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(71) Applicant: **Panasonic Electric Works Co., Ltd.**
Kadoma-shi
Osaka (JP)

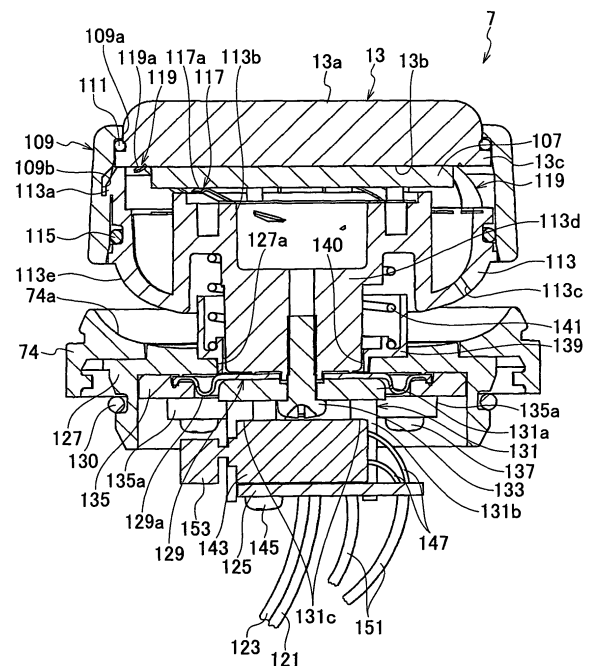
(72) Inventors:
• **Matsusaka, Takeshi**
Kadoma-shi,
Osaka 571-8686 (JP)
• **Taniguchi, Shinichi**
Kadoma-shi,
Osaka 571-8686 (JP)
• **Kishimoto, Atsuko**
Kadoma-shi,
Osaka 571-8686 (JP)

(74) Representative: **Appelt, Christian W.**
Forrester & Boehmert
Pettenkoferstrasse 20-22
80336 München (DE)

(54) **Ultrasonic cosmetic device**

(57) An ultrasonic cosmetic device includes a head unit (7) including: an ultrasonic vibrator (107) which generates ultrasonic vibrations; and a probe head (13) which transmits ultrasonic vibrations generated by the ultrasonic vibrator (107) to a skin surface. The device further includes a vibration motor (143) which is integrally fixed to the head unit (7) and vibrates the head unit (7). The head unit (7) is provided with the probe head (13) ultrasonically vibrating. The device furthermore includes a main body member (127) which supports the head unit (7) and the vibration motor (143). The head unit (7) and the vibration motor (143) are relatively movable relative to the main body member (127).

FIG. 17



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an ultrasonic cosmetic device that transmits ultrasonic vibrations generated by an ultrasonic vibrator to a skin surface through a probe head.

2. Description of the Related Art

[0002] There has been known an ultrasonic cosmetic device that provides various skincare effects such as a skin firming effect (refer to Japanese Patent Unexamined Publication No. 2000-233005). According to the ultrasonic cosmetic device, an ultrasonic vibrator attached to a head unit ultrasonically vibrates a probe head, and a vibration motor vibrates the entire head unit.

BRIEF SUMMARY OF THE INVENTION

[0003] In the conventional ultrasonic cosmetic device, the head unit is fixed to the main body member. It makes the probe head difficult to keep in contact with the uneven skin surface. As a result, sufficient skincare effects are not achieved.

[0004] The present invention has been made focusing on the above-mentioned conventional problems. An object of the present invention is to provide an ultrasonic cosmetic device including an ultrasonic vibrator and a vibration motor, and enabling a probe head to keep in good contact with an uneven skin surface.

[0005] According to one aspect of the present invention, there is provided an ultrasonic cosmetic device including: a head unit including: an ultrasonic vibrator which generates ultrasonic vibrations; and a probe head which transmits ultrasonic vibrations generated by the ultrasonic vibrator to a skin surface; a vibration motor which is integrally fixed to the head unit and vibrates the head unit, the head unit being provided with the probe head ultrasonically vibrating; and a main body member which supports the head unit and the vibration motor, the head unit and the vibration motor being relatively movable relative to the main body member.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0006]

FIG. 1 is a front view showing an embodiment of an ultrasonic cosmetic device of the present invention.
FIG. 2 is a rear view showing the ultrasonic cosmetic device of FIG. 1.
FIG. 3 is a front view showing the ultrasonic cosmetic device of FIG. 1 provided with caps.

FIG. 4 is an exploded perspective view showing the ultrasonic cosmetic device of FIG. 3.

FIG. 5 is a cross-sectional view taken along the line A-A in FIG. 2.

FIG. 6 is a cross-sectional view showing a first head unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 7 is an exploded perspective view showing the first head unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 8 is a cross-sectional view showing the first head unit connected to a head base unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 9 is a cross-sectional view showing the first head unit with an attachment in FIG. 6 moved backward.

FIG. 10 is a front view showing the first head unit with the attachment detached in the ultrasonic cosmetic device of FIG. 1.

FIG. 11 is a front view showing the first head unit omitted the illustration of a first head ring, a probe spring cover, a probe head spring and the attachment from FIG. 6.

FIG. 12 is a cross-sectional view showing the first head unit of FIG. 11.

FIG. 13 is a cross-sectional view taken along the line B-B in FIG. 12.

FIG. 14 is a plan view showing a probe base in the first head unit of FIG. 13.

FIG. 15 is a bottom view showing the probe base in the first head unit of FIG. 13.

FIG. 16 is a cross-sectional view showing an example that coil springs is provided instead of connecting metal fittings in the first head unit of FIG. 12.

FIG. 17 is a cross-sectional view showing a second head unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 18 is an exploded perspective view showing the second head unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 19 is a cross-sectional view showing the second head unit connected to the head base unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 20 is an external view showing the second head unit connected to the head base unit of the ultrasonic cosmetic device of FIG. 1.

FIG. 21 is a cross-sectional view showing the second head unit in FIG. 17 moved backward.

FIG. 22 is a cross-sectional view showing the second head unit in FIG. 17 inclined while swinging.

FIG. 23 is a cross-sectional view showing an example that a hollow ring is provided instead of a head spring in the second head unit of FIG. 12.

DETAILED DESCRIPTION OF THE INVENTION

[0007] Hereinafter, descriptions will be made of embodiments of the present invention with reference to the drawings.

[0008] FIG. 1 is a front view showing an embodiment

of an ultrasonic cosmetic device of the present invention. The ultrasonic cosmetic device includes a main body unit 1 that a user holds with the hand, a head base unit 3 located at the top of the main body unit 1 (the upper end in FIG. 1), and a first head unit 5 and a second head unit 7 protruded separating from the head base unit 3 into right and left respectively. Each of the first head unit 5 and the second head unit 7 constitutes a plurality of head units. As shown in FIG. 1, each of the first and second head units 5 and 7 is protruded approximately diagonally upward from the head base unit 3 at the upper end of the main body unit 1. Thus, the ultrasonic cosmetic device is formed of a Y-shape as a whole.

[0009] As shown in FIG. 6, the first head unit 5 includes a first probe head 9 provided at the top of the first head unit 5 and made of an electrically conductive material. The first head unit 5 also includes an attachment 11 provided encompassing the first probe head 9. The first probe head 9 and the attachment 11 are directly put on a nose so that the ultrasonic vibrations are transmitted to obtain a skincare effect. While, the second head unit 7 includes a second probe head 13 provided at the top of the second head unit 7 and made of an electrically conductive material. The second probe head 13 is directly placed on cheeks so that the ultrasonic vibrations are transmitted to obtain the skincare effect.

[0010] FIG. 2 is a rear view showing the ultrasonic cosmetic device of FIG. 1. The ultrasonic cosmetic device has a switch 15, which switches the operations from the first head unit 5 to the second head unit 7 alternatively, provided at an upper position of the main body unit 1. A switch panel 17 is provided in outer periphery of the switch 15.

[0011] As shown in FIG. 1, the main body unit 1 has an LED (light-emitting diode) 19 that indicates the charging state of the ultrasonic cosmetic device according to the switch 15. The main body unit 1 also has LEDs 21, 23, 25 at the upper position of the main body unit 1 that indicate the operating status of the first head unit 5 and the second head unit 7.

[0012] When the ultrasonic cosmetic device is not in use, as shown in FIG. 3, caps 27, 29 are attached to the first head unit 5 and the second head unit 7.

[0013] FIG. 4 is an exploded perspective view of the ultrasonic cosmetic device, and FIG. 5 is a cross-sectional view taken along the line A-A in FIG. 2. A circuit board 33 is kept in a housing 31 of the main body unit 1. A main body circuit substrate 35 is fixed to one side of the circuit board 33 by use of ribs 33a, which is opposite to the side that the switch 15 is provided. The circuit board 33 is fixed to a head base 61, which is described later, by inserting screws 37 into screw holes 33b provided at an upper portion of the circuit board 33. Reference numeral 36 in FIG. 4 is an vibrator controlling circuit substrate that includes a controlling circuit to vibrate a first ultrasonic vibrator 75 and a second ultrasonic vibrator 107 described below with a single ultrasonic frequency. The vibrator controlling circuit substrate 36 is connected

to the main body circuit substrate 35 via electrical wiring.

[0014] A rechargeable battery 39 is housed on the side that the switch 15 is provided in a lower part of the circuit board 33. In FIG. 4, a battery positive-electrode metal piece 41 is provided at a lower end of the rechargeable battery 39, and a battery negative-electrode metal piece 43 is provided at an upper end of the rechargeable battery 39, respectively.

[0015] In addition, a switch substrate 45 is provided at the circuit board 33 corresponding to the switch 15. The switch base 45 is fixed to the circuit board 33 by inserting screws 47 into screw holes 33c. The switch 15 constitutes the switch section with the switch panel 17, the switch substrate 45, a switch pressing plate 49, and a switch rubber 51 as a sealing member. Out of these components, the switch panel 17, the switch pressing plate 49 and the switch rubber 51 are fixed to the housing 31 by ultrasonic welding so as to make the structure of the switch section water-resistant. While, the structure of the switch section may be fixed by an engagement structure with an engagement protrusion and an engagement concave part, or by fixing members such as screws as long as the water-resistant effect is available.

[0016] The housing 31, which houses the main body circuit substrate 35, the rechargeable battery 39 and the like, has a lower cover 53 attached to a lower opening of the housing 31 as an end cover by use of a waterproof screw 55. When fixed, a lower cover O-ring 57 is set between the housing 31 and the lower cover 53 as a sealing member, and an O-ring 59 is set between the waterproof screw 55 and its screw hole as a sealing member, respectively. Hereinafter, a screw provided with the O-ring between the screw and its screw hole will be referred to as a waterproof screw.

[0017] The head base unit 3 includes a three-pronged hollow head base 61. The head base 61 includes head connecting parts 61a, 61b, each of which is connected to the first head unit 5 and the second head unit 7, respectively. The head base 61 also includes a main body connecting part 61c connected to the housing 31 in a lower part of a joint portion where the head connecting parts 61a, 61b are jointed together.

[0018] The main body connecting part 61 c, as shown in FIG. 5, is fixed by being inserted into an uppermost part 31 a of the housing 31. A main body O-ring 63 is set between the main body connecting part 61 c and the uppermost part 31 a as a sealing member.

[0019] The head base 61 is interposed between a pair of head cases 65, 67 covering on both sides of the head base 61 (correspond to the face and reverse sides of the sheet in FIG. 1). Uppermost portions of each head case 65, 67, as shown in FIG. 5, are engaged with engagement parts 69, respectively. Lowermost portions of each head case 65, 67 are positioned in the outer periphery of the uppermost part 31a of the housing 31. The uppermost part 31a is interposed between the lowermost portions of each head case 65, 67 and the main body connecting part 61c of the head base 61.

[0020] In this state, the head cases 65, 67 are mutually fixed by inserting a waterproof screw 71 in a screw insertion hole 67a of the head case 67, and screwing into a screw hole 65a provided at the head case 65. At this time, as shown in FIG. 5, a boss part 67b including the screw insertion hole 67a of the head case 67 and a boss part 65b including the screw hole 65a of the head case 65 are inserted into a through-hole 61d provided at the head base 61, respectively, so that the tip portions of the boss parts 65b and 67b are joined to face each other.

[0021] In addition, an accent ring 72 is provided between the head cases 65, 67 and a stepped part 31 b formed in a base end of the uppermost part 31a of the housing 31. Further, a first head ring 73 and a second head ring 74 are provided to the outer peripheries of the opening edges of each head case 65, 67, which the first head unit 5 and the second head unit 7 are attached respectively. Thus, the head cases 65, 67 are fixed to each other.

[0022] FIG. 6 is a cross-sectional view of the first head unit 5 and its vicinity. FIG. 7 is an exploded perspective view of the first head unit 5 and its vicinity. FIG. 8 is a cross-sectional view showing the first head unit 5 connected to the head connecting part 61a of the head base 61. The first head unit 5 includes the first probe head 9 as described above. The surface of the first probe head 9 is a contact surface 9a that is directly in contact with the skin. The first ultrasonic vibrator 75 is mounted on a rear face 9b located on the opposite side of the contact surface 9a. The first ultrasonic vibrator 75 generates ultrasonic vibrations by means of being applied a driving voltage from the vibrator controlling circuit substrate 36 of the main body unit 1. The first probe head 9 also ultrasonically vibrates in accordance with the ultrasonic vibrations of the first ultrasonic vibrator 75.

[0023] The first probe head 9 includes a cylindrical part 9c protruding toward the opposite direction of the contact surface 9a from the outer peripheral edge of the rear face 9b. A flange 9d protruding outward is formed in an end of the cylindrical part 9c.

[0024] A probe cover 77, which is approximately cylindrical in shape, is provided covering the cylindrical part 9c and the flange 9d. The probe cover 77 has a bending part 77a, of which the front end portion protrudes inward and is in contact with the outer circumference of the first probe head 9. Also, an O-ring 79 is provided in an interstice between the bending part 77a and the flange 9d as a sealing member.

[0025] A probe spring cover 81, which is approximately cylindrical in shape, is provided around the outer side of the probe cover 77. The probe spring cover 81 is movable in the upward and downward directions relative to the probe cover 77 in FIG. 6. The probe spring cover 81 includes a slide part 81a being in slide contact with the periphery of the upper part of the probe cover 77. The probe spring cover 81 also includes a cover part 81b, of which the diameter is larger than that of the slide part 81a, provided at the bottom of the probe spring cover 81.

A probe head spring 83 is housed in the inside of the cover part 81b.

[0026] The probe head spring 83 is made of an elastic material such as Piano wires A (code; SWP-A) and Piano wires B (code; SWP-b) standardized according to Japanese Industrial Standards (JIS) G3522, and SUS304 and SUS304-WPB standardized according to JIS G4314. The inner diameter of the probe head spring 83 is approximately 22.0 mm.

[0027] The probe head spring 83 is set between a spring receiving portion 81c provided between the slide part 81a and the cover part 81 b and a spring receiving portion 77b protruding outward from the bottom end of the probe cover 77. The probe head spring 83 pushes the probe spring cover 81 upward with the attachment 11 in FIG. 6.

[0028] Then, the rear end portion of the cover part 81 b of the probe spring cover 81 is inserted in the first head ring 73. Also, an engagement part 81d protruding outward is engaged with the first head ring 73 so as to prevent the probe spring cover 81 from coming off upward.

[0029] The attachment 11 is attached to a front end of the probe spring cover 81 (upward in FIG. 6). The opening in the front end of the attachment 11 is smaller than that in the rear end of the attachment 11. In addition, a cut-out 11a is formed in a part of the outer peripheral edge of the front end of the attachment 11.

[0030] The attachment 11 is provided with a plurality of engagement pieces 11b protruding downward in multiple locations in the peripheral edge of the opening at the rear end. An engagement protrusion 11c formed on the inner surface of each engagement piece 11b protrudes inward. The engagement protrusion 11c is engaged to its corresponding engagement concave part 81e provided in the outer peripheral surface of the probe spring cover 81. Thus, the attachment 11 is fixed to the probe spring cover 81. Note that it is easy for a user to release the engagement between the engagement protrusions 11c and the engagement concave parts 81e.

