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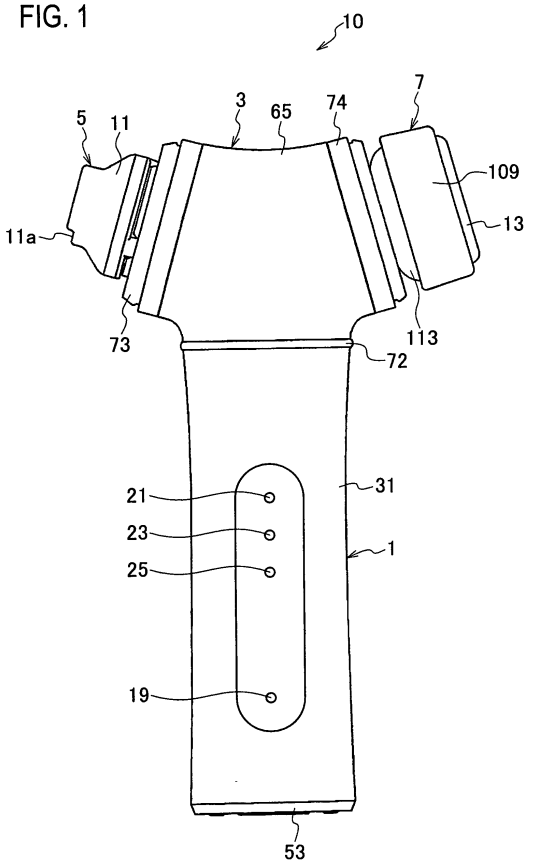
(54) Ultrasonic esthetic implement

(57) An ultrasonic esthetic implement (10), includes: a body part (1); a plurality of head parts (5, 7) mounted to the body part (1) and respectively including: probe heads (9, 13) respectively having contact faces (9a, 13a) each for contacting a skin surface, the contact faces (9a, 13a) being different from each other in scale, and ultrasonic oscillators (75, 107) respectively mounted to the probe heads (9, 13), the ultrasonic oscillators (75, 107) being configured to receive a same ultrasonic frequency from a same control circuit (36) so that an ultrasonic vibration from each of the ultrasonic oscillators (75, 107) is transmitted to the skin surface via one of the respective probe heads (9, 13).

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to an ultrasonic esthetic implement for transmitting an ultrasonic vibration from an ultrasonic oscillator to a skin surface via a probe head.

2. DESCRIPTION OF THE RELATED ART

[0002] Japanese Patent Application Laid-Open No. JP2001-252323 (= JP2001252323) discloses a known esthetic implement including two head parts each including a metal probe head and an ultrasonic oscillator which causes an ultrasonic vibration to the metal probe head. In addition, the above known esthetic implement is shaped substantially into an alphabetical T-shape in its entirety.

[0003] One of the two head parts is for bringing about an effect of beatifying the face skin while the other of the same is for bringing about an effect of slimming the body. With the known esthetic implement, the two ultrasonic oscillator are switchably operated by means of switching operations for giving different ultrasonic frequencies.

SUMMARY OF THE INVENTION

[0004] The above known esthetic implement including the two head parts for bringing about the effects of beatifying the face skin and slimming the body, however, fails to take account of bringing about an effect of beatifying detailed parts of the face skin.

[0005] It is therefore an object of the present invention to provide an ultrasonic esthetic implement capable of bringing about an effect of beautifying detailed parts of the face skin in addition to the main parts of the face skin.

[0006] According to an aspect of the present invention, an ultrasonic esthetic implement, includes: a body part; a plurality of head parts mounted to the body part and respectively including: probe heads respectively having contact faces each for contacting a skin surface, the contact faces being different from each other in scale, and ultrasonic oscillators respectively mounted to the probe heads, the ultrasonic oscillators being configured to receive a same ultrasonic frequency from a same control circuit so that an ultrasonic vibration from each of the ultrasonic oscillators is transmitted to the skin surface via one of the respective probe heads.

[0007] Other objects and features of the present invention will become understood from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a front view of an ultrasonic esthetic implement, according to an embodiment of the present invention.

