrode part
42a first electrode surface
44 second electrode part
44a second electrode surface
46 boundary part
48 first temperature sensor
50 second temperature sensor
52 temperature detection block
54 heat insulating sheet

56 drive unit
58 voltage supply unit
60 heater
62 controller

Claims

1. An electric shaver, comprising:

an outer blade that comes into contact with a skin surface;
an inner blade that linearly reciprocates with respect to the outer blade to cut body hair on the skin surface in cooperation with the outer blade; and
an electrode that comes into contact with the skin surface to supply a weak current to the skin surface,
wherein
the electrode comprises:

a first electrode part in which a first electrode surface disposed side by side with the outer blade is formed; and
a second electrode part in which a second electrode surface hanging down from the first electrode surface in a direction intersecting the first electrode surface is formed.

2. The electric shaver according to Claim 1, wherein a boundary part between the first electrode surface and the second electrode surface is formed in a curved shape.

3. The electric shaver according to Claim 1 or 2, wherein

the outer blade is formed in an elongated shape in a predetermined direction, and is formed in a curved shape in the predetermined direction, and
the first electrode surface is disposed side by side with the outer blade in a direction perpendicular to the predetermined direction, and is formed in the predetermined direction in a curved shape having a curvature identical to that of the curved shape of the outer blade.

4. The electric shaver according to any one of Claims 1 to 3, wherein the second electrode surface is formed in a curved shape in plan view of the outer blade.

5. The electric shaver according to any one of Claims 1 to 4, further comprising:
a roller that is disposed between the outer blade and the first electrode part and projects more toward a

skin surface than the outer blade and the first electrode part.

6. The electric shaver according to any one of Claims 1 to 5, further comprising:
 - a drive unit that linearly reciprocates the inner blade with respect to the outer blade; and
 - a controller that performs control to switch from one of a first mode and a second mode to another, wherein
 - in the first mode, the drive unit is driven and the weak current is supplied from the electrode to the skin surface, and
 - in the second mode, the drive unit is stopped driving and the weak current is supplied from the electrode to the skin surface.
7. The electric shaver according to Claim 6, wherein the controller controls temperature of the electrode depending on temperature of the skin surface.
8. The electric shaver according to Claim 6 or 7, wherein the controller performs control to cause the temperature of the electrode to differ between the first mode and the second mode.
9. The electric shaver according to any one of Claims 6 to 8, further comprising:
 - a temperature sensor that detects the temperature of the skin surface in contact with the electrode, wherein
 - the controller controls the electrode or the drive unit on the basis of a detection result of the temperature sensor.
10. The electric shaver according to Claim 9, wherein the controller controls an amplitude of the inner blade on the basis of the detection result of the temperature sensor.
11. The electric shaver according to Claim 9, wherein the controller controls the temperature of the electrode on the basis of the detection result of the temperature sensor.
12. An electric shaver, wherein
 - a blade head is provided with an outer blade and an electrode,
 - the electrode comprises a first electrode surface disposed side by side with the outer blade and a second electrode surface extending from the first electrode surface so as to hang down to a

front surface side or a back surface side of the blade head.

13. The electric shaver according to Claim 12, wherein a boundary part between the first electrode surface and the second electrode surface is formed in a curved shape.
14. The electric shaver according to Claim 12 or 13, wherein
 - the outer blade is formed in an elongated shape in a predetermined direction, and is formed in a curved shape in the predetermined direction, and
 - the first electrode surface is disposed side by side with the outer blade in a direction perpendicular to the predetermined direction, and is formed in the predetermined direction in a curved shape having a curvature identical to that of the curved shape of the outer blade.
15. The electric shaver according to any one of Claims 12 to 14, wherein the second electrode surface is formed in a curved shape in plan view of the outer blade.