[0031] In the engagement structure, a lower end 11e in the peripheral edge of the opening at the rear end of the attachment 11 is in contact with a stepped part 81 f provided in an upper portion of the outer periphery of the cover 81b of the probe spring cover 81.

[0032] Accordingly, the attachment 11 is pushed upward in FIG. 6 by the probe head spring 83 via the probe spring cover 81. By pressing the attachment 11 downward in the position of FIG. 6, the attachment 11 is moved with the probe head spring 83 being compressed as shown in FIG. 9.

[0033] In this case, not especially shown in Figures, the probe spring cover 81 is provided with an anti-rotation part in order not to rotate against the first head ring 73. In addition, the first head ring 73 is fixed to the head connecting part 61a of the head base 61 shown in FIG. 8 by inserted onto the head connecting part 61 a so as to control the rotation relative to the head base 61.

[0034] Therefore, the attachment 11 is kept with the

cut-out 11a located at the side of the main body unit 1 as shown in FIGs. 1, 2 and 8.

[0035] An outer peripheral cylindrical part 77c is provided at an outer periphery of the spring receiving portion 77b in a lower end of the probe cover 77. A front end of the outer peripheral cylindrical part 77c at the attachment 11 side is in contact with the first head ring 73. An O-ring 89 is provided on the outer periphery of the outer peripheral cylindrical part 77c as a sealing member. The O-ring 89 is provided to seal the gap between the spring receiving portion 77b of the probe cover 77 and the head connecting part 61a of the head base 61.

[0036] A probe base 91 is provided under the first ultrasonic vibrator 75. The probe base 91 is formed of a cup shape with a lower end opened. The lower end of the cylindrical part 9c of the first probe head 9 is placed on a stepped part 91a in a periphery of the upper part of the probe base 91. The probe base 91 and the probe cover 77 supports the first probe head 9 being interposed between the probe base 91 and the probe head 77.

[0037] FIG. 10 is a front view of the first head unit 5 with the attachment 11 detached. FIG. 11 is a front view of the first head unit 5 omitted the illustrations of the first head ring 73, the probe spring cover 81, the probe head spring 83 and the attachment 11 from FIG. 6. FIG. 12 is a cross-sectional view of the first head unit of FIG. 11. As shown in FIG. 12, a flange 91b protruding outward is provided at the lower end of the probe base 91. The probe cover 77 and the probe base 91 are fixed to each other by inserting screws 93 into the flange 91b. At this time, as shown in FIG. 6, an engagement pin 77d of the probe cover 77 is inserted into an engagement hole 91c of the probe base 91.

[0038] Connecting metal fittings 95, 97 is attached to an uppermost wall 91d of the probe base 91. The connecting metal fitting 95 reserves as a positive electrode, and is in contact with the rear face of the first ultrasonic vibrator 75. The connecting metal fitting 97 reserves as a negative electrode, and is in contact with the under surface of the flange 9d of the first probe head 9.

[0039] FIG. 13 is a cross-sectional view taken along the line B-B in FIG. 12. FIG. 14 is a plan view of the probe base 91 in FIG. 13. FIG. 15 is a bottom view of the probe base 91 in FIG. 13.

[0040] The connecting metal fitting 95 is fixed by being inserted into an attachment hole 91e provided in the outer periphery of the uppermost wall 91d of the probe base 91. A contact piece 95a of the connecting metal fitting 95 protruded upward is elastically brought into contact with the rear face of the first ultrasonic vibrator 75 by pressure as shown in FIG. 12. While, a connecting piece 95b, which is bent at about a 90-degree angle to the contact piece 95a and protruded downward, is connected to one end of a lead wire 99.

[0041] The connecting metal fitting 97 is fixed by being inserted into an attachment hole 91f provided in approximately the middle of the uppermost wall 91d of the probe base 91. A contact piece 97a of the connecting metal

fitting 97 is elastically brought into contact with the under surface of the flange 9d of the first probe head 9 by pressure as shown in FIG. 13. While, a connecting piece 97b protruded downward is connected to one end of a lead wire 101. The other ends of the respective lead wires 99, 101 are connected to the main body circuit substrate 35.

[0042] In addition, a cross-shaped insulating rib 91g is provided at the under surface of the uppermost wall 91d as shown in FIG. 15 so as to avoid the connecting metal fittings 95, 97 being brought into contact with (short-circuited) each other. That is, an upper end of a rib piece 91g1 of the insulating rib 91g in FIG. 15 is in close contact with the connecting metal fitting 95, and a right end of a rib piece 91g2 of the insulating rib 91g in FIG. 15 is in close contact with the connecting metal fitting 97. Thus, it is possible to prevent from coming into contact with the connecting metal fittings 95, 97 each other.

[0043] The connecting metal fitting 95, as shown in FIG. 12, is fixed by engaging an engagement piece 95c with the lower end of an engagement rib 91h provided on the inner peripheral surface of the probe head 91. The engagement piece 95c is provided in approximately the middle of the connecting piece 95b in the vertical direction. While, the connecting metal fitting 97, as shown in FIGs. 12 and 13, is fixed by engaging an engagement piece 97c with the lower end of the rib piece 91g2. The engagement piece 97c is provided in approximately the middle of the connecting piece 97b in the vertical direction.

[0044] With respect to the uppermost wall 91d of the probe base 91 that the connecting metal fittings 95, 97 are attached, as shown in FIG. 13, the position fixing the connecting metal fitting 97 is lower than the position fixing the connecting metal fitting 95. Thus, there is a difference in height between the attached positions of each connecting metal fitting 95, 97.

[0045] The pressing load of each connecting metal fitting 95, 97 against the first ultrasonic vibrator 75 and the first probe head 9 respectively is considered 0.5 N or more, preferably, 1.0 N or more. In addition, the amount of bending of each contact piece 95a, 97a is 0.5 mm or more, preferably, 1.0 mm or more.

[0046] It may be provided with a square hollow or solid rib instead of the cross-shaped insulating rib 91g. In addition, the insulating rib may be attached as a discrete member with a screw or hook.

[0047] FIG. 16 shows an example that a positive-electrode coil spring 103 and a negative-electrode coil spring 105 are provided instead of the connecting metal fittings 95, 97. In the first head unit in FIG. 16, a probe base 910 is used corresponding to the probe base 91 of FIG. 12. An annular concave part 910a is formed in the upper surface of the probe base 910. The positive-electrode coil spring 103 is set in the concave part 910a. Then, the upper end of the positive-electrode coil spring 103 is brought into contact with the rear face of the first ultrasonic vibrator 75. Also, the negative-electrode coil spring 105 of which the diameter is larger than that of the pos-

itive-electrode coil spring 103 is set in an annular stepped part 910b formed at the upper outer periphery of the probe base 910. Then, the upper end of the negative-electrode coil spring 105 is brought into contact with the under surface of the flange 9d of the first probe head 9. Each of the positive-electrode coil spring 103 and the negative-electrode coil spring 105 is connected to the lead wires 99 and 101, respectively.

[0048] The other configuration in the example of FIG. 16 is the same as FIG. 6. With regard to this example, the cross-shaped insulating rib 91 g shown in FIG. 15 is not necessary. Therefore, it is possible to simplify the configuration. Alternatively, the lead wires 99, 101 may be directly connected to the first ultrasonic vibrator 75 and the first probe head 9 respectively, without providing the connecting metal fittings and the coil springs.

[0049] FIG. 17 is a cross-sectional view of the second head unit 7. FIG. 18 is an exploded perspective view of the second head unit 7. FIG. 19 is a cross-sectional view showing the second head unit 7 connected to the head connecting part 61b of the head base 61. FIG. 20 is an external view showing the second head unit 7 connected to the head connecting part 61b of the head base 61. The second head unit 7 includes the second probe head 13 as described above. The surface of the second probe head 13 is a contact surface 13a that directly comes in contact with the skin. A rear face 13b on the opposite side of the contact surface 13a is provided with the second ultrasonic vibrator 107. The second ultrasonic vibrator 107 generates ultrasonic vibrations by means of being applied a driving voltage from the vibrator controlling circuit substrate 36 of the main body unit 1. The second probe head 13 also ultrasonically vibrates in accordance with the ultrasonic vibrations of the second ultrasonic vibrator 107.

[0050] The area of the contact surface 13a of the second probe head 13 is formed larger than that of the contact surface 9a of the first probe head 9.

[0051] The second probe head 13 includes a flange 13c protruding outward in an outer peripheral edge at the rear face 13b side that the second ultrasonic vibrator 107 is provided. A head cover 109, which is approximately cylindrical in shape, is provided as a probe cover covering the flange 13c. The head cover 109 has a bending part 109a, of which the front end protrudes inward and is brought into contact with the outer circumference of the second probe head 13. Also, an O-ring 111 is provided in an interstice between the bending part 109a and the flange 13c as a sealing member.

[0052] As shown in FIG. 17, the upper end of the opening of a head base 113 is inserted into the head cover 109. In this position, an engagement protrusion 113a of the head base 113 is engaged with an engagement concave part 109b so that the head cover 109 is fixed to the head base 113. An O-ring 115 is set between the head cover 109 and the head base 113 as a sealing member.

[0053] A metal fitting attachment rib 113b is formed in the inside of the head base 113. A positive-electrode con-

necting metal fitting 117 is attached to the metal fitting attachment rib 113b. Also, a negative-electrode connecting metal fitting 119 is attached to the metal fitting attachment rib 113b being located in the outer periphery of the connecting metal fitting 117. A contact piece 117a constituting a front end portion of the connecting metal fitting 117 is elastically pressed to the rear face of the second ultrasonic vibrator 107 so as to come in contact with it. A connecting piece 117b constituting a rear end portion of the connecting metal fitting 117 is connected to one end of a lead wire 121.

[0054] Contact pieces 119a constituting front end portions of the connecting metal fitting 119 are elastically pressed to the rear face 13b of the second probe head 13, of which the diameter is larger than that of the second ultrasonic vibrator 107, so as to come in contact with it. A contact piece 119b constituting a rear end portion of the connecting metal fitting 119 is connected to one end of a lead wire 123. The other ends of each lead wire 121 and 123, as shown in FIG. 22, are connected to the main body circuit substrate 35 by extending downward and passing through a boss part 113d, a rubber cover 129 and a head stopper 131.

[0055] The connecting metal fitting 119, as shown in FIG. 18, is formed in an approximately annular shape. The three contact pieces 119a are provided along the peripheral edge of the connecting metal fitting 119. While, the connecting metal fitting 117 formed in an approximately semicircular shape is located inside the connecting metal fitting 119 and provided with one contact piece 117a.

[0056] A lower end portion of the boss part 113d located in the center of the head base 113 is movably inserted into a through-hole 127a provided at the center of a spring base 127 as a base part. The lower end surface of the boss part 113d is provided with the rubber cover 129 as an elastic body. The rubber cover 129 is fixed to the boss part 113d by a screw 133 via a plate-shaped part 131a of the head stopper 131 as a connecting member. An O-ring 130 is provided around the outer periphery of the spring base 127 as a sealing member in order to seal the gap between the spring base 127 and the head connecting part 61b of the head base 61. The second head ring 74 is fixed by being screwed onto the head connecting part 61b of the head base 61 shown in FIG. 18.

[0057] An elastic deformation part 129a, which is curved and ring-shaped, is provided in the vicinity of the outer peripheral edge of the rubber cover 129. The outer side of the elastic deformation part 129a is held between a ring-shaped rubber cover press 135 and the spring base 127. In this position, the rubber cover 129 is fixed to the spring base 127 by screws 137. As shown in FIG. 18, the rubber cover press 135 is provided with a plurality of convex portions 135a (four locations in this case) protruding downward in the vicinity of the outer periphery of the rubber cover 129. The rubber cover 129 and the rubber cover press 135 are fixed to the spring base 127 by use of the screws 137 and the convex portions 135a.

While, the head stopper 131 is located inside the rubber cover press 135. The lower end surface of the boss part 113d is approximately the same position as the lower end of the through-hole 127a of the spring base 127.

[0058] A cylindrical spring cover 139 is provided above the inner periphery of the spring base 127. The spring cover 139 functions as a shock absorber when the boss part 113d of the head base 113 is inserted in the spring base 127. A head spring 141 is set between the spring cover 139 and the boss part 113d as an elastic member. The head spring 141 presses the head base 113 upward in FIG. 18 relative to the spring base 127.

[0059] The lower end portion of the spring cover 139 is inserted in the through-hole 127a of the spring base 127. In this position, a gap 140 is formed between the bottom of the spring cover 139 and the boss part 113d.

[0060] By the configuration described above, the second head unit 7 is movable in a vertical direction (upward and downward directions in FIG. 17) to the spring base 127 as a base member that the second head unit 7 is fixed. Also, the second head unit 7 is capable of swinging around the axis in the vertical direction to the spring base 127 in FIG. 17.

[0061] A convex curved surface 113e is formed on the lower surface of the head base 113 in order to enable the second head unit 7 to easily swing. A concave curved surface 74a is formed on the surface of the second head ring 74 facing the head base 113 corresponding to the convex curved surface 113 e.

[0062] The material of the spring cover 139 and the rubber cover 129 is an ethylene-propylene-diene monomer (EPDM) rubber, a nitrile-butadiene rubber (NBR) or a silicone rubber. In addition, the head spring 141 is made of an elastic material such as SWPA, SWPB, SUS304 and SUS304WPB as the probe head spring 83. The inner diameter of the head spring 141 is approximately 16.0 mm.

[0063] The load of the head spring 141 when the contact surface 13a of the second probe head 13 tightly comes in contact with the skin may be approximately 5.0 N, preferably, 2.0 N to 4.0 N, more preferably, 2.5 N to 3.0 N. The setting force of the head spring 141 may be approximately 0.5 N to 2.0 N, preferably, 1.0 N to 1.5 N. The setting force represents the repulsive force of the spring when assembled by compression. In addition, the amount of movement of the second probe head when the second probe head 13 is pressed against the skin 13 may be approximately 1.0 mm to 7.0 mm, preferably, 2.0 mm to 6.0 mm, more preferably, 3.0 mm to 5.0 mm. The amount of movement represents the depressed distance of the second probe head 13 toward the second head ring 74 when the second probe head 13 is pressed against the skin.

[0064] FIG. 21 corresponds to FIG. 17 and shows that the second probe head 13 is pressed against the skin so that the head spring 141 is compressed and the second head unit 7 is close to the spring base 127. FIG. 22 corresponds to FIG. 17 and shows that the second head

unit 7 leans relative to the spring base 127 while swinging. Note that FIG. 22 is the cross-sectional view viewing from a different angle from FIG. 17.

[0065] The head stopper 131 has a motor mounting part 131b on the undersurface of the plate-shaped part 131 a to mount a vibration motor 143. Also, the motor mounting part 131b has an arced part 131c formed to correspond to the external shape of the vibration motor 143. A base board 125 is fixed to the motor mounting part 131b by screws 145. The vibration motor 143 is held between the base board 125 provided below and the arced part 131c.

[0066] The base board 125 is connected to ends of lead wires 147 as an electrical cable, and the other ends are connected to the vibration motor 143. Also, the base board 125 is connected to the main body circuit substrate 35 via lead wires 151.

[0067] An end portion of the vibration motor 143 is provided with an eccentric balancer 153. The eccentric balancer 153 rotates so as to vibrate the entire second head unit 7 by being carried the electric current to the vibration motor 143. The adequate revolutions of the vibration motor 143 are preferably about 4400 rpm to 7000 rpm, more preferably, about 5700 rpm.

[0068] FIG. 23 is an example that a hollow ring 155, which is made of an elastic resin such as urethane, is provided as an elastic member instead of the head spring 141. In this example, the cylindrical hollow ring 155 is provided instead of the head spring 141 and the spring cover 139. The other configuration is the same as FIG. 18. Alternatively, an air suspension may be used as an elastic member instead of the head spring 141.

[0069] When the hollow ring 155 is used, it is possible to reduce the number of parts so as to simplify the structure compared to the use of the head spring 141. The material of the hollow ring 155 may be EPDM, NBR or the silicone rubber as same as the rubber cover 129.