Fig. 2 is a back view of Fig. 1, where a switch as a switching part for switchably operating the first head part and the second head part is disposed at an upper part of the body part 1.

Fig. 3 is a front view of the ultrasonic esthetic implement covered with caps.

Fig. 4 is an exploded perspective view of the ultrasonic esthetic implement.

Fig. 5 is a cross sectional view taken along the line V-V in Fig. 2.

Fig. 6 is a cross sectional view of an area around the first head part.

Fig. 7 is an exploded perspective view of the first head part and peripheral parts of the first head part.

Fig. 8 is a cross sectional view showing the first head part connected to the head connector of the head substrate.

Fig. 9 is a cross sectional view of the ultrasonic esthetic implement, with an attachment moved more backward (downward) relative to Fig. 6.

Fig. 10 shows a front view of the first head part with the attachment removed.

Fig. 11 is a front view of the first head part, showing a modified version of Fig. 6 by omitting a first head ring, a probe spring cover, a probe head spring and the attachment.

Fig. 12 is a front cross sectional view of the first head part, showing a modified version of Fig. 6 by omitting a first head ring, a probe spring cover, a probe head spring and the attachment.

Fig. 13 is a cross sectional view of the first head part taken along the line XIII-XIII in Fig. 12.

Fig. 14 is a plan view of a probe substrate in Fig. 13.

Fig. 15 is a bottom view of a probe substrate in Fig. 13.

Fig. 16 is a cross sectional view showing an anodal coil spring and a cathodal coil spring replacing respectively an anodal connecting metal fitting and a cathodal connecting metal fitting in Fig. 12.

Fig. 17 is a cross sectional view of the second head part.

Fig. 18 is an exploded perspective view of the second head part.

Fig. 19 is a cross sectional view showing the second head part connected to a head connector of a head substrate.

Fig. 20 is an external view of the second head part connected to the head connector of the head substrate.

Fig. 21 is a cross sectional view showing a state that the second head part approaches the spring base, as compared with Fig. 17.

Fig. 22 is a cross sectional view showing that the second head part is swung and thereby is inclined, as compared with Fig. 17.

Fig. 23 is a cross sectional view showing a cylindrical hollow ring, replacing a head spring in Fig. 17.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] In the following, an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0010] For ease of understanding, the following description will contain various directional terms, such as left, right, upper, lower, forward, rearward or the like. However, such terms are to be understood with respect to only a drawing or drawings on which the corresponding part of element is illustrated.

[0011] In addition, it is noted that the drawings referred to hereinafter as illustrating the preferred embodiment of the present invention are not to scale and are schematic in nature and, therefore, should not be taken too literally. Nevertheless, the drawings illustrate the invention sufficiently to enable one skilled in the art to practice the invention.

[0012] Fig. 1 is a front view of an ultrasonic esthetic implement 10, according to an embodiment of the present invention.

[0013] The ultrasonic esthetic implement 10 includes:

1) a body part 1 gripped by a user,
2) a head substrate 3 positioned at a head end (upper end in Fig. 1) of the body part 1,
3) a first head part 5 and a second head part 7 which so protrude as to be divided leftward and rightward respectively in Fig. 1 from the head substrate 3.

[0014] The first head part 5 and the second head part 7 each form a part of a plurality of head parts.

[0015] As shown in the front view of Fig. 1, each of the first head part 5 and the second head part 7 directs slightly diagonally upward from the head substrate 3 at the upper end of the body part 1, thereby the entirety of ultrasonic esthetic implement 10 forms substantially an alphabetical Y-shape.

[0016] The first head part 5 includes:

1) a first probe head 9 (see Fig. 6) which is disposed at a head end of the first head part 5 and made of a conductive material, and
2) an attachment 11 so disposed as to cover a periphery of the first probe head 9.

[0017] With the above structure, the first head part 5 caused to contact the nasal part of the user gives an ultrasonic vibration to the nasal part, thus bringing about an effect of beatifying the skin of the user.

[0018] Meanwhile, the second head part 7 includes a second probe head 13 which is disposed at a head end of the second head part 7 and made of a conductive material.