FIG. 1A

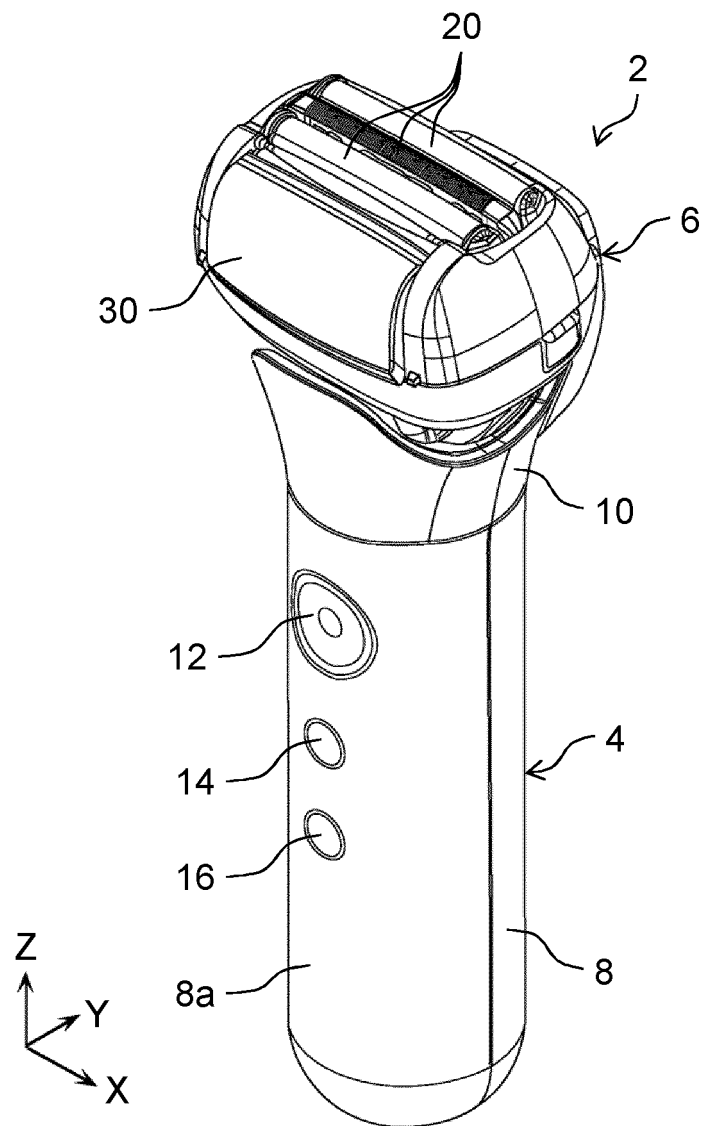


FIG. 1B

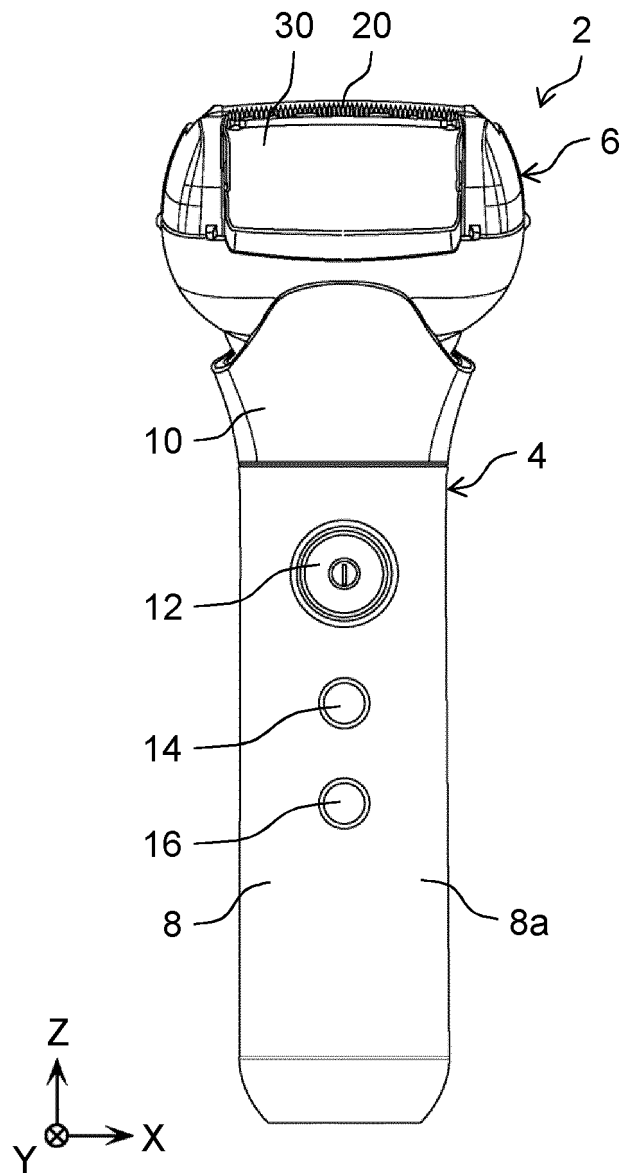


FIG. 1C

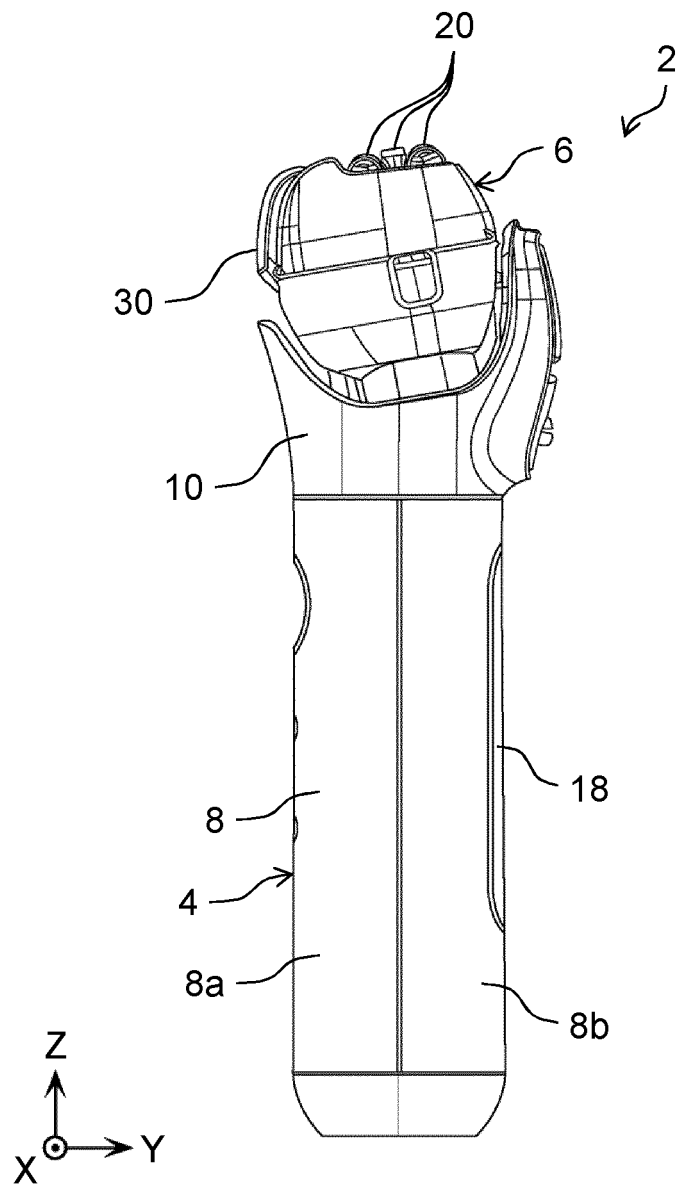


FIG. 1D

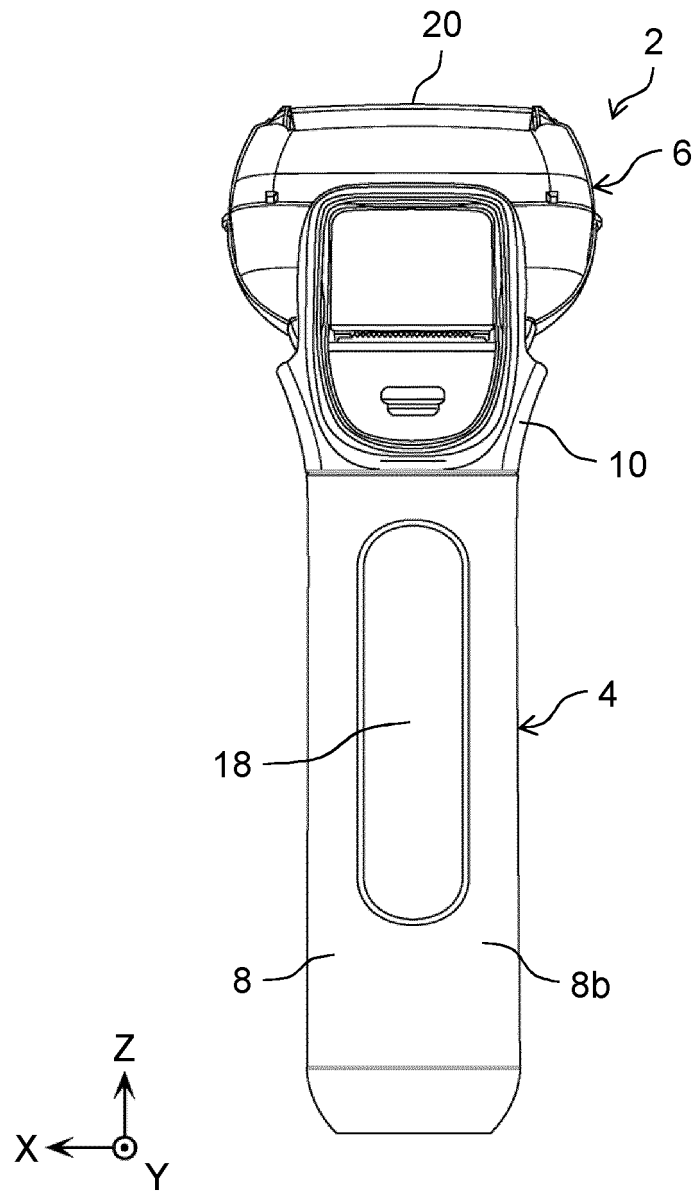


FIG. 2

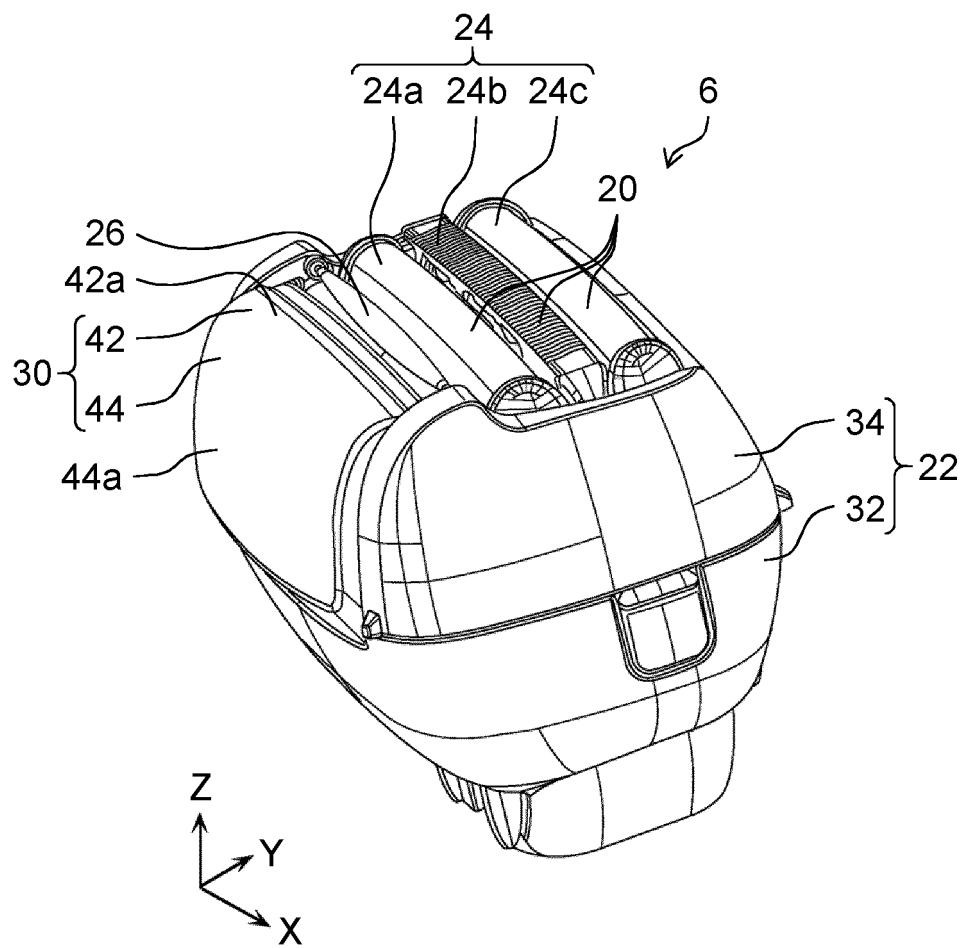


FIG. 3

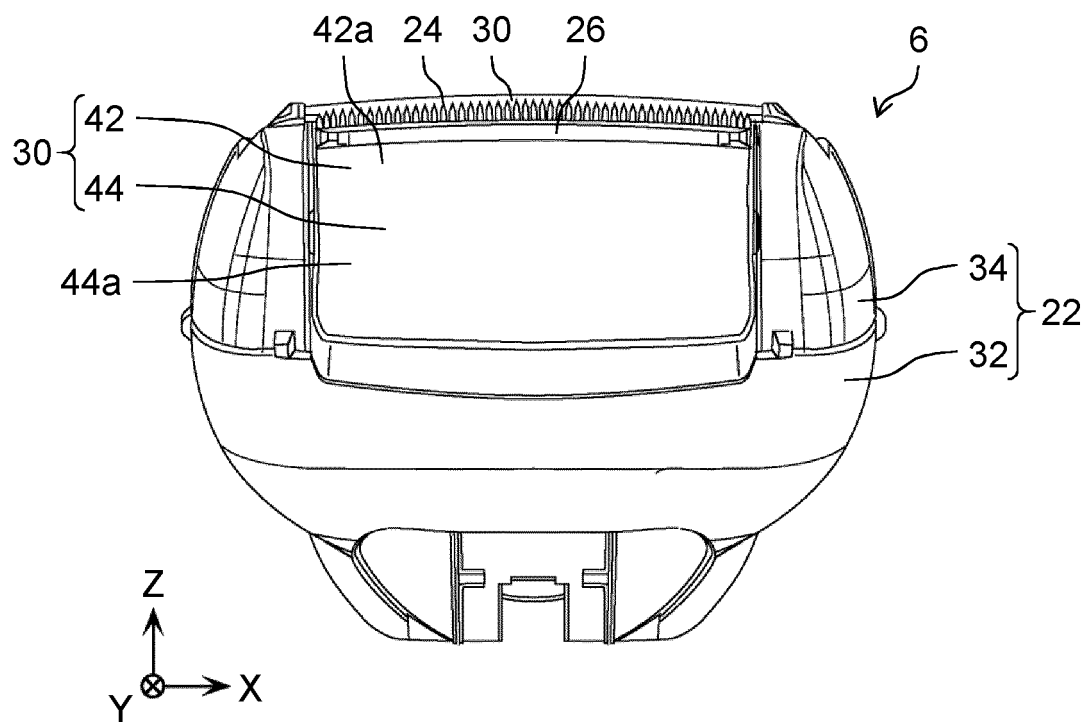


FIG. 4