[0070] Instead of the spring cover 139 shown in FIG. 17, an elastic body such as a rubber and an elastomer may be fixed to at least one of the convex curved surface 113e of the head base 113 and the concave curved surface 74a of the second head ring 74. Also, an elastic body such as a resin may be integrally formed with the convex curved surface 113e or the concave curved surface 74a. Further, the convex curved surface 113e or the concave curved surface 74a may be coated with rubber or urethane coating.

[0071] The following is the explanation of an operation mode of the ultrasonic cosmetic device. The LED 21 lights up with one press of the switch 15 shown in FIG. 2 so as to indicate the main body power supply is turned on. Then, the first ultrasonic vibrator 75 of the first head unit 5 capable of offering a skin care to the nose starts to vibrate ultrasonically and the ultrasonic vibrations are transmitted to the first probe head 9.

[0072] The main body power supply is automatically turned off when five minutes have passed after pressing the switch 15 once. The first probe head 9 that has been

operating stops generating the ultrasonic vibrations by pressing the switch 15 once again within five minutes. Instead, the second ultrasonic vibrator 107 of the second head unit 7 capable of offering a skin care to the face starts to vibrate ultrasonically and the ultrasonic vibrations are transmitted to the second probe head 13. The vibration motor 143 also starts to operate simultaneously with the ultrasonic vibrations of the second ultrasonic vibrator 107 so as to vibrate the entire second head unit 7. While the LED 23 is turned on, the LED 21 is turned off.

[0073] The main body power supply is automatically turned off when six minutes have passed in this state. If the switch 15 is pressed once again within six minutes, the vibration motor 143 stops, and the only second ultrasonic vibrator 107 continues operating so as to keep the ultrasonic vibrations of the second probe head 13. While the LED 25 is turned up, the LED 23 is turned off.

[0074] If the switch 15 is pressed once again in this state, the main body power supply is turned off and the LED 25 is turned off. Also, the main body power supply is turned off if the second probe head 13 is kept under the condition that the ultrasonic vibrations are not transmitted to the skin for two and a half minutes. Alternatively, main body power supply is turned off if the second probe head 13 is kept being pressed against the skin for ten minutes to care the skin.

[0075] As described above, the presented ultrasonic cosmetic device enables the first head unit 5 and the second head unit 7 to be selectively operated by operating the switch 15 provided in the main body unit 1.

[0076] Moreover, in the present embodiment, the single ultrasonic frequency from the single controlling circuit in the vibrator controlling circuit substrate 36 is supplied for the first probe head 9 and the second probe head 13 when the first probe head 9 or the second probe head 13 is being operated. Thus, it is possible to make the entire ultrasonic cosmetic device downsized.

[0077] According to the presented ultrasonic cosmetic device, the entire body is Y-shaped as shown in FIG. 1. It enables the contact surfaces 9a, 13a of the first and second probe heads 9, 13 to be easily placed in contact with the skin when the user holds the main body unit 1 naturally. Accordingly, it makes the usability of the ultrasonic cosmetic device improved compared to the T-shaped device.

[0078] The following is the explanation of the operation to offer a skin care to the nose by use of the first head unit 5 shown in FIG. 6. The first probe head 9 starts to generate ultrasonic vibrations with one press of the switch 15 while holding the main body unit 1 by the hand. Then, the first head unit 5 is brought closer to and pressed against an upper part of the nose (almost immediately under the area between the eyebrows). While the cut-out 11a of the attachment 11 is located downward, a pressing load more than a certain value is applied via the attachment 11. As a result, the attachment 11 retracts against the elastic force of the probe head spring 83.

[0079] The inner diameter of a skin contact part of the

attachment 11 is 17.0 mm, the outer diameter is 20.0 mm. FIG. 9 shows a cross-sectional view of one example that the attachment 11 retracts 1.5 mm. In the device of FIG. 9, the attachment 11 and the first probe head 9 are in contact with the skin, while the ultrasonic vibrations have been imparted to the first probe head 9. With such a state, the ultrasonic vibrations of the first probe head 9 make plugs of sebum and dirt in pores softened so as to push out of the skin. Then, the device is gradually slid toward the front end of the nose so that the plugs and pore dirt softened and pushed out are wiped off and removed from the skin by the inner peripheral edge of the attachment 11. The cut-out 11a is located in the front part in the direction of movement, while the rounded inner peripheral edge in contact with the nose is formed opposite to the cut-out 11a. Thus, it is possible to offer a skin care to the nose with relieving from damaging the skin. Further, it is possible to obtain a firming effect of the pores of the skin after the removal by the ultrasonic vibrations.

[0080] The ultrasonic cosmetic device continues offering the same skincare effect even if the moving direction of the attachment 11 is changed because of its circular shape. Since the attachment 11 is detachable, it enables the attachment 11 to be washed independently and constantly used in a clean condition.

[0081] When the attachment 11 is pressed against the skin, the retraction stroke relative to the position before pressed is preferably about 2.0 mm at maximum. When the attachment 11 comes to its maximum retraction position, the inner surface of the attachment 11 comes in contact with the front end of the probe cover 77 in an abutment face P. A protrusion amount α from the contact surface 9a of the first probe head 9 is 0.3 mm or more, preferably, 0.5 mm when in use. If the retraction stroke exceeds 2.0 mm, the stroke while being pressed against the skin is too large to be used efficiently. If the protrusion amount α exceeds 0.5 mm when in use, it makes the first probe head 9 hard to come in contact with the skin. In addition, the pressing load of the attachment 11 to the skin is preferably 0.686 N to 1.078 N, more preferably, 0.784 N to 0.98 N.

[0082] While the attachment 11 is movable in the upward and downward directions by the probe head spring 83 as shown in FIGs. 6 and 9, the attachment 11 may be fixed to the first probe head 9. Moreover, the attachment 11 is not limited to being ring-shaped as shown in FIG. 7, but plate-shaped.

[0083] The following is the explanation of the operation to offer a skin care to the face by use of the second head unit 7 shown in FIG. 17. As mentioned above, the second probe head 13 starts to generate ultrasonic vibrations when the switch 15 is pressed once again while the first head unit 5 is being operated. Simultaneously, the vibration motor 143 starts to operate so as to generate the vibrations. Then, the second head unit 7 is brought closer to and pressed against the skin such as cheeks.

[0084] The ultrasonic vibrations of the second probe head 13 and the vibrations of the vibration motor 143

make the pores of the skin firm and blood circulation increased. In addition, these vibrations enhance the skin firming and stimulate the skin to produce collagen so as to make the pores virtually imperceptible.

[0085] When the second probe head 13 is pressed against the skin with a pressing load more than a certain value, as shown in FIG. 21, the head spring 141 deforms and the second probe head 13 retracts. At the same time, the head base 113 retracts integrally, and the boss part 113d bends the rubber cover 129. In addition, the head stopper 131 and the vibration motor 143 integrally retract with the second probe head 13 and the head base 113.

[0086] When the presented device is moved along the skin surface, as shown in FIG. 22, the parts that integrally retract lean as a whole. Thus, it is possible that the contact surface 13a of the second probe head 13 is kept in contact with the skin surface naturally.

[0087] In addition, the presented device includes the spring cover 139 made of the elastic body such as EPDM. The spring cover 139 absorbs the vibrations in a lateral direction caused by the vibration motor 143 integrated with the head base 113. It results in a reduction of odd noises generated between the head base 113 and the spring base 127. Thus, it is possible to offer the skin care without feeling discomfort by unpleasant noise.

[0088] In the first head unit 5 as shown in FIG. 6, the first probe head 9 is arranged on the probe base 91 provided with the connecting metal fittings 95, 97. Then, the assembly assembled by the probe base 91 and the first probe head 9 is covered with the probe cover 77. The probe base 91 is fixed to the probe cover 77 by the screws 93, and the first probe head 9 is pressed against the probe base 91. As a result, each contact piece 95a and 97a of the connecting metal fittings 95, 97 deforms so that each of the contact pieces 95a and 97a comes in contact with the first ultrasonic vibrator 75 and the undersurface of the flange 9d of the first probe head 9, respectively. It makes the connection maintained in a good state, and as a result, it is possible to stably transmit electrical signals from the main body circuit substrate 35 to the first ultrasonic vibrator 75.

[0089] Moreover, the connecting metal fittings 95, 97, as shown in FIG. 15, are isolated from each other by the cross-shaped insulating rib 91g. Thus, it is possible to steadily avoid contacting each other, and prevent from short-circuiting between the connecting metal fittings 95, 97 and causing problems such as damage of the control circuit.

[0090] When the first head unit 5 is used for the skin care with a fluid such as gel, the fluid is going to penetrate into the first head unit 5 running through the first probe head 9 and the attachment 11. However, the O-rings 79, 89 prevent the fluid from penetrating so as to keep a better operating condition. With such a water-resistant structure, the fluid and solid adhering to the first probe head 9 and its surrounding components can be washed away with water. Moreover, it is possible to prevent from damaging the controlling circuit since this structure

avoids penetration of the fluid into the main body unit 1.

[0091] Also, when the second head unit 7 is used for the skin care with a fluid such as gel, the fluid is going to penetrate into the second head unit 7 running through the second probe head 13 and the head cover 109. However, the O-rings 111, 115, the rubber cover 129 and the O-ring 130 prevent the fluid from penetrating so as to keep a better operating condition. With such a water-resistant structure, the fluid and solid adhering to the second probe head 13 and its surrounding components can be washed away with water. Moreover, it is possible to prevent from damaging the controlling circuit since this structure avoids penetration of the fluid into the main body unit 1.

[0092] Further, when the present device is used for the skin care with a fluid such as gel, the fluid is going to penetrate into the main body running through the head cases 65, 67 and the housing 31 as shown in FIG. 5. However, the O-ring 63, the switch rubber 51 and the lower cover O-ring 57 prevent the fluid from penetrating so as to keep a better operating condition. Therefore, the fluid and solid adhering to the components surrounding the main body unit 1 can be washed away with water, and it is possible to prevent from damaging the control circuit.

[0093] In the second head unit 7 shown in FIG. 17, the head stopper 131 provided with the vibration motor 143 and the base board 125 is fixed to the boss part 113d of the head base 113. The head base 113, the vibration motor 143 and the base board 125 integrally move up and down and swing relative to the spring base 127. Thus, the lead wires 147, which connect the vibration motor 143 and the base board 125 and are formed relatively thin, are prevented from being severed.

[0094] While, connecting metal fittings respectively provided to the vibration motor 143 and the base board 125 may be brought into contact with each other, instead of the lead wires 147 that connect the vibration motor 143 and the base board 125. Also, a connecting metal fitting provided to the vibration motor 143 may be brought into contact with a contact point formed by plating on the base board 125.

[0095] According to the present invention as described above, the head member 7 and the vibration motor 143 provided with the ultrasonic vibrator 107 relatively move relative to the main body member 127. Therefore, it enables the probe head 13 to keep in good contact with the uneven skin surface even when the entire device is moved bringing the probe head 13 provided at the head member 7 into contact with the skin. As a result, the skin-care effect can be achieved sufficiently.

[0096] Moreover, according to the present invention, the head member 7 provided with the probe head 13 can be relatively moved integrally with the vibration motor 143 and the base board 125 relative to the main body member 127. Therefore, it is possible to stably connect between the vibration motor 143 and the base board 125 by use of an electrical connecting member. When the

lead wire is used as the electrical connecting member, for example, the lead wire is prevented from being severed so that the life of the motor is extended.

[0097] Furthermore, according to the present invention, when the head member 7 provided with the probe head 13 is relatively moved relative to the main body member 127, the shock absorber 139 avoids the vibrations and odd noises generated by the vibration motor. 5

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Claims

1. An ultrasonic cosmetic device, comprising:

a head unit (7) comprising: 15

an ultrasonic vibrator (107) which generates ultrasonic vibrations; and
a probe head (13) which transmits ultrasonic vibrations generated by the ultrasonic vibrator (107) to a skin surface; 20

a vibration motor (143) which is integrally fixed to the head unit (7) and vibrates the head unit (7), the head unit (7) being provided with the probe head (13) ultrasonically vibrating; and 25
a main body member (127) which supports the head unit (7) and the vibration motor (143), the head unit (7) and the vibration motor (143) being relatively movable relative to the main body member (127). 30

2. The ultrasonic cosmetic device according to claim 1, wherein the vibration motor (143) is integrally fixed to the head unit (7) by a fixing member (131), 35 a base board (125) connected to the vibration motor (143) via an electrical connecting member (147) is fixed to the fixing member (131), and the base board (125) and a controlling circuit (35) are electrically connected by lead wires (151). 40

3. The ultrasonic cosmetic device according to claim 1 or 2, wherein a shock absorber (139) is provided between the head unit (7) and the main body member (127). 45