[0019] With the above structure, the second head part 7 caused to contact the principle portion of the user's face such as cheek gives an ultrasonic vibration to the cheek, thus bringing about an effect of beatifying the skin of the user.

[0020] Fig. 2 is a back view of Fig. 1, where a switch 15 as a switching part for switchably operating the first head part 5 and the second head part 7 is disposed at an upper part of the body part 1. A switch panel 17 is disposed around the switch 15.

[0021] As shown in Fig. 1, the body part 1 includes:

1) an LED 19 for showing the ultrasonic esthetic implement 10's state charged by the switch 15, and
2) an LED 21, an LED 23 and an LED 25 which are disposed above the LED 19 and show operating states of the first head part 5 and second head part 7.

[0022] Hereinabove and hereinafter, "LED" stands for Light Emitting diode.

[0023] As shown in Fig. 3, the first head part 5 and the second head part 7, when not used, wear a first cap 27 and a second cap 29 respectively.

[0024] Fig. 4 is an exploded perspective view of the ultrasonic esthetic implement 10, while Fig. 5 is a cross sectional view taken along the line V-V in Fig. 2.

[0025] A circuit substrate 33 is received in a body part housing 31 of the body part 1. The circuit substrate 33 has a first side for providing the switch 15 and a second side (opposite to the first side) for fixing a body circuit board 35 with a rib 33a (see Fig. 5).

[0026] Inserting a screw 37 into a screw hole 33b at an upper part of the circuit substrate 33 fixes the circuit substrate 33 to an after-described head substrate 61.

[0027] In Fig. 4, a control circuit board 36 has one control circuit for causing an ultrasonic vibration to a first ultrasonic oscillator 75 (described afterward, see Fig. 6) and a second ultrasonic oscillator 107 (described afterward, see Fig. 17) at one ultrasonic frequency. The control circuit board 36 is connected to the body circuit board 35 by wiring.

[0028] A chargeable battery assembly 39 is received in a lower part of the first side (for providing the switch 15) of the circuit substrate 33. In Fig. 4, a battery anodal metal fitting 41 is disposed corresponding to a lower part of the chargeable battery assembly 39 while a battery cathodal metal fitting 43 is disposed corresponding to an upper part of the chargeable battery assembly 39.

[0029] Moreover, the circuit substrate 33 has the following structure:

[0030] Corresponding to the switch 15, a switch board 45 is mounted to the circuit-substrate 33, with a screw 47 inserted into a screw hole 33c.

[0031] In combination with the switch panel 17 (see above), the switch board 45 (see above), a switch presser 49 and a switch rubber 51 which is a seal member, the switch 15 forms a switch assembly.

[0032] With the above members, fixing the switch panel 17, switch presser 49 and switch rubber 51 to the body

part housing 31 through an ultrasonic welding accomplishes a waterproof structure of the switch part (switch 15).

[0033] Provided that the waterproof structure be secured, any of: 1) an engagement structure having an engaging protrusion and an engaged dent and 2) a fixture such as screw can replace the ultrasonic welding.

[0034] The body part housing 31 receiving therein the body circuit board 35, the chargeable battery assembly 39 and the like has a lower opening to which a lower cover 53 as an end cover is mounted by means of a waterproof screw 55.

[0035] For the above mounting, a lower cover O-ring 57 as a seal member is interposed between the body part housing 31 and the lower cover 53 while an O-ring 59 (see Fig. 5) as a seal member is interposed between the waterproof screw 55 and a screw hole.

[0036] Hereinafter, the screw structure interposing an O-ring between the screw and the screw hole is referred to as a waterproof screw.

[0037] As shown in Fig. 4, the above head substrate 3 includes the head substrate 61 which is trifid and hollow.

[0038] The head substrate 61 has a head connector 61a and a head connector 61b connected respectively to the first head part 5 and the second head part 7. A lower part of a connection for connecting the head connector 61a with the head connector 61 b has a body connector 61 c coupled with the body part housing 31.