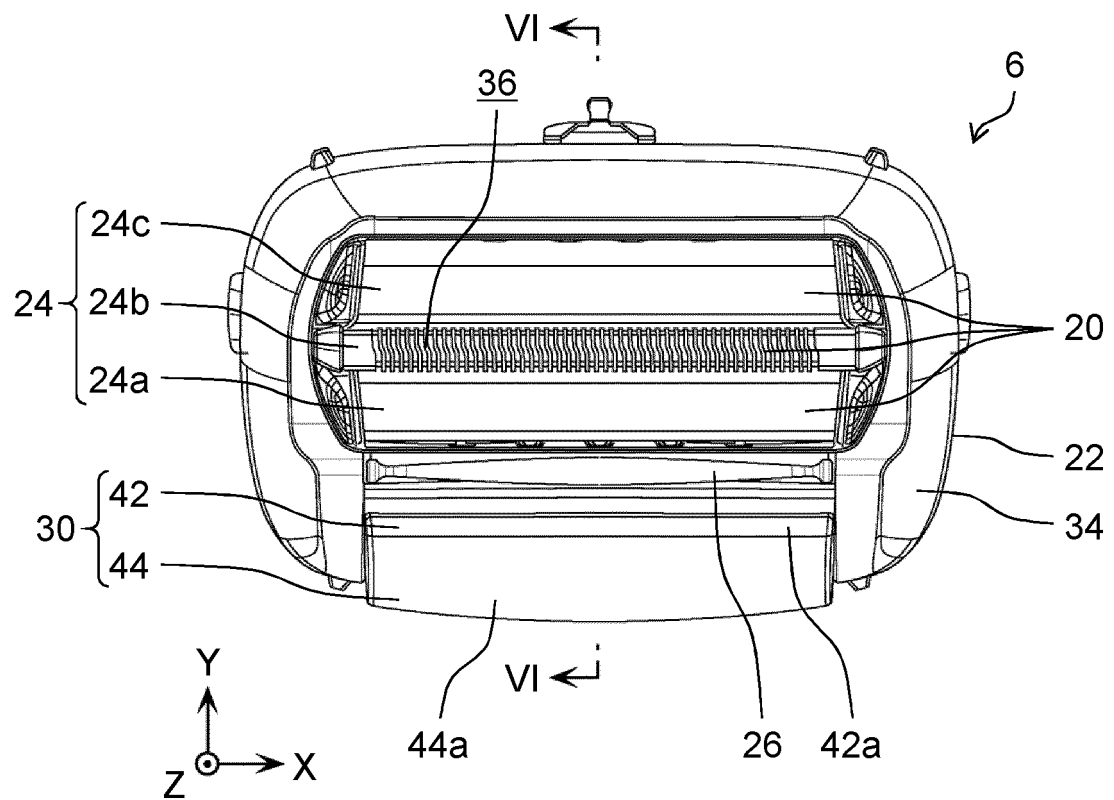


FIG. 5

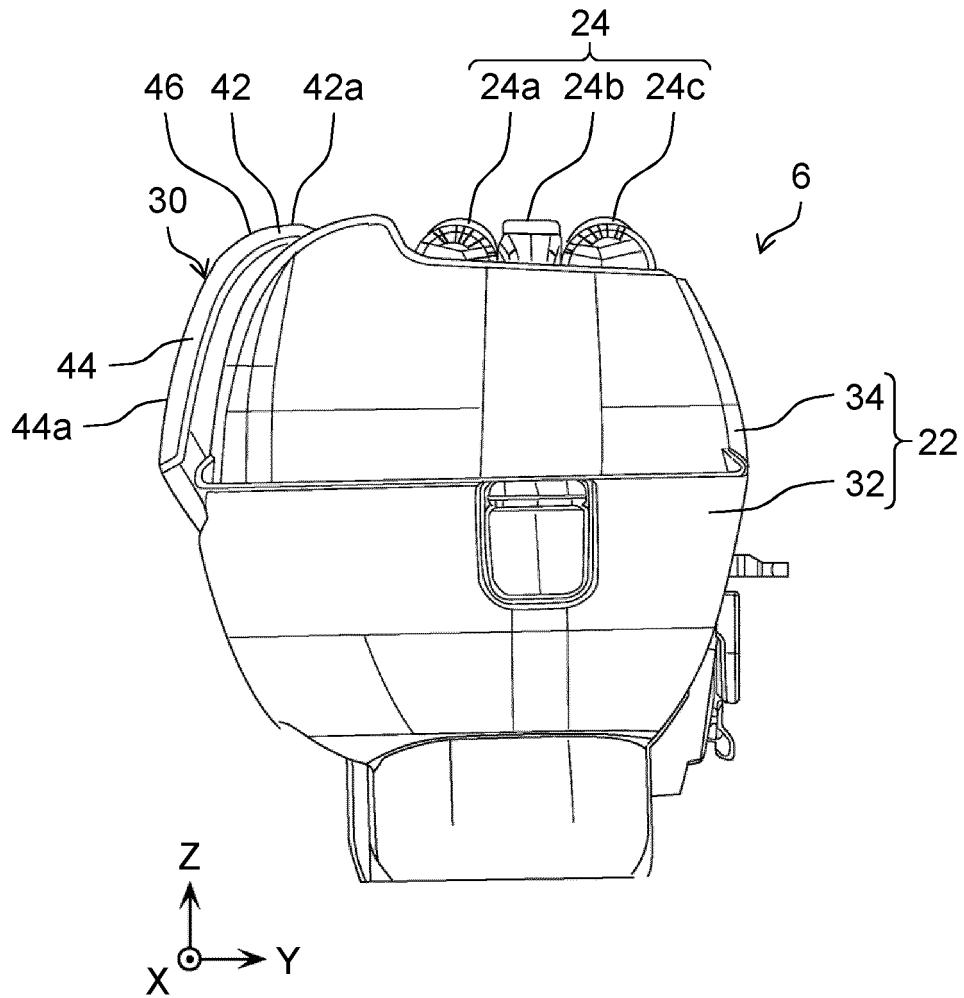


FIG. 6

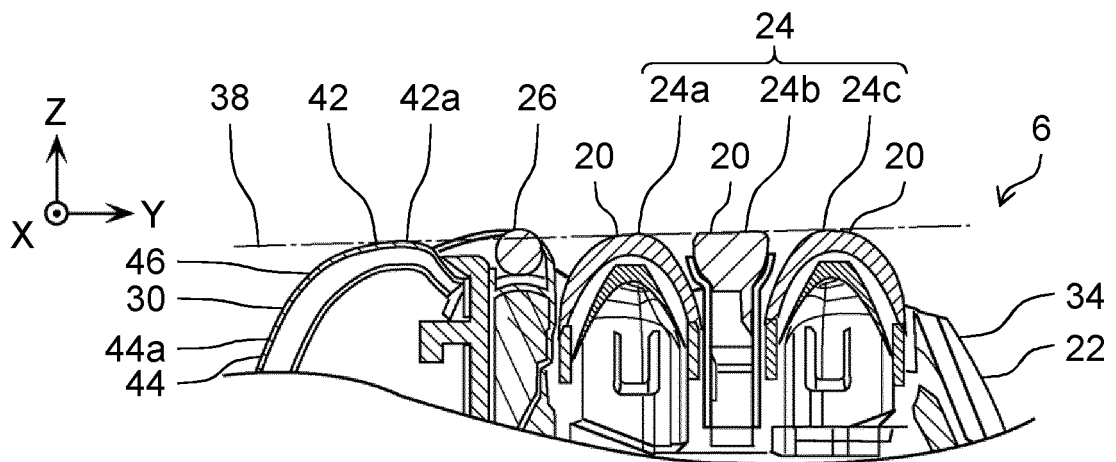


FIG. 7A

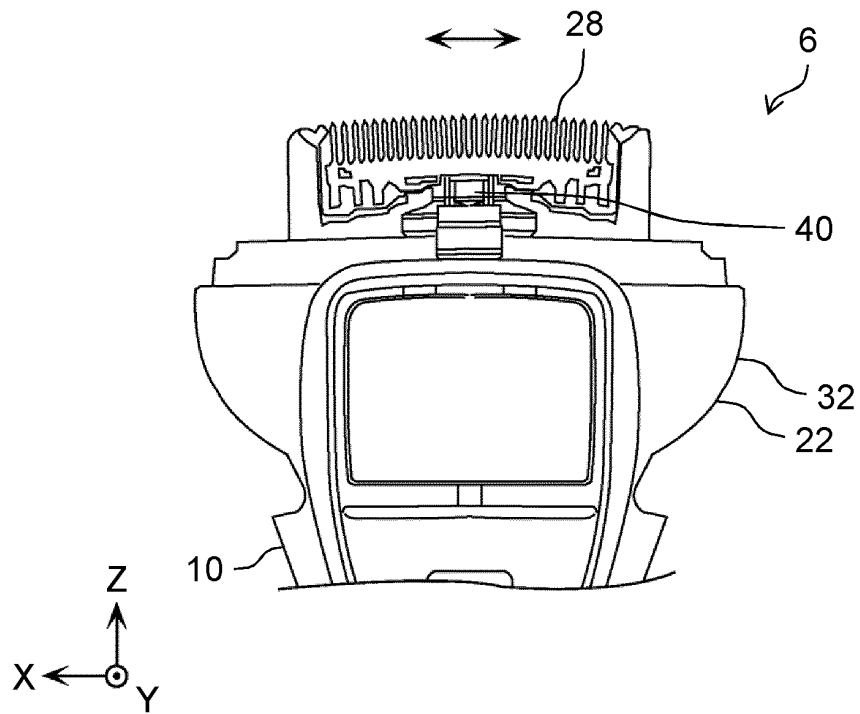


FIG. 7B

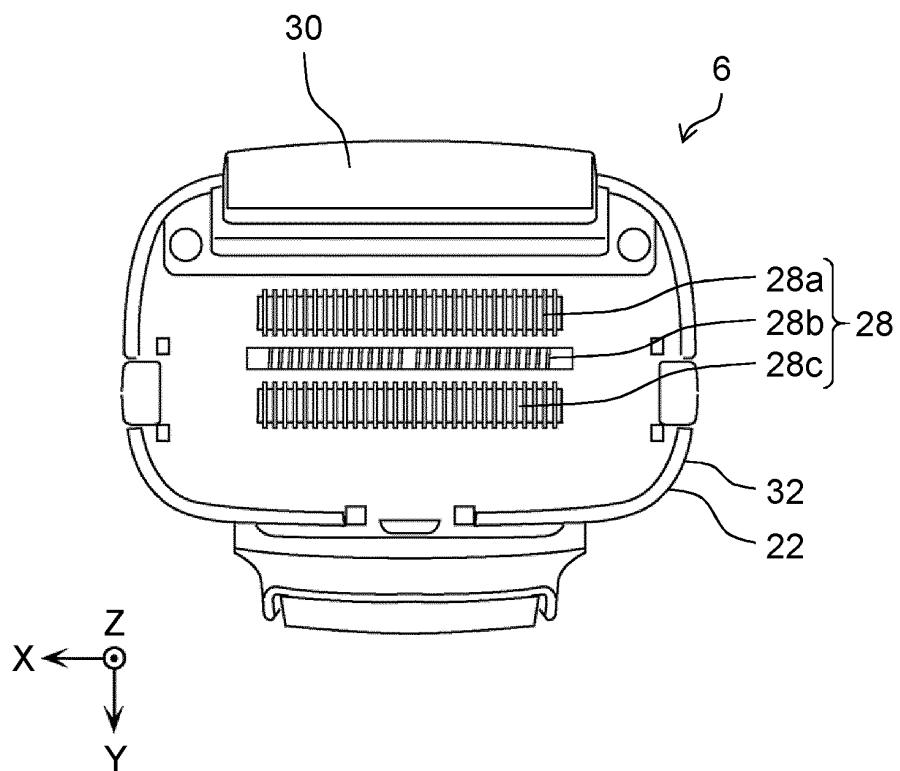


FIG. 8A

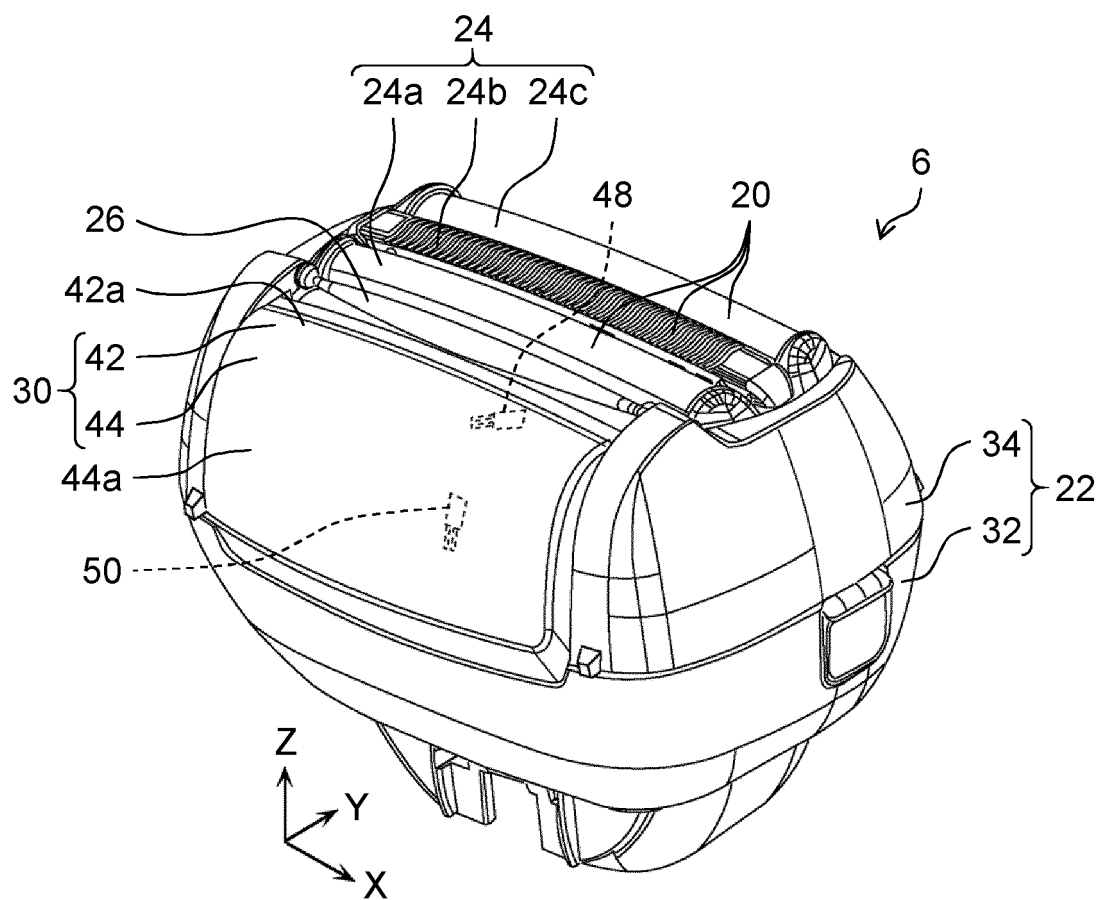


FIG. 8B

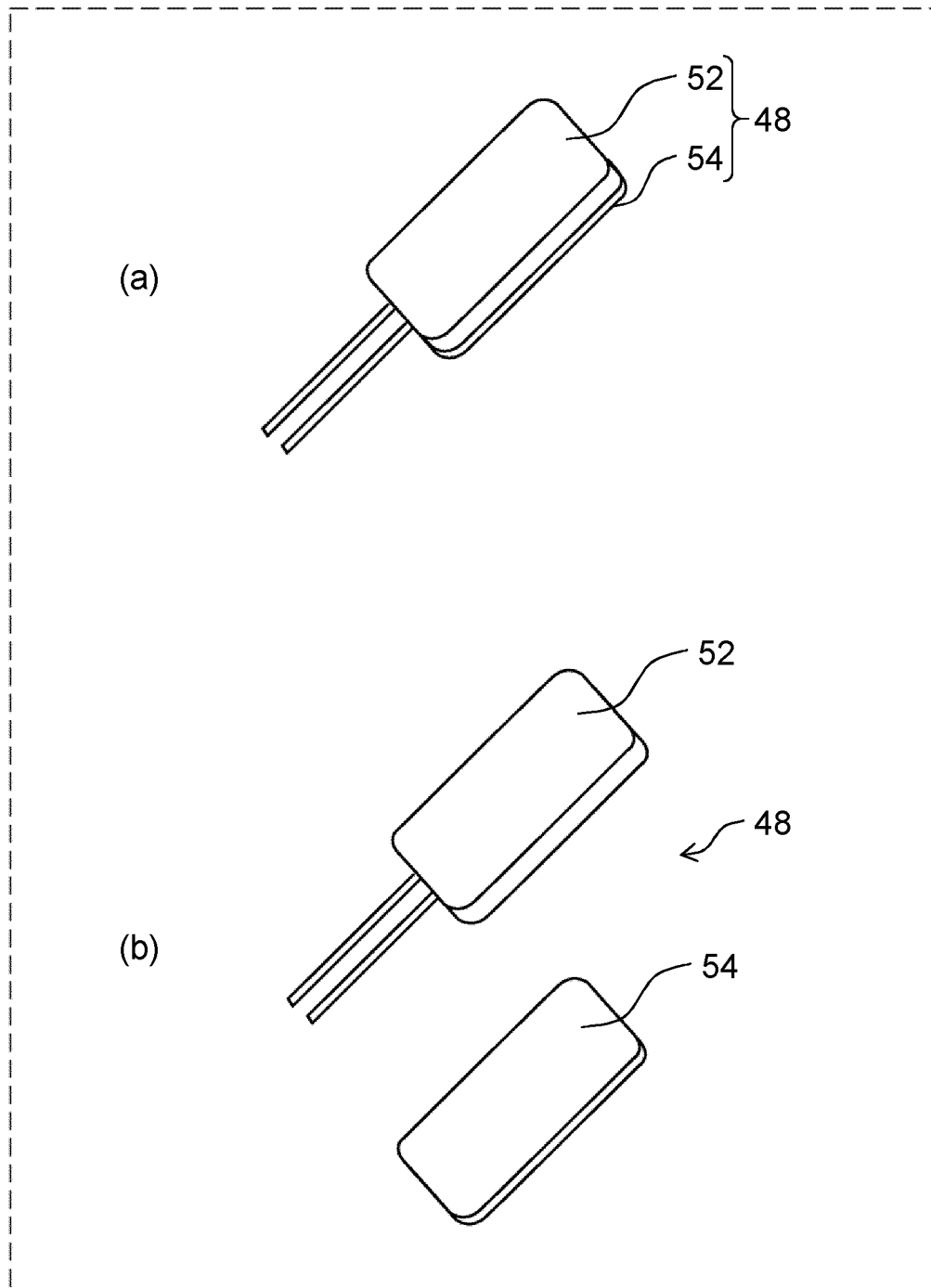


FIG. 9