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FIG. 1

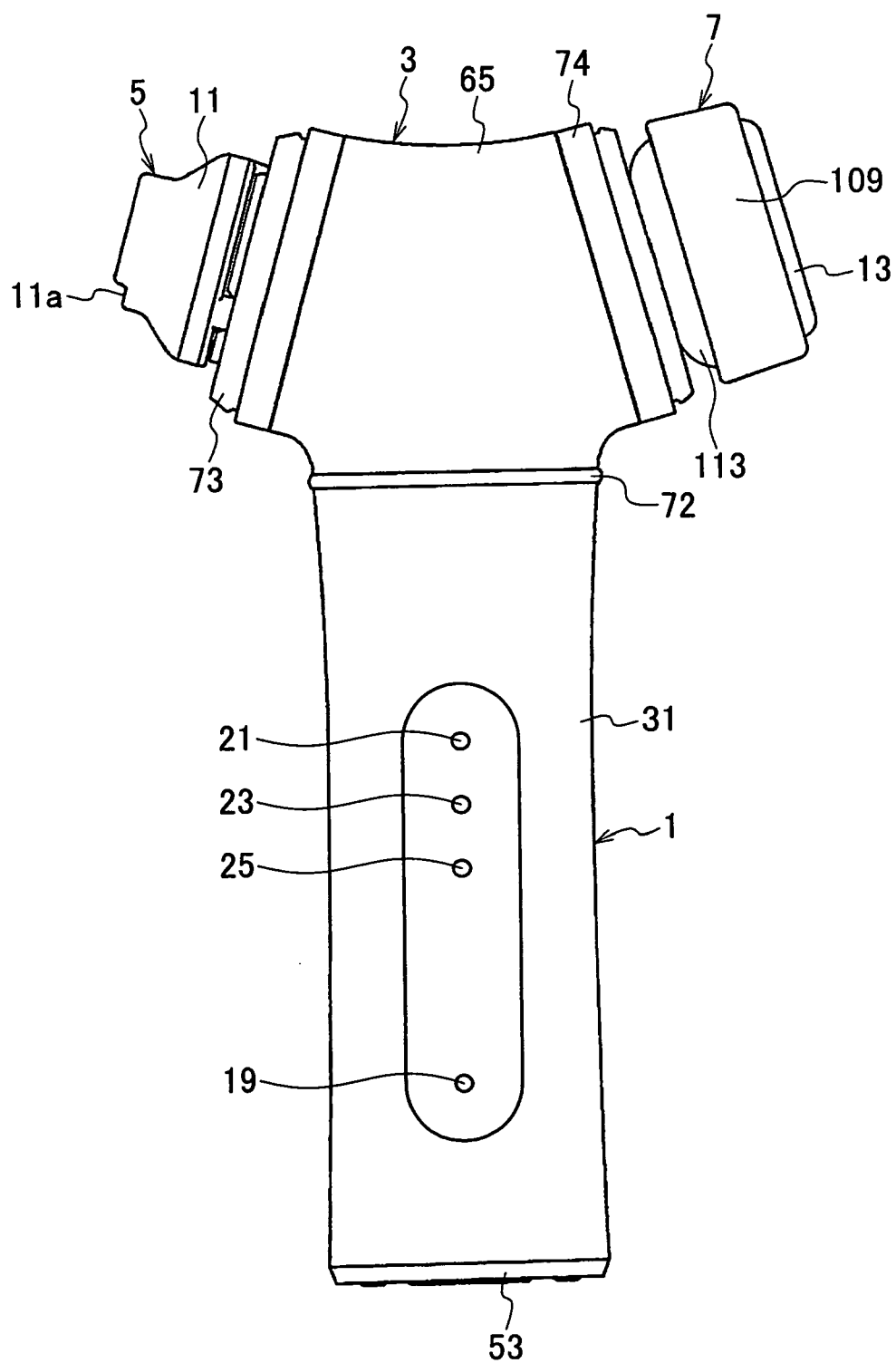


FIG. 2

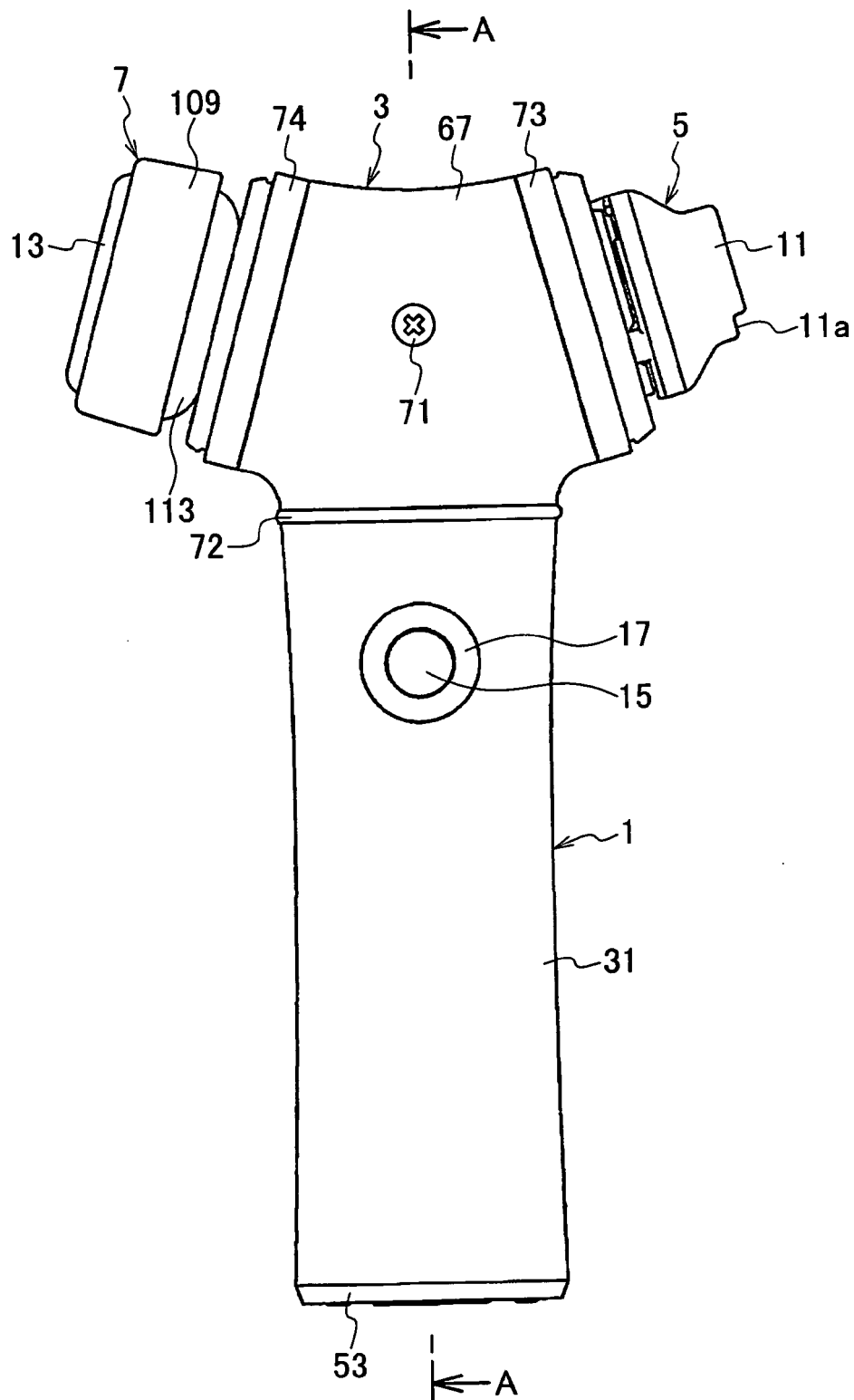


FIG. 3

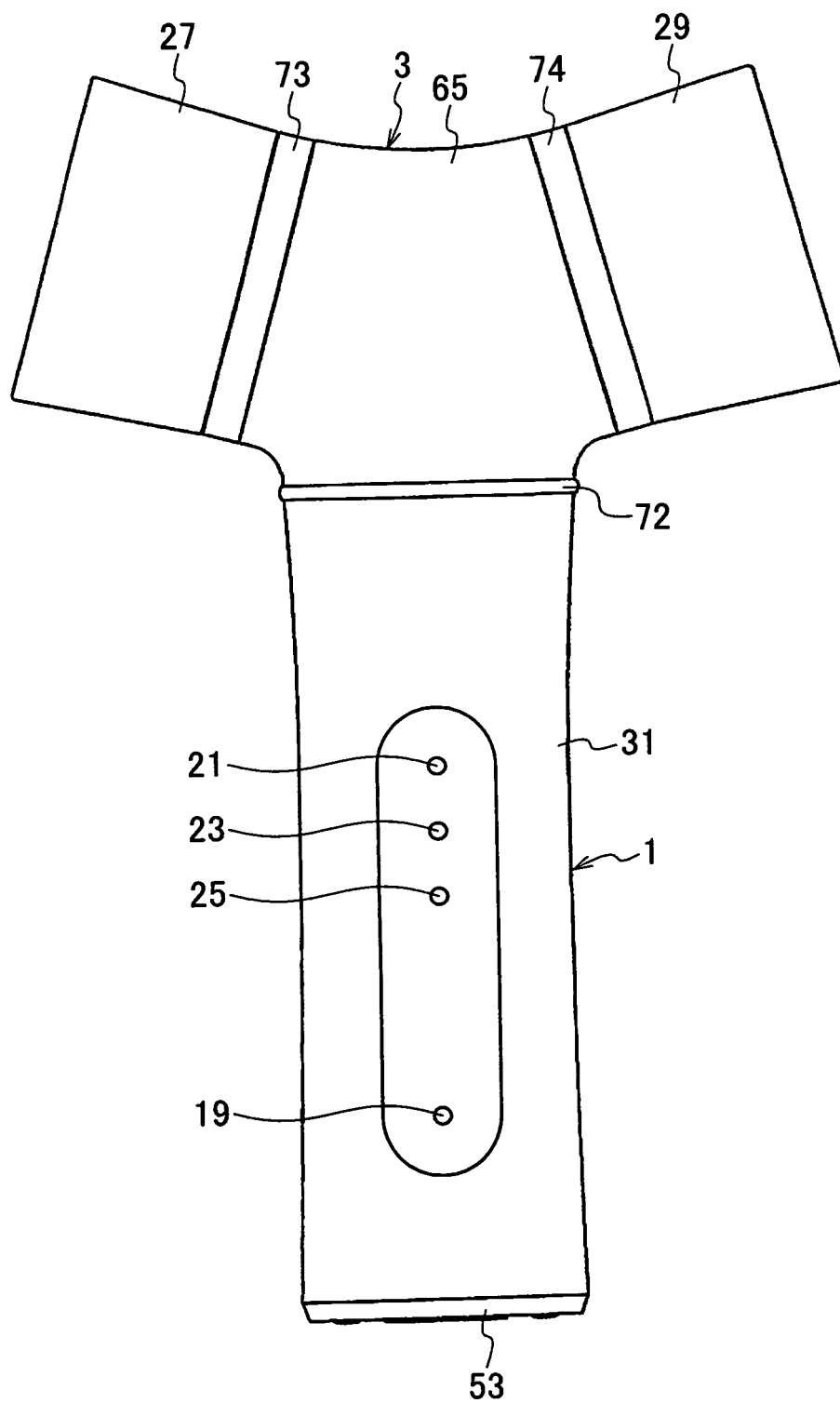


FIG. 4

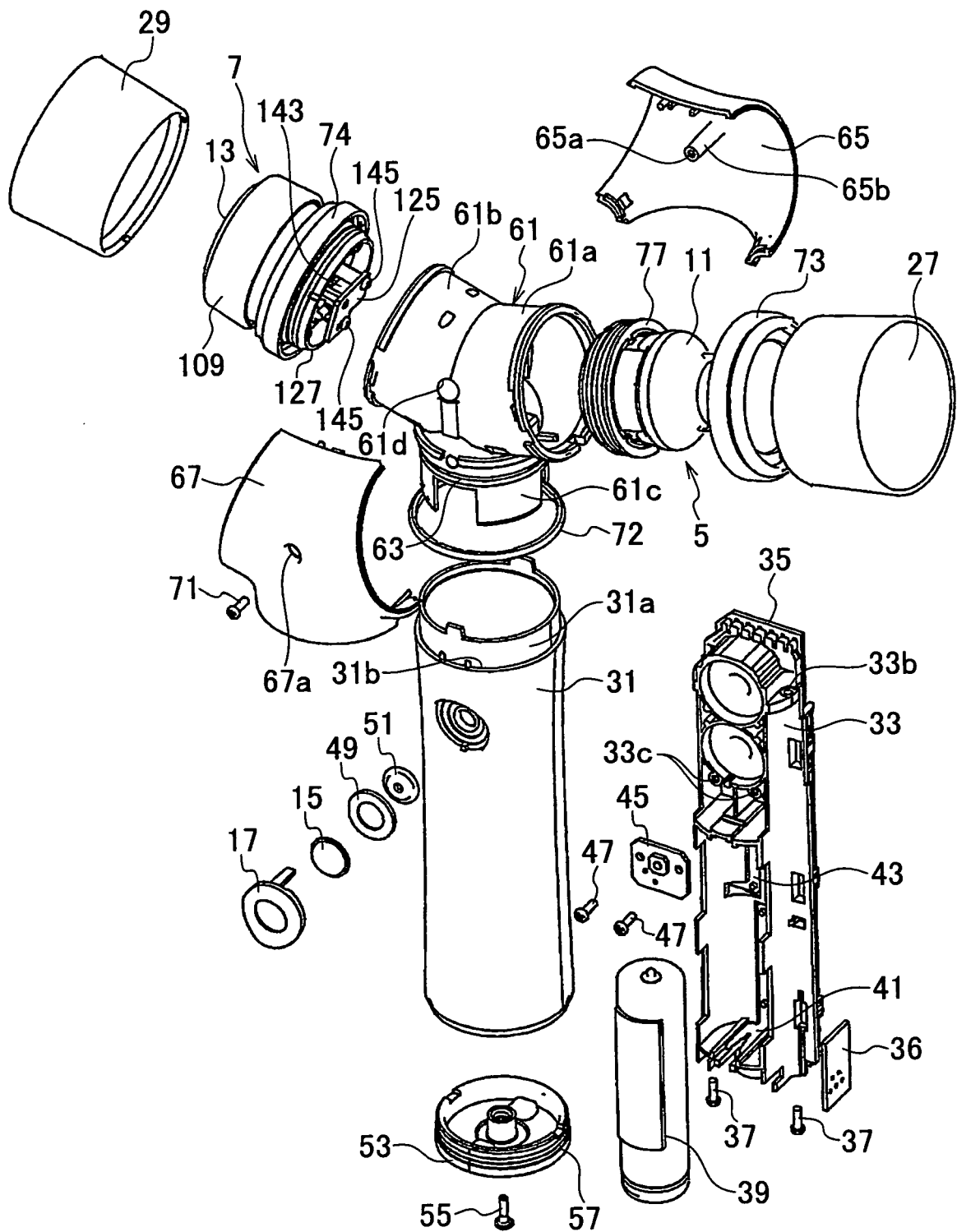


FIG. 5

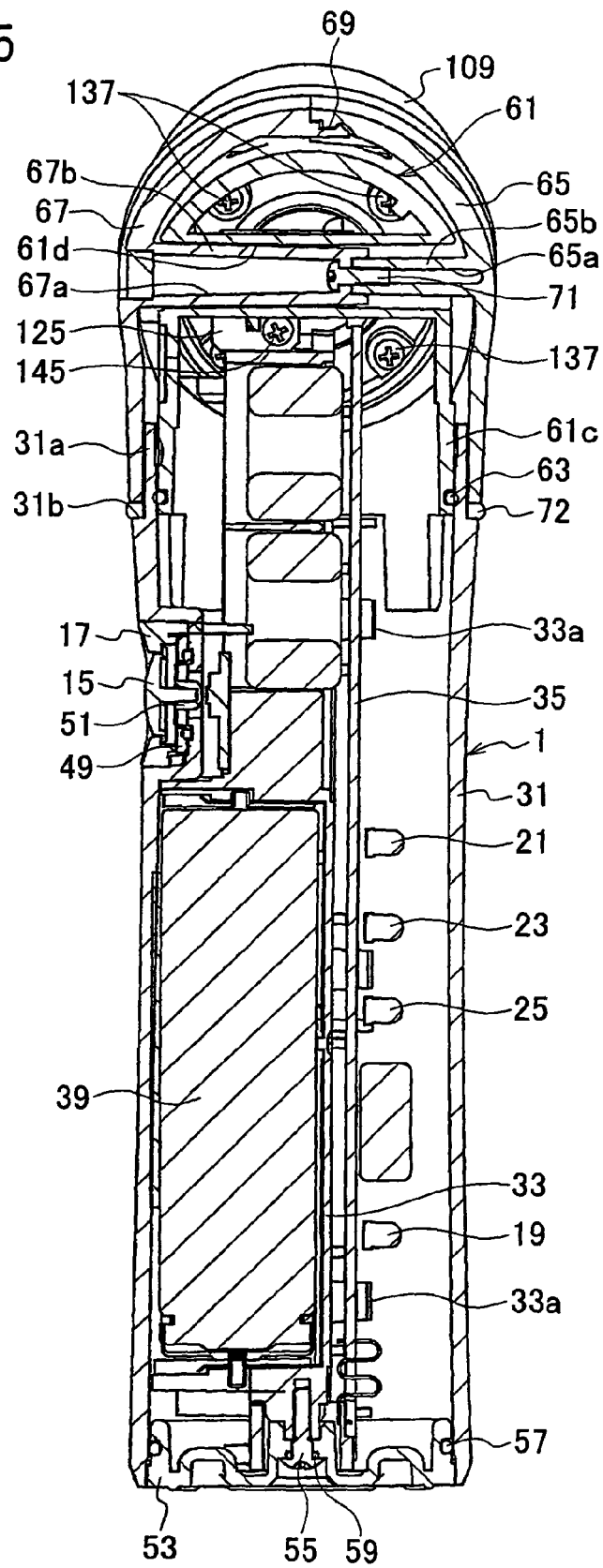


FIG. 6

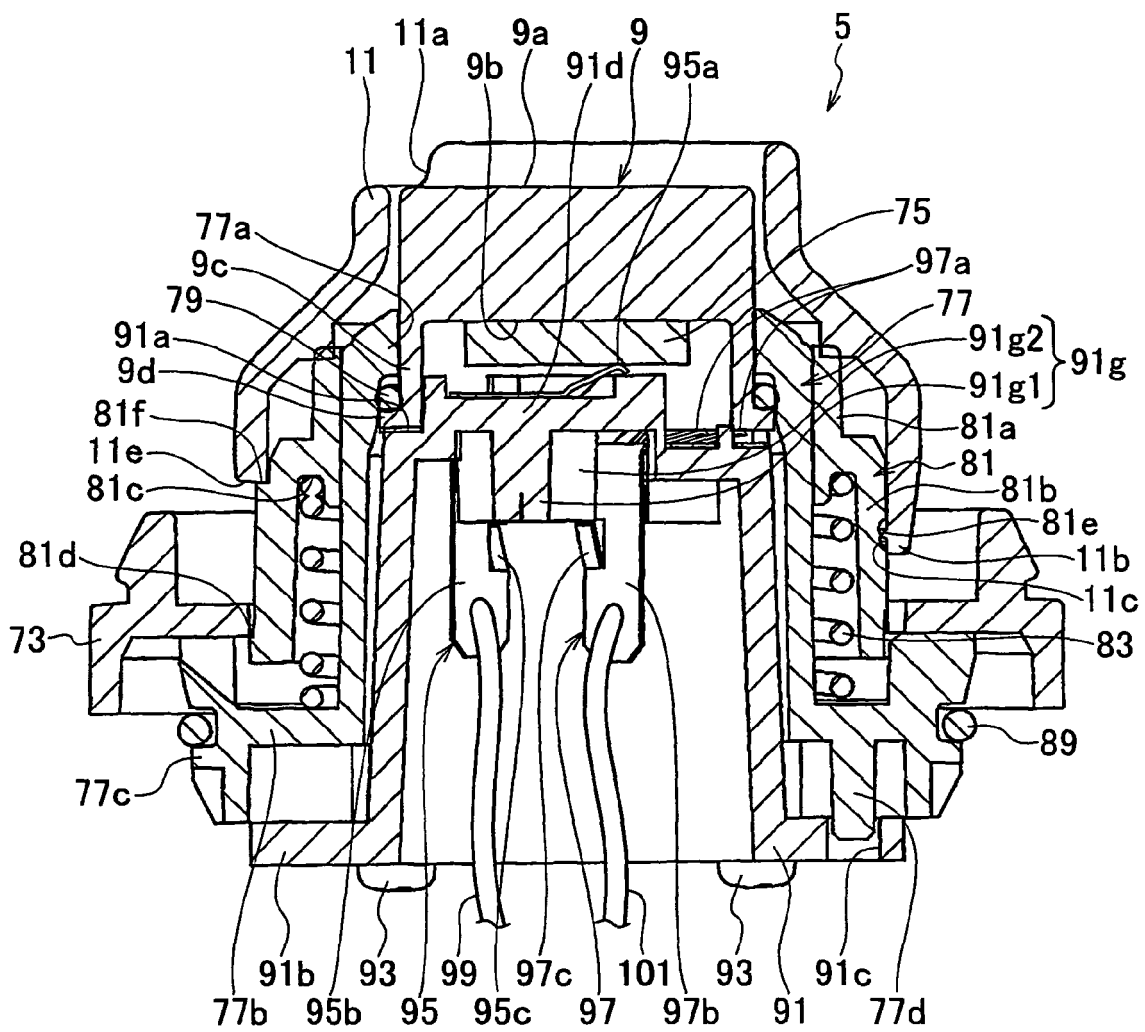
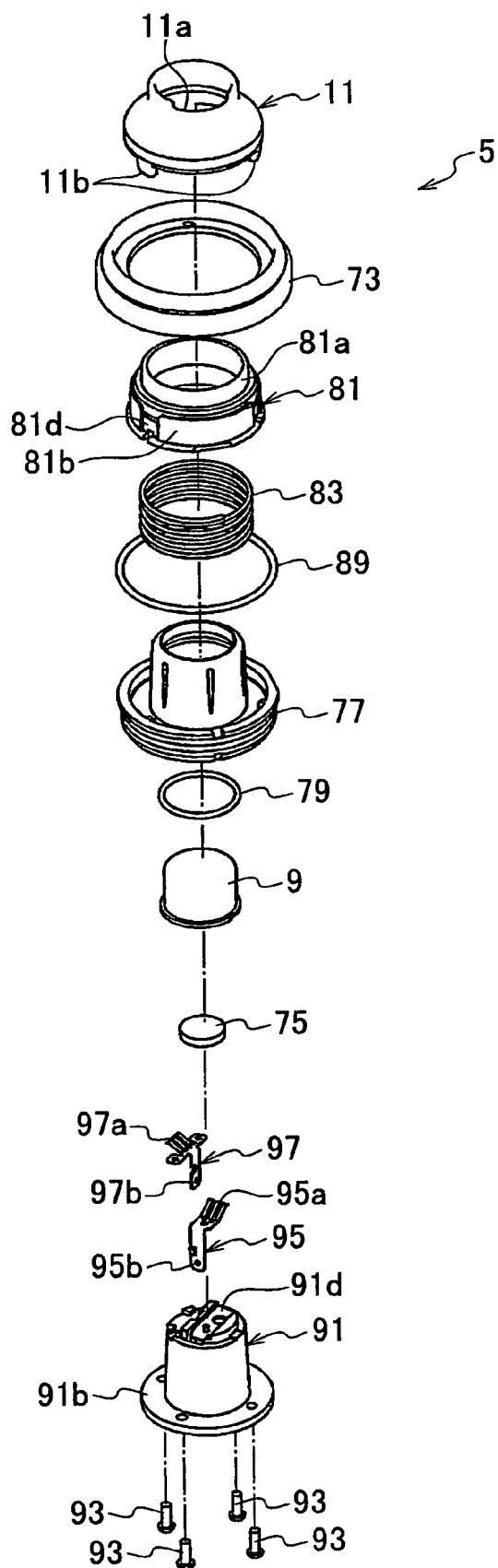