[0039] As shown in Fig. 5, the body connector 6 1 c is inserted into an upper end part 31 a of the body part housing 31 for fixation. A body O-ring 63 as a seal member is interposed between the body connector 61c and the upper end part 31a.

[0040] A pair of a head case 65 and a head case 67 are mounted respectively to first and second sides (respectively, surface and backface in Fig. 1) of the head substrate 61 in such a manner as to interpose therebetween the head substrate 61.

[0041] As shown in Fig. 5, an engagement part 69 allows upper ends of the head case 65 and head case 67 to be engaged with each other for fixation, meanwhile, lower parts of the head case 65 and head case 67 are positioned on an outer peripheral side of the upper end part 31a of the body part housing 31 to thereby interpose the upper end part 31a between the body connector 61 c and the lower parts of the head case 65 and head case 67.

[0042] In the above state, a waterproof screw 71 is inserted from a screw insertion hole 67a of the head case 67. Then, screwing the waterproof screw 71 into a screw hole 65a of the head case 65 fixes the head case 65 and the head case 67 with each other.

[0043] In this operation, as shown in Fig. 5, a boss part 67b having a screw insertion hole 67a of the head case 67 and a boss part 65b having a screw hole 65a of the head case 65 are inserted into a through hole 61d of the head substrate 61, thus causing such a structure that head ends of the boss part 67b and boss part 65b face each other.

[0044] Moreover, an accent ring 72 is disposed between:

i) the head case 65 (likewise, the head case 67) and
ii) a stepped part 31b on a base end side of the upper end part 31a of the body part housing 31.

[0045] Moreover, as shown in Fig. 4, a first head ring 73 is disposed on an outer periphery of each of the head case 65's first open end and the head case 67's first open end which ends are disposed on sides for mounting the first head part 5 while a second head ring 74 is disposed on an outer periphery of each of the head case 65's second open end and the head case 67's second open end which ends are disposed on sides for mounting the second head part 7, thus fixing the head case 65 and the head case 67.

[0046] Fig. 6 is a cross sectional view of an area around the first head part 5. Fig. 7 is an exploded perspective view of the first head part 5 and peripheral parts of the first head part 5. Fig. 8 is a cross sectional view showing the first head part 5 connected to the head connector 61a of the head substrate 61.

[0047] As set forth above, the first head part 5 has the first probe head 9 (see Fig. 6). A contact face 9a (first contact face) of the first probe head 9 is a surface for contacting the skin of the user. The first ultrasonic oscillator 75 is mounted to a backface 9b opposite to the contact face 9a.

[0048] Applying a driving voltage from the control circuit board 36 of the body part 1 to the first ultrasonic oscillator 75 causes the ultrasonic vibration to the first ultrasonic oscillator 75, which also causes an ultrasonic vibration to the first probe head 9.

[0049] On an outer periphery on a side for mounting the first ultrasonic oscillator 75, the first probe head 9 has a cylindrical part 9c protruding toward a side opposite to the contact face 9a.

[0050] Moreover, a flange 9d so bent as to protrude outward is formed at a head end (lower end in Fig. 6) of the cylindrical part 9c.

[0051] Then, a probe cover 77 which is substantially cylindrical is so disposed as to cover the cylindrical part 9c and flange 9d.

[0052] A deformation 77a of the probe cover 77 protrudes inward at a head end of the probe cover 77 and contacts an outer peripheral face of the first probe head 9. In addition, an O-ring 79 as a first seal member of the first head part 5 is disposed in a gap between the deformation 77a and the flange 9d.

[0053] Further outside the probe cover 77, a probe spring cover 81 which is also substantially cylindrical is so mounted as to move upward and downward relative to the probe cover 77 in Fig. 6.

[0054] A head end side of the probe spring cover 81 has a sliding part 81a for slidably contacting an outer peripheral face of the probe cover 77. A lower end of the

probe spring cover 81 has a cover part 81b which is larger in diameter than the sliding part 81a. A probe head spring 83 is received in the cover part 81b.

[0055] Herein, the probe head spring 83 made of elastic materials such as SWPA, SWPB, SUS304, SUS304WPB or the like has an inner diameter about 22.0 mm.