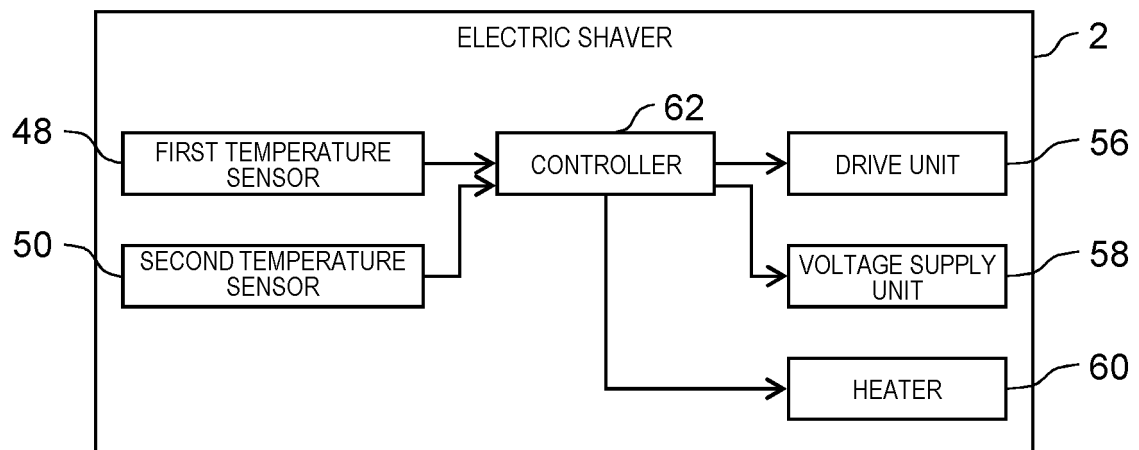


FIG. 10

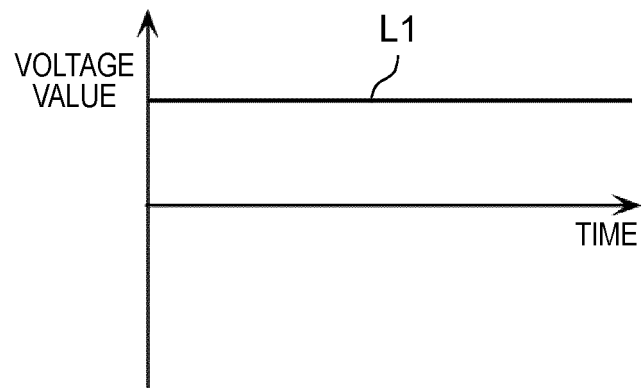


FIG. 11

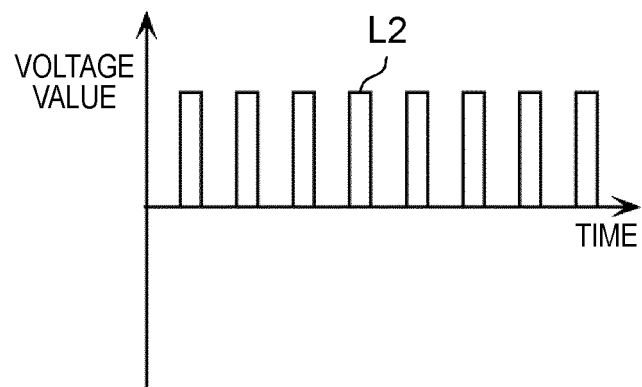


FIG. 12

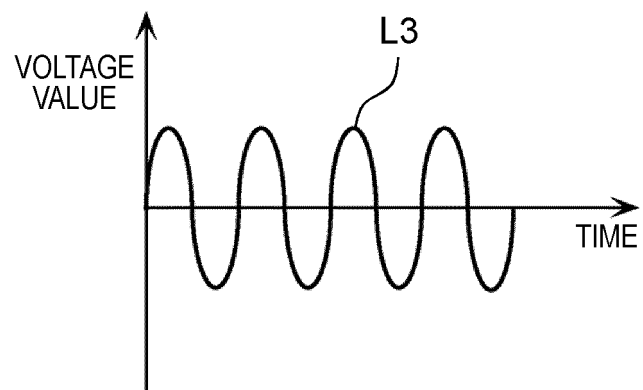


FIG. 13

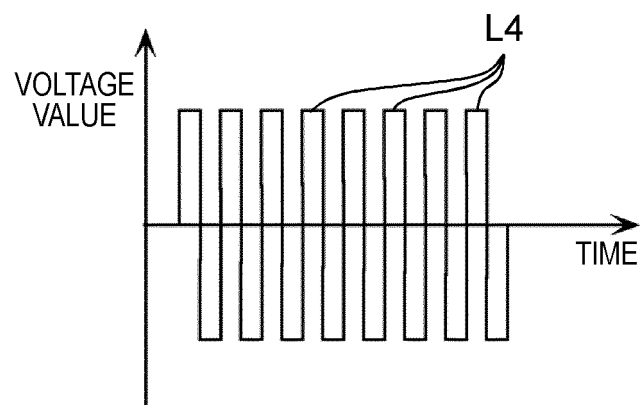


FIG. 14A

FIRST MODE

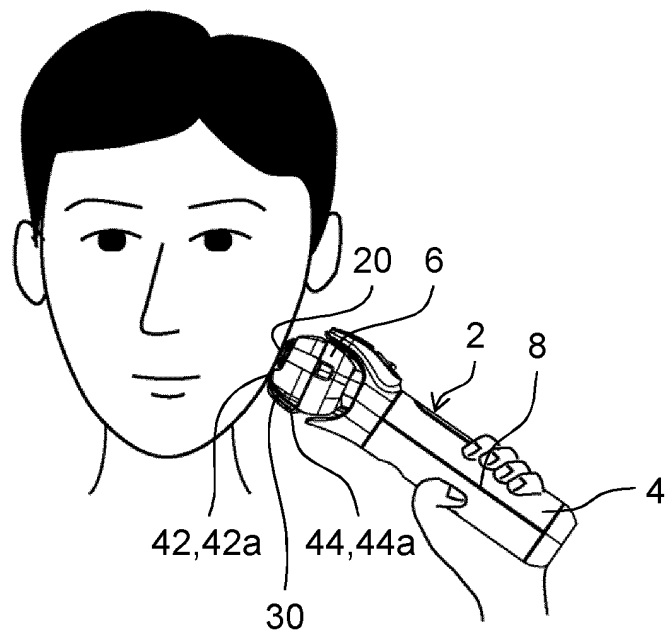
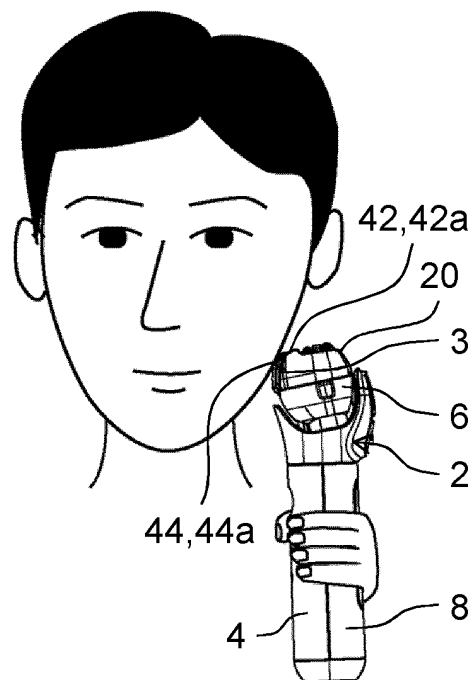