FIG. 7



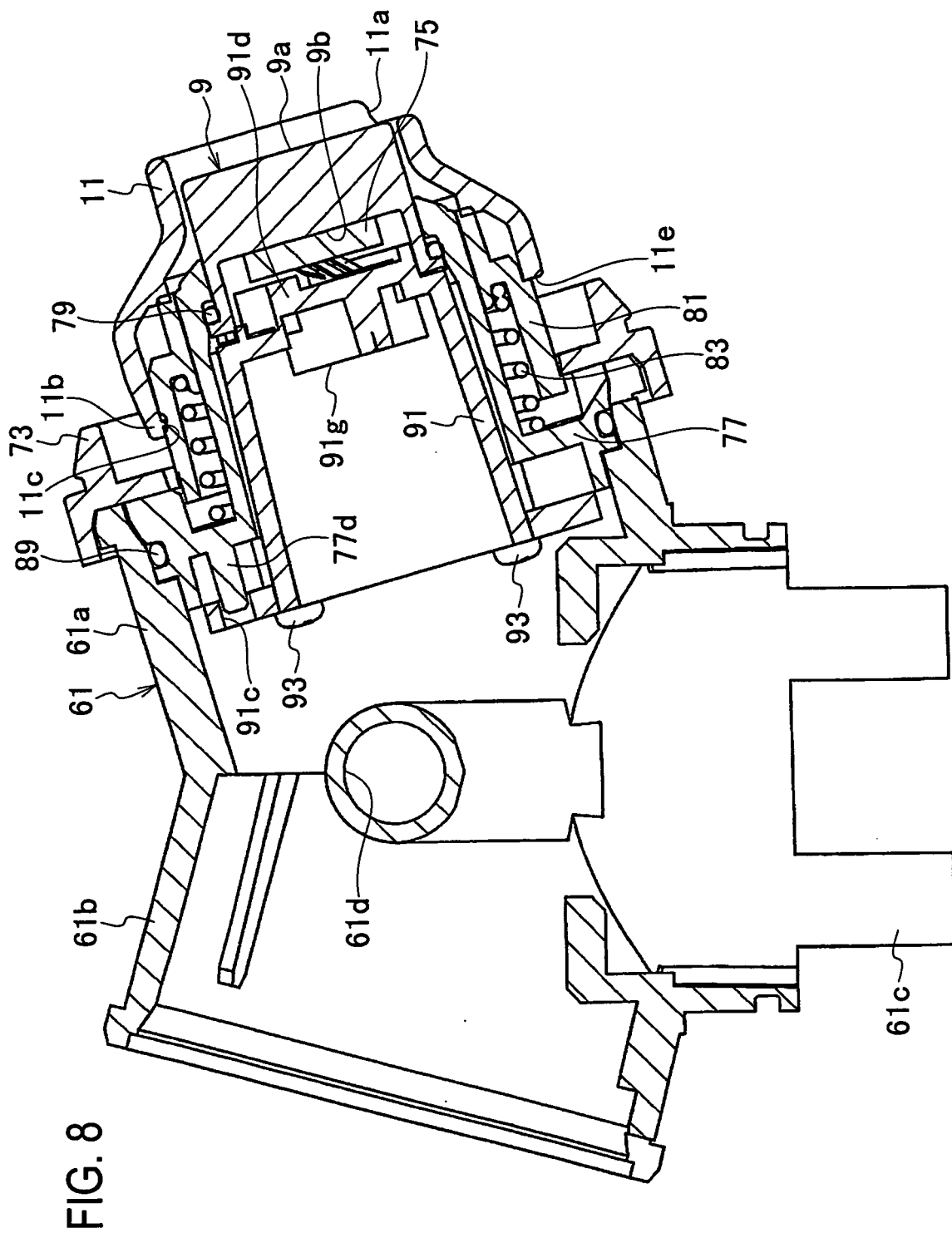


FIG. 9

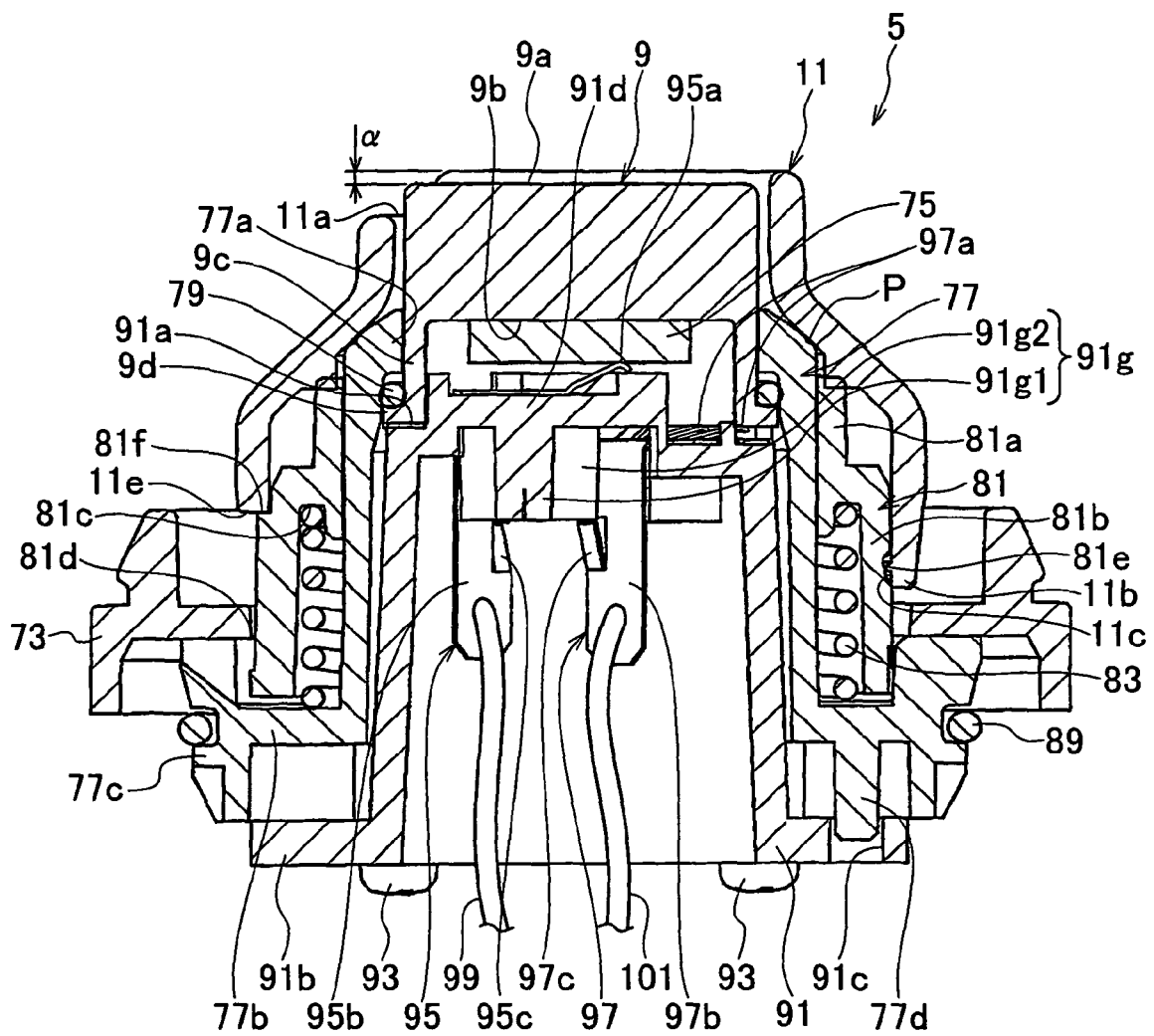


FIG. 10

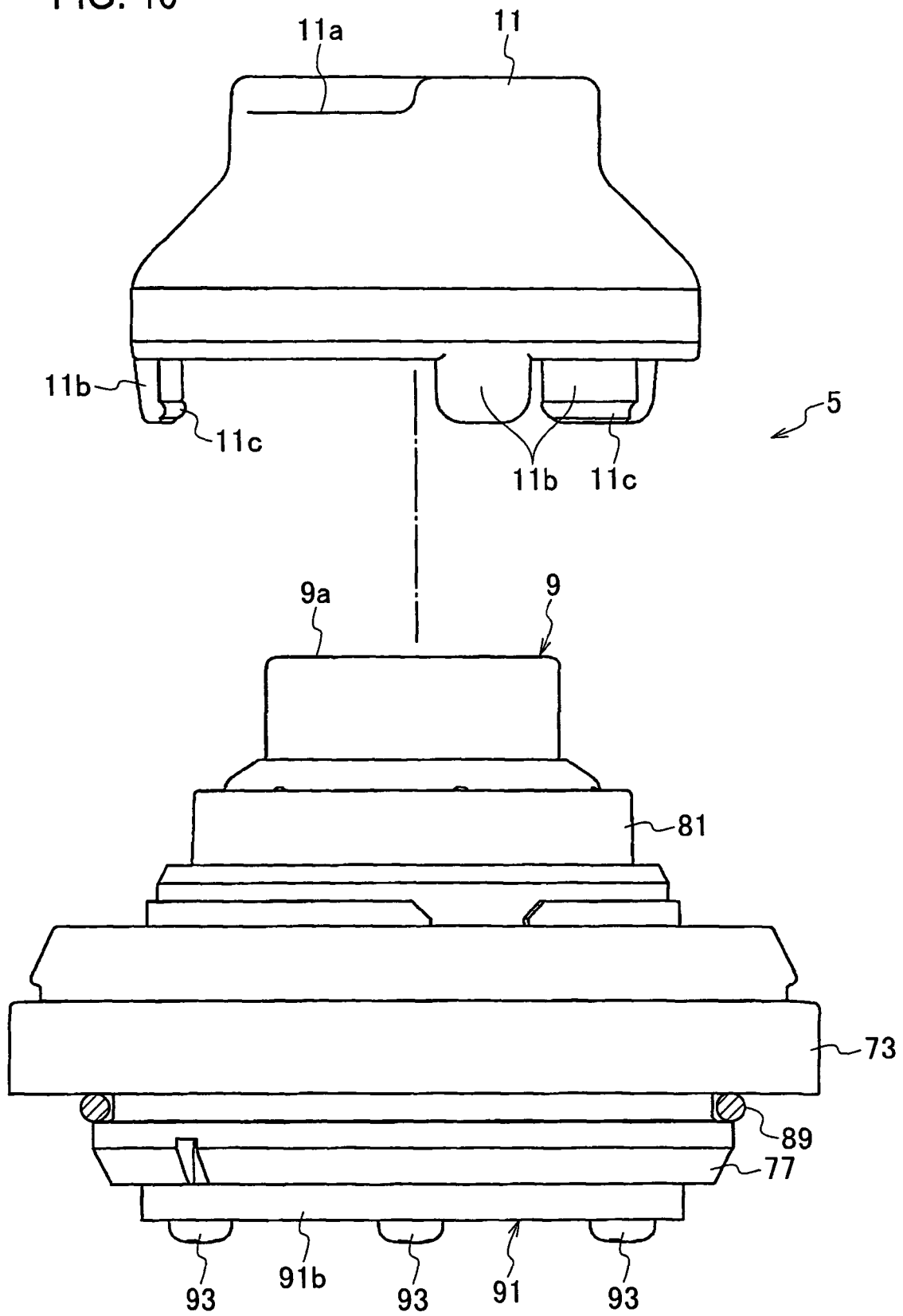


FIG. 11

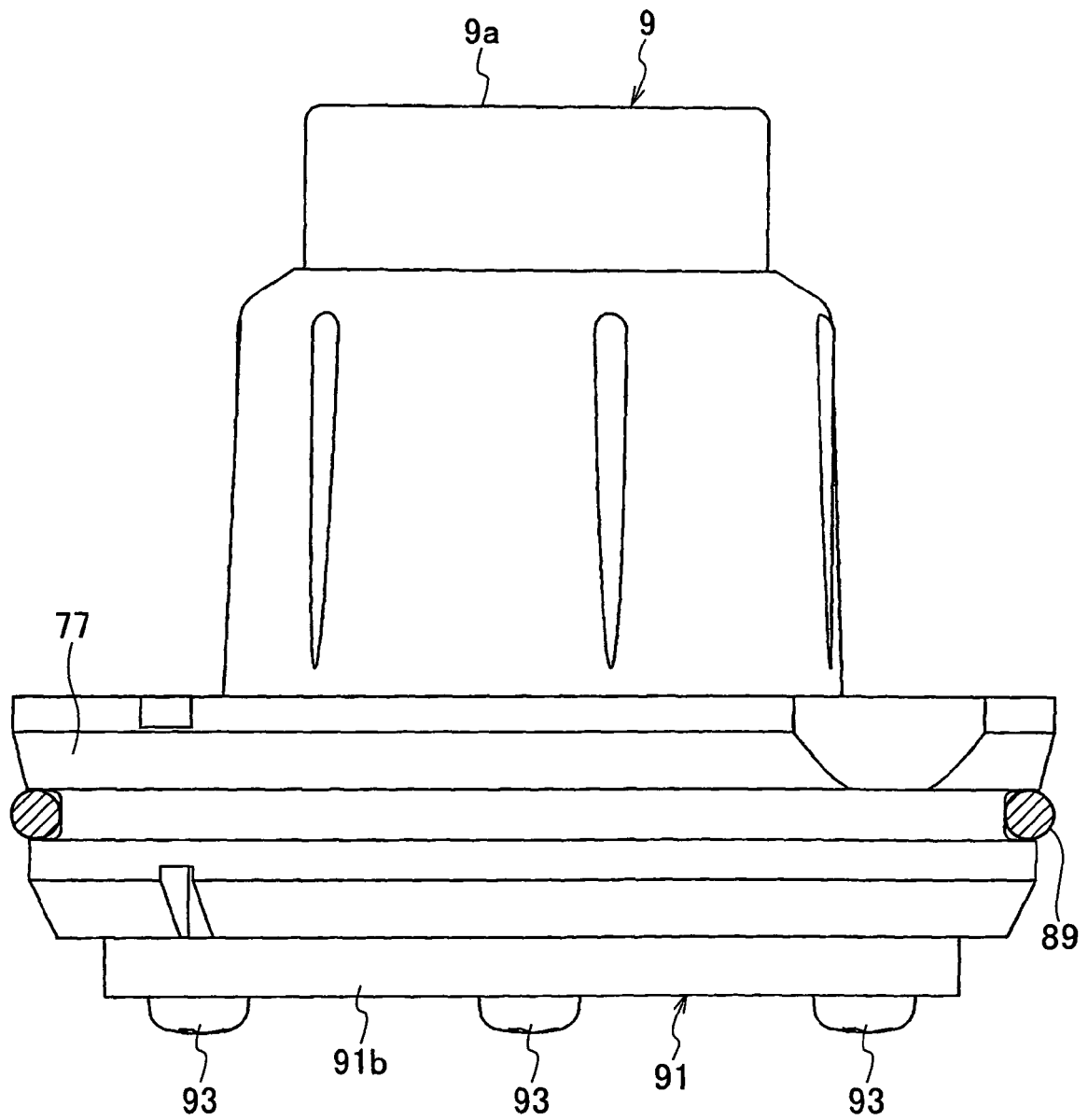