[0056] The above probe head spring 83 is disposed between a spring receiver 81 c (between the sliding part 81a and the cover part 81 b) and a spring receiver 77b which protrudes outward from a lower end of the probe cover 77. In Fig. 6, the probe head spring 83 presses upward the probe spring cover 81 and attachment 11.

[0057] In this operational structure, a lower end of the cover part 81b of the probe spring cover 81 is inserted into the first head ring 73, and a probe spring cover 81d protruding outward is engaged with the first head ring 73, thus stopping the probe spring cover 81 from being removed (drawn) upward.

[0058] The attachment 11 is mounted to the head end side (upper in Fig. 6) of the probe spring cover 81. The attachment 11 has a head end opening which is smaller than its rear end opening. Moreover, a cutout 11a is partly formed at an outer peripheral end on the head end side of the attachment 11.

[0059] In a plurality of parts in the circumferential direction at the open peripheral end on the rear end side of the attachment 11, engagement pieces 11b protrude downward, as shown in Fig. 7.

[0060] An engagement protrusion 11c (see Fig. 6) disposed inside the engagement piece 11b is engaged with an engagement dent part 81e on the outer periphery of the probe spring cover 81. As such, the attachment 11 is fixed to the probe spring cover 81.

[0061] Hereinabove, structure of the engagement protrusion 11c engaged with the engagement dent part 81e is such that the user can easily disengage the engagement protrusion 11c from the engagement dent part 81e.

[0062] With the above engaged and fixed state, the attachment 11 has such a structure that a lower end part 11e at the open peripheral end on the rear end side (lower in Fig. 6) of the attachment 11 abuts on a stepped part 81f on the outer periphery of the cover part 81b of the probe spring cover 81.

[0063] As such, by means of the probe head spring 83, the attachment 11 is pressed upward in Fig. 6 via the probe spring cover 81. Biasing the attachment 11 downward in the state in Fig. 6 compresses the attachment 11 and thereby moves the attachment 11 as shown in Fig. 9.

[0064] In this case, the probe spring cover 81 has a rotation regulator (not shown) for preventing the probe spring cover 81's rotation relative to the first head ring 73.

[0065] In addition, the first head ring 73 is screwed on the head connector 61 a of the head substrate 61 shown in Fig. 8, thus fixing the first head ring 73 and thereby preventing rotation of the first head ring 73.

[0066] As such, the attachment 11 when being mounted can keep such a state that the cutout 11a is positioned on the body part 1 side (lower), as shown in Fig. 1, Fig. 2 and Fig. 8.

[0067] An outer cylindrical part 77c is provided on an outer peripheral side of the spring receiver 77b at the lower end which is on the base end side of the probe cover 77.

[0068] The outer cylindrical part 77c's end part on the attachment 11 side abuts on the first head ring 73.

[0069] Moreover, an O-ring 89 as a second seal member of the first head part 5 is mounted to the outer cylindrical part 77c's outer peripheral face, in such a manner as to seal an area between the outer cylindrical part 77c's outer periphery and the head connector 6 1 a of the head substrate 61 on the body part 1 side, as shown in Fig. 8.

[0070] A probe substrate 91 is disposed below the first ultrasonic oscillator 75 set forth above.

[0071] The probe substrate 91 having a lower opening in Fig. 6 is shaped substantially into a cup. The lower end of the cylindrical part 9c of the first probe head 9 is disposed on a stepped part 91 a on the upper outer periphery of the probe substrate 91. The probe substrate 91 in combination with the probe cover 77 support the first probe head 9, i.e., the first probe head 9 is sandwiched between the probe substrate 91 and the probe cover 77.

[0072] Fig. 10 shows a front view of the first head part 5 with the attachment 11 removed.

[0073] Fig. 11 is a front view of the first head part 5, showing a modified version of Fig. 6 by omitting the first head ring 73, probe spring cover 81, probe head spring 83 and attachment 11.

[0074] Fig. 12 is a front cross sectional view of the first head part 5, showing a modified version of Fig. 6 by omitting the first head ring 73, probe spring cover 81, probe head spring 83 and attachment 11.