FIG. 14B

SECOND MODE



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/038076

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. B26B19/48 (2006.01) i, B26B19/28 (2006.01) i

FI: B26B19/48C, B26B19/28Z

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. B26B19/48, B26B19/28

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.
A	JP 2008-154607 A (MATSUSHITA ELECTRIC WORKS, LTD.) 10 July 2008 (2008-07-10), entire text, all drawings	1-15
A	JP 2008-307097 A (KYUSHU HITACHI MAXELL LTD.) 25 December 2008 (2008-12-25), entire text, all drawings	1-15
A	JP 2010-510821 A (KONINKLEJKE PHILLIPS N.V.) 08 April 2010 (2010-04-08), paragraph [0040], fig. 9	1-15
A	KR 10-2017-0140637 A (PYO, J. Y.) 21 December 2017 (2017-12-21), fig. 1	1-15

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
24 December 2020Date of mailing of the international search report
12 January 2021Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2020/038076

JP 2008-154607 A	10 July 2008	(Family: none)
JP 2008-307097 A	25 December 2008	(Family: none)
JP 2010-510821 A	08 April 2010	US 2010/0076367 A1 paragraph [0051], fig. 9 WO 2008/062365 A2 page 10, fig. 9 CN 101541374 A page 8, fig. 9
KR 10-2017-0140637 A	21 December 2017	(Family: none)

REFERENCES CITED IN THE DESCRIPTION

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