FIG. 12

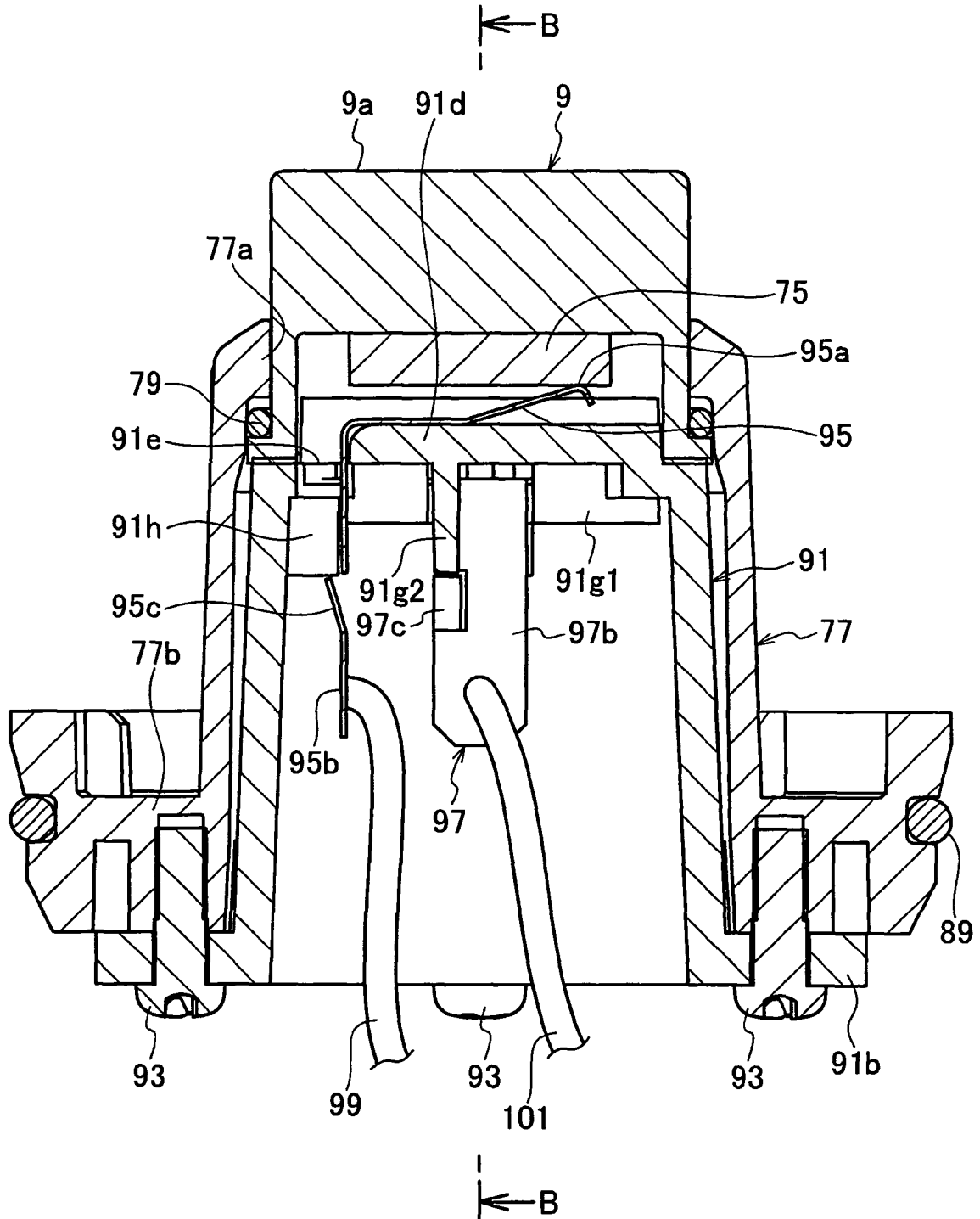


FIG. 13

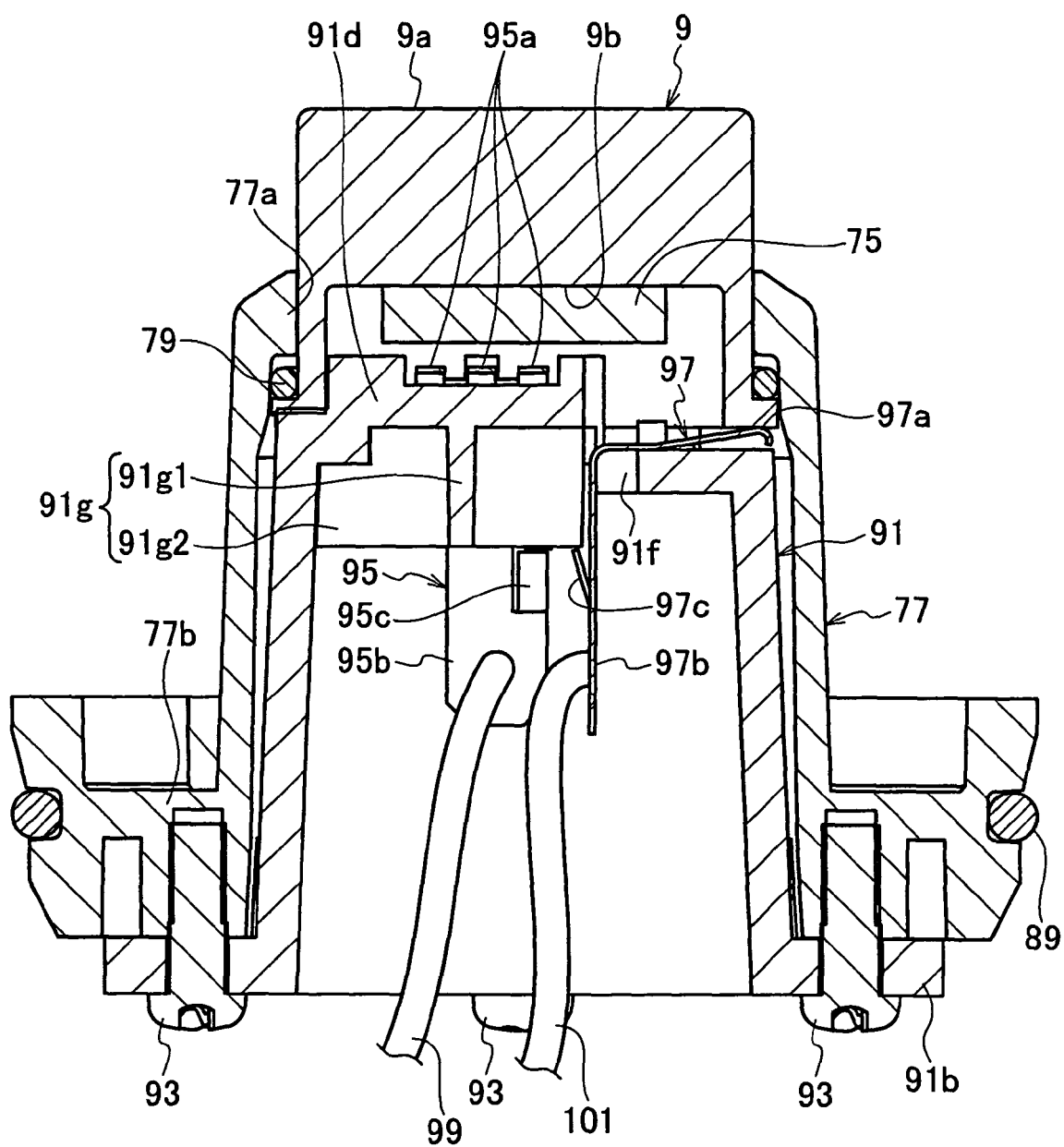


FIG. 14

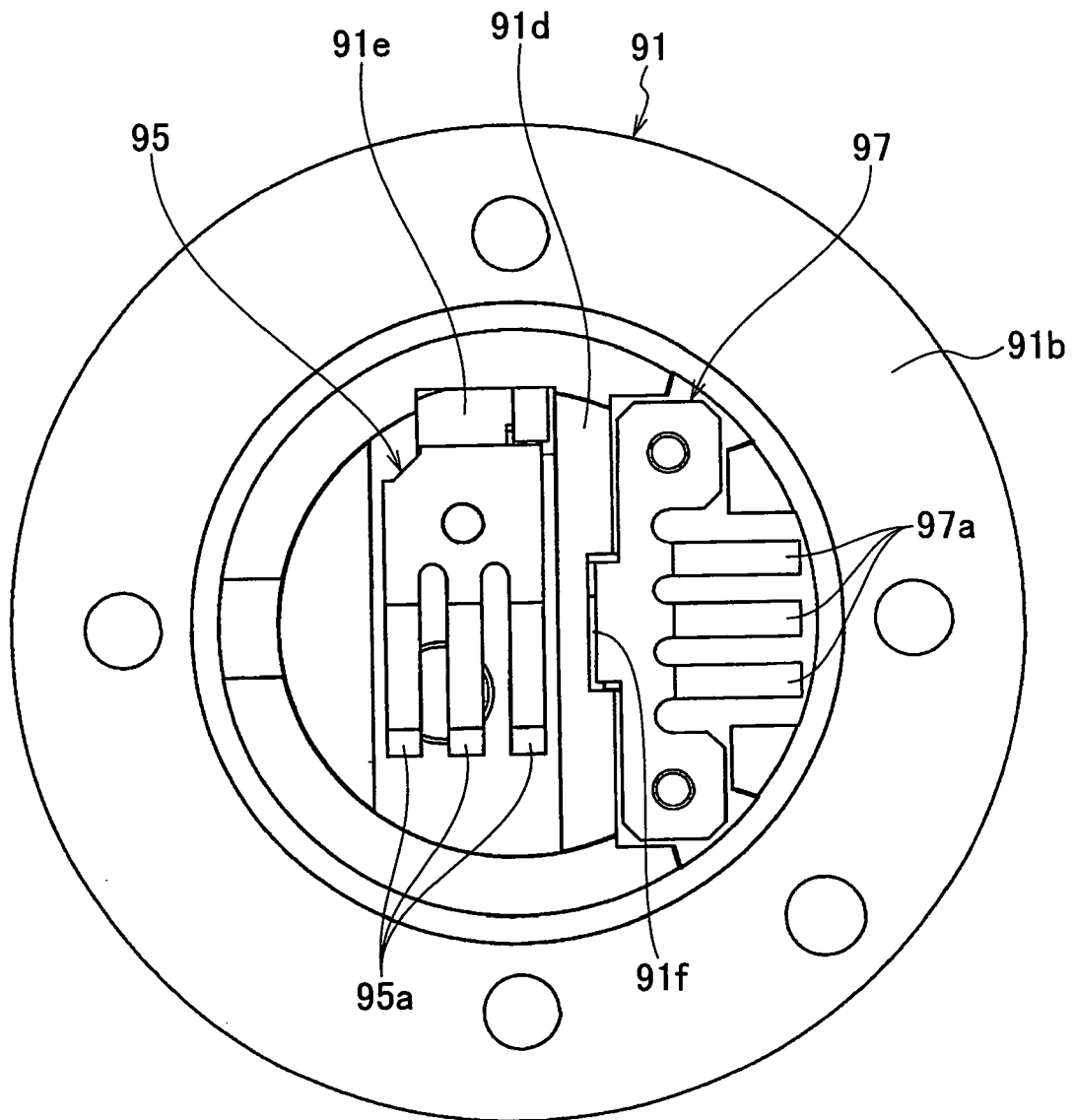


FIG. 15

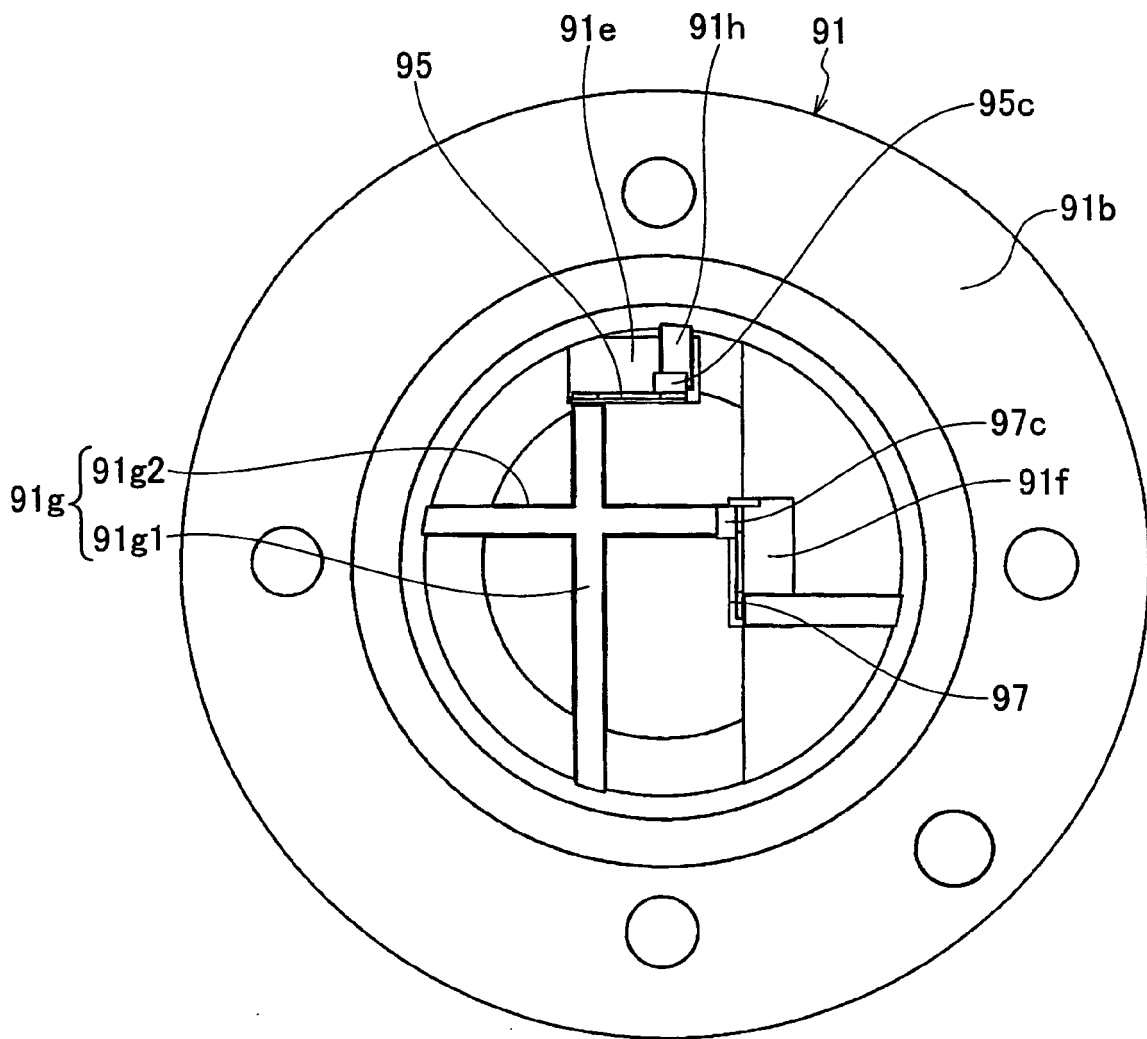