[0075] As shown in Fig. 12, the lower end of the probe substrate 91 has a flange 91b protruding outward. A screw 93 is inserted from below the flange 91b, thus tightly fixing the probe substrate 91 to the probe cover 77.

[0076] In this case, as shown in Fig. 6, an engagement pin 77d on the probe cover 77 side is inserted into an engagement hole 91c of the probe substrate 91.

[0077] To an upper wall 9 1 d of the probe substrate 91, i) an anodal connecting metal fitting 95 contacting a backface of the first ultrasonic oscillator 75 and ii) a cathodal connecting metal fitting 97 contacting the lower face of the flange 9d are mounted respectively.

[0078] Fig. 13 is a cross sectional view of the first head part 5 taken along the line XIII-XIII in Fig. 12.

[0079] Fig. 14 is a plan view of the probe substrate 91 in Fig. 13.

[0080] Fig. 15 is a bottom view of the probe substrate 91 in Fig. 13.

[0081] The anodal connecting metal fitting 95 is inserted for fixation into a mounting hole 9 1 e defined on the outer peripheral side of the upper wall 91d of the probe substrate 91, and an upwardly protruding contact piece 95a is elastically pressure-welded to the backface of the first ultrasonic oscillator 75, as shown in Fig. 12. Mean-

while, a first end of a lead wire 99 is connected to a connection piece 95b which is bent by about 90° relative to the contact piece 95a and protrudes downward.

[0082] On the other hand, the cathodal connecting metal fitting 97 is inserted for fixation into the mounting hole 91f defined in substantially the center of the upper wall 91d of the probe substrate 91, and an upwardly protruding contact piece 97a is elastically pressure-welded to the lower face of the flange 9d of the first probe head 9, as shown in Fig. 13. Meanwhile, a first end of a lead wire 101 is connected to a connection piece 97b which is bent by about 90° relative to the contact piece 97a and protrudes downward.

[0083] The second end of each of the lead wire 99 and the lead wire 101 is connected to the body circuit board 35 shown in Fig. 4.

[0084] Moreover; as shown in Fig. 13 and Fig. 15, a cross-shaped insulating rib 91g is provided beneath the lower face of the upper wall 91d, to thereby prevent the anodal connecting metal fitting 95 from contacting the cathodal connecting metal fitting 97, i.e., preventing a short circuit.

[0085] In other words, the insulating rib 91g has such a structure that the upper end of a first rib piece 91g1 in Fig. 15 is disposed close to the anodal connecting metal fitting 95 while the right end of a second rib piece 91 g2 in Fig. 15 is disposed close to the cathodal connecting metal fitting 97, thus preventing the anodal connecting metal fitting 95 and cathodal connecting metal fitting 97 from moving closer to each other.

[0086] Herein, as shown in Fig. 12 and Fig. 15, the anodal connecting metal fitting 95 has such a structure that an engagement piece 95c disposed in substantially the center of the connection piece 95b in the upward-downward direction is engaged for fixation with the lower end of an engagement rib 91h on the inner peripheral face of the probe substrate 91.

[0087] Meanwhile, as shown in Fig. 12 and Fig. 13, the cathodal connecting metal fitting 97 has such a structure that the engagement piece 97c disposed in substantially the center of the connection piece 97b in the upward-downward direction is engaged for fixation with the lower end of the second rib piece 91 g2.

[0088] Moreover, the upper wall 9 1 d to which the anodal connecting metal fitting 95 and the cathodal connecting metal fitting 97 are mounted has such a structure that the upper wall 91d's part for mounting the cathodal connecting metal fitting 97 is lower than the upper wall 91d's portion for mounting the anodal connecting metal fitting 95, thereby defining a stage between the above two parts of the upper wall 91d.

[0089] Herein, each of the anodal connecting metal fitting 95's pressing load to the first ultrasonic oscillator 75 and the cathodal connecting metal fitting 97's pressing load to the first probe head 9 is 0.5 N or over, and preferably 1.0 N or over.