FIG. 16

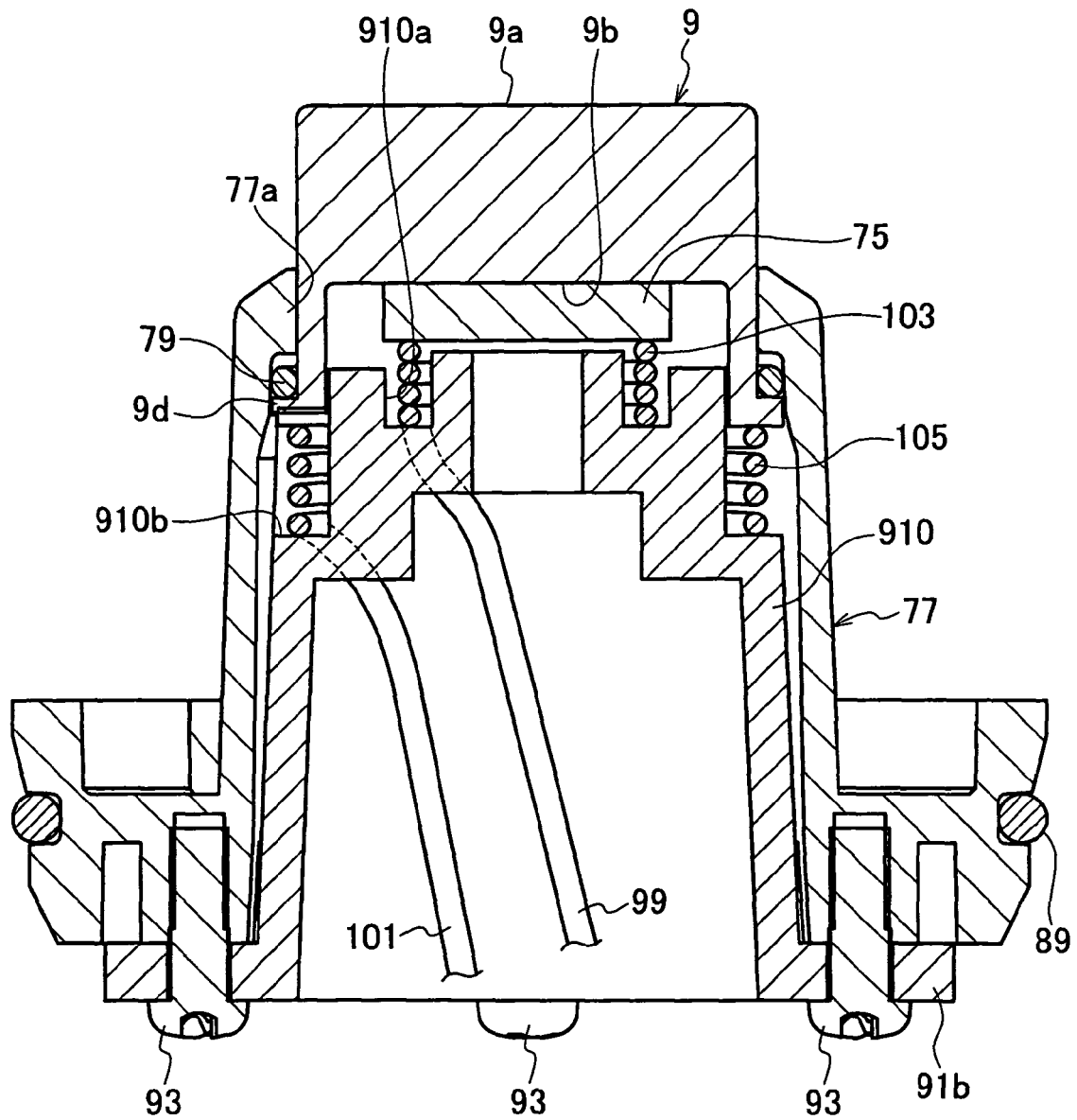


FIG. 17

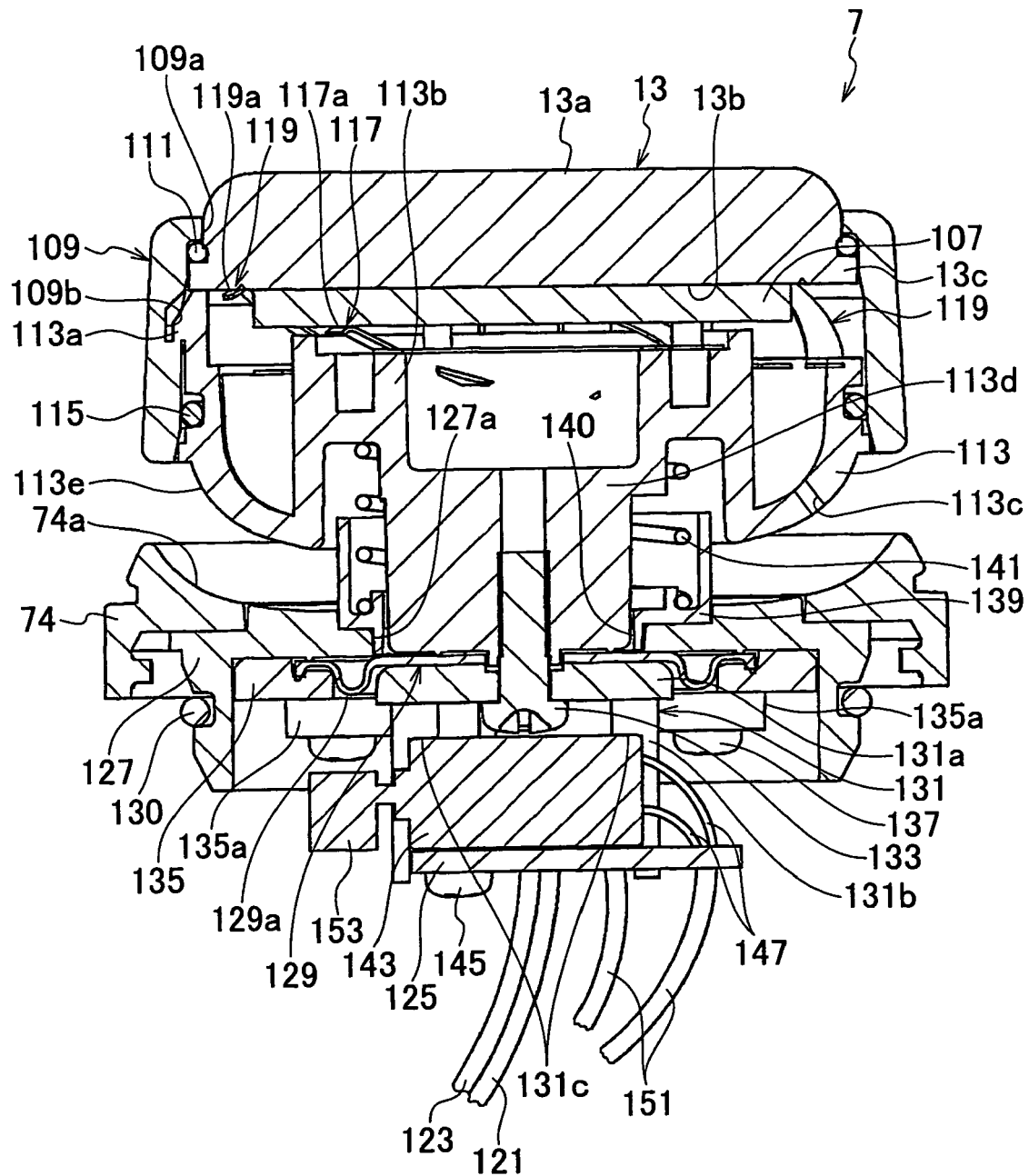
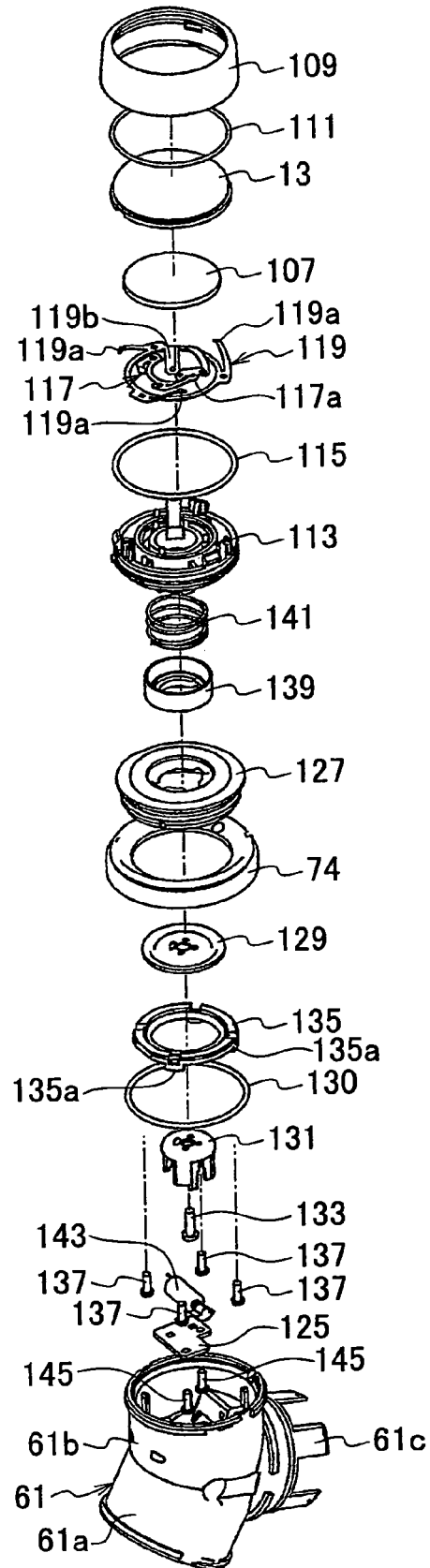
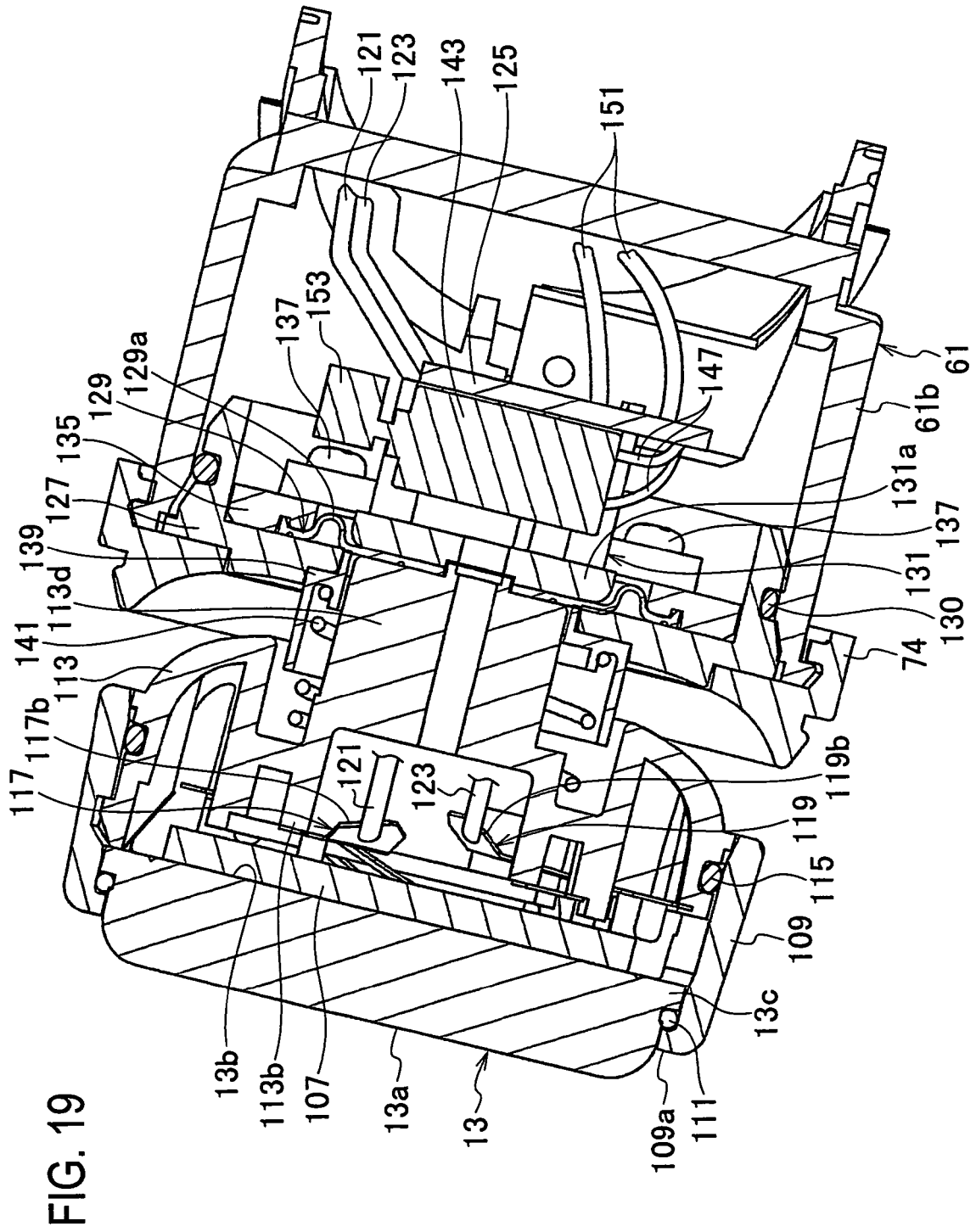


FIG. 18





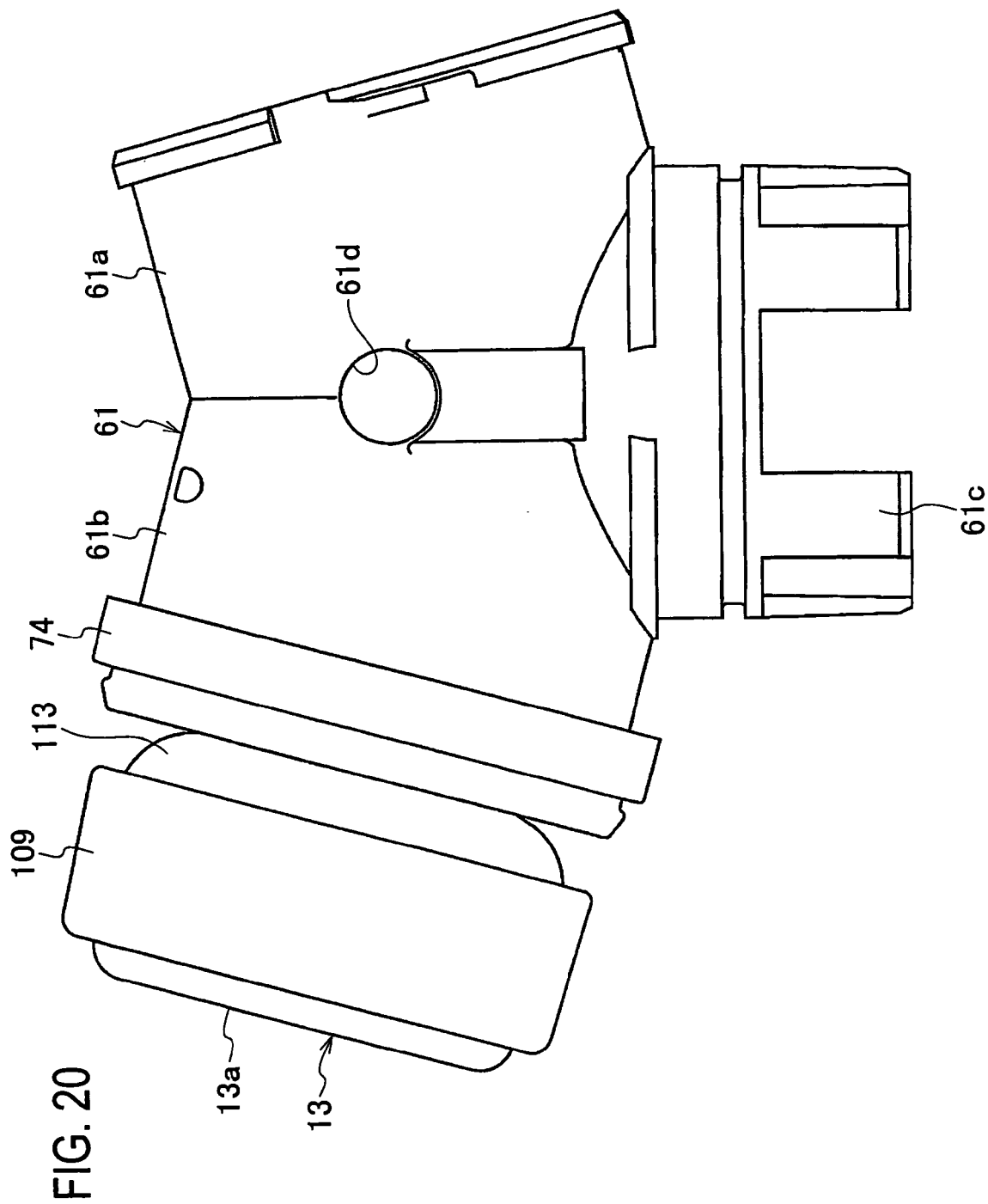


FIG. 21

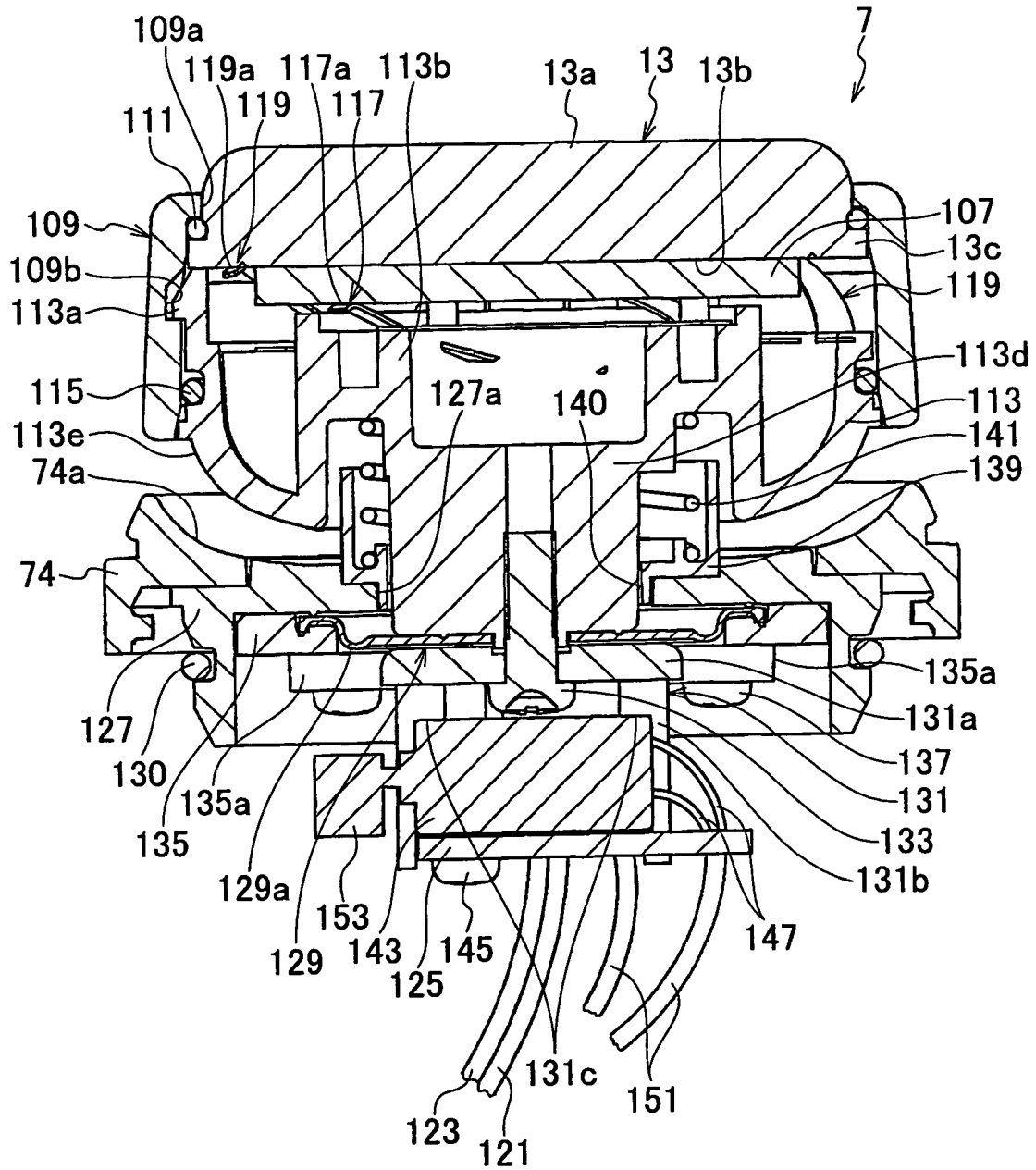


FIG. 22

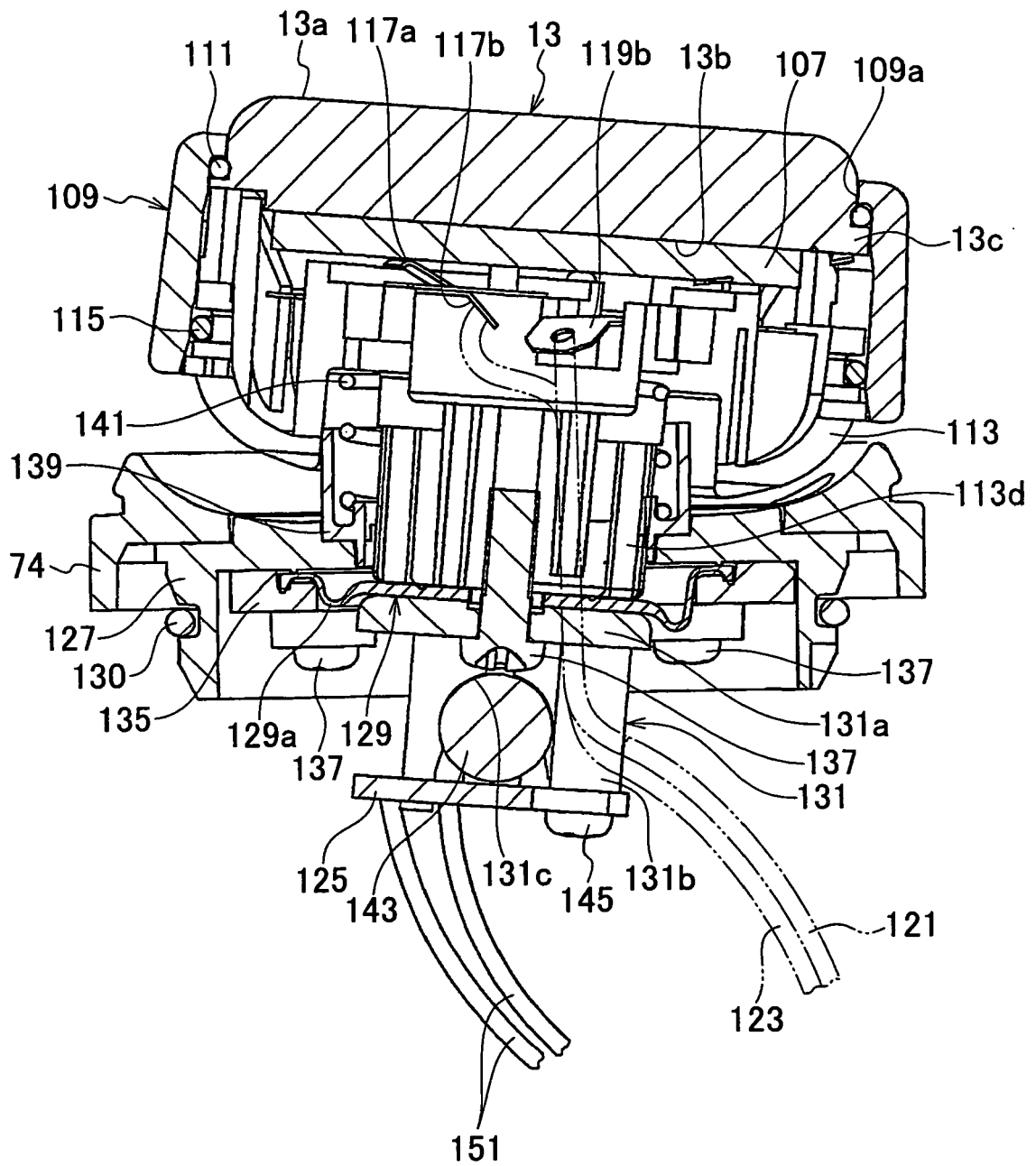
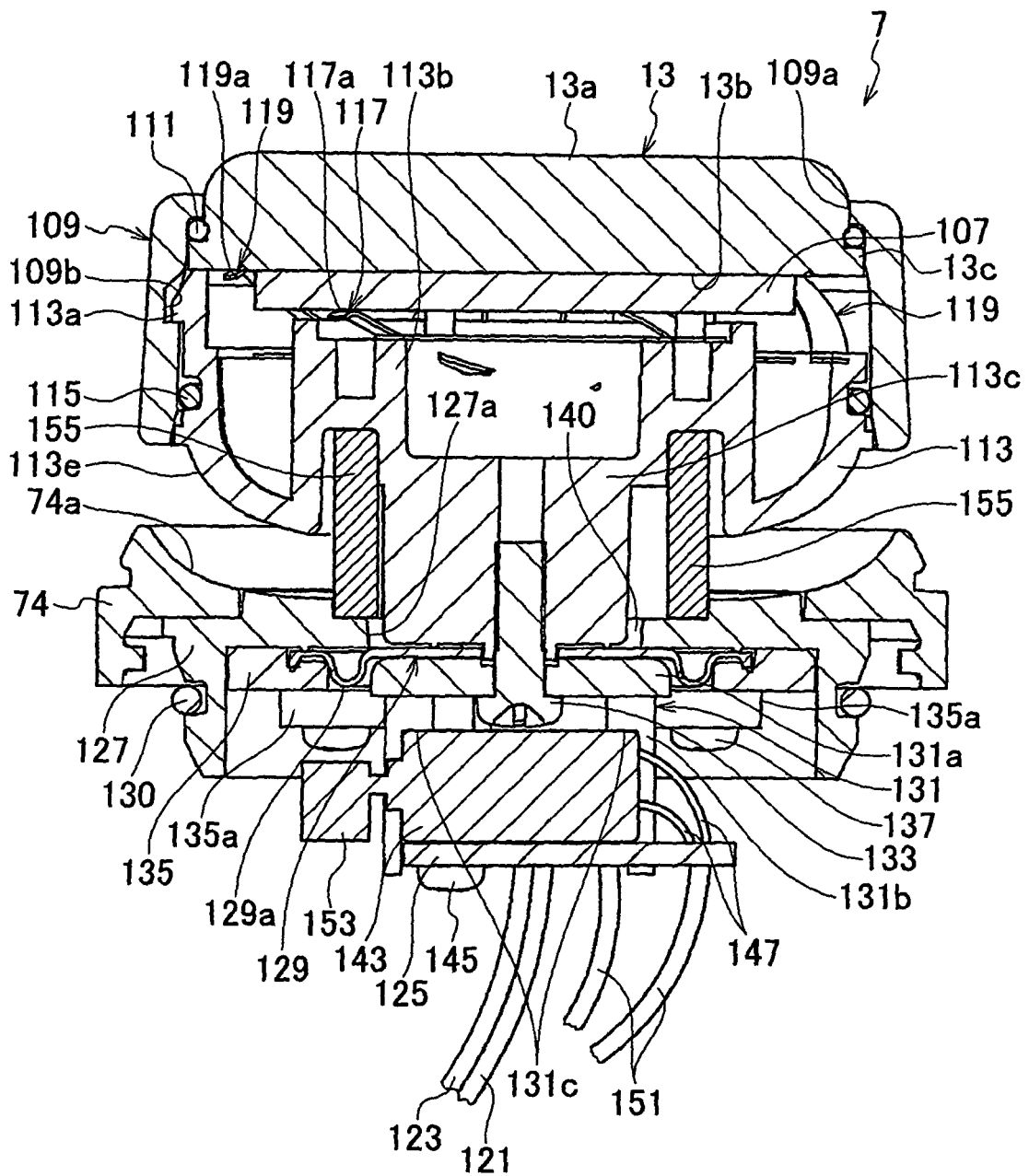


FIG. 23





EUROPEAN SEARCH REPORT

Application Number
EP 08 01 6711

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
D,Y	JP 2000 233005 A (YA MAN LTD) 29 August 2000 (2000-08-29) * abstract; figure 1 * -----	1-3	INV. A61H7/00 A61H23/02
Y	JP 2006 204767 A (MATSUSHITA ELECTRIC WORKS LTD) 10 August 2006 (2006-08-10) * paragraph [0003]; figures * -----	1-3	
Y	JP 2006 034651 A (JAPAN GIYARUZU KK) 9 February 2006 (2006-02-09) * abstract; figures * -----	1-3	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A61H
Place of search		Date of completion of the search	Examiner
Munich		15 December 2008	Fischer, Elmar
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 08 01 6711

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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15-12-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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REFERENCES CITED IN THE DESCRIPTION

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