[0090] Moreover, the deflection of each of the contact piece 95a and the contact piece 97a is 0.5 mm or over, and preferably 1.0 mm or over.

[0091] In addition, the cross-shaped insulating rib 91 g may be replaced with a rectangular hollow rib or a solid rib. Otherwise, with an insulating rib serving as another part, a screw or a hook may be used for mounting the insulating rib.

[0092] Fig. 16 is a cross sectional view corresponding to Fig. 12. In Fig. 16, an anodal coil spring 103 and a cathodal coil spring 105 are disposed for replacing respectively the anodal connecting metal fitting 95 and the cathodal connecting metal fitting 97.

[0093] Specifically, in Fig. 16, the anodal coil spring 103 is received in an annular dent part 910a formed in the upper face of the probe substrate 910 corresponding to the probe substrate 91 in Fig. 12, such that an upper end of the anodal coil spring 103 contacts the backface of the first ultrasonic oscillator 75.

[0094] Meanwhile, the cathodal coil spring 105 larger in diameter than the anodal coil spring 103 is received in an annular stepped part 910b formed on an upper outer periphery of the probe substrate 910, such that an upper end of the cathodal coil spring 105 contacts a lower face of the flange 9d of the first probe head 9.

[0095] Then, the anodal coil spring 103 and the cathodal coil spring 105 are connected respectively with the lead wire 99 and the lead wire 101.

[0096] Other structures of Fig. 16 are substantially the same as those in Fig. 12. Eliminating the need of the cross-shaped insulating rib 91 g in Fig. 15, the structure in Fig. 16 is simpler than the structure in Fig. 12 (Fig. 15).

[0097] Herein, the lead wire 99 and the lead wire 101 may be directly attached respectively to the first ultrasonic oscillator 75 and the first probe head 9, without the need of the anodal connecting metal fitting 95 and cathodal connecting metal fitting 97 in Fig. 12 or the anodal coil spring 103 and cathodal coil spring 105 in Fig. 16.

[0098] Fig. 17 is a cross sectional view of the second head part 7. Fig. 18 is an exploded perspective view of the second head part 7.

[0099] Fig. 19 is a cross sectional view showing the second head part 7 connected to the head connector 61b of the head substrate 61.

[0100] Fig. 20 is an external view of the second head part 7 connected to the head connector 61b of the head substrate 61.

[0101] As set forth above, the second head part 7 has the second probe head 13, where the surface of the second probe head 13 serves as a contact face 13 a (second contact face) for contacting the skin of the user and the second ultrasonic oscillator 107 is mounted to a backface 13b opposite to the contact face 13a. Applying the driving voltage to the second ultrasonic oscillator 107 from the control circuit board 36 (see Fig. 4) in the body part 1 causes the ultrasonic vibration to the second ultrasonic oscillator 107, thus also causing the ultrasonic vibration to the second probe head 13.

[0102] Herein, the contact face 13a of the second probe head 13 is larger in area than the contact face 9a

of the first probe head 9.

[0103] The second probe head 13 has such a structure that a flange 13c protruding outward is disposed at an outer peripheral end on the side for mounting the second ultrasonic oscillator 107.

[0104] Then, a head cover 109 as a cylindrical probe cover is so provided as to cover the flange 13c.

[0105] The head cover 109 has such a structure that a deformation 109a protruding inward at the head end of the head cover 109 contacts the outer peripheral face of the second probe head 13 and that an O-ring 111 as a first seal member of the second head part 7 is disposed in a gap between the deformation 109a and the flange 13c.

[0106] A head base 113 is disposed on a base end side 109c of the head cover 109. The upper end of the head base 113 having an open upper part is inserted into the head cover 109. In this state, an engagement protrusion 113a of the head base 113 is engaged with an engagement dent part 109b, thus fixing the head cover 109 to the head base 113. An O-ring 115 as a second seal member of the second head part 7 is interposed between the head cover 109 and the head base 113.

[0107] The head base 113 includes a metal fitting rib 113b to which an anodal connecting metal fitting 117 is mounted, while a cathodal connecting metal fitting 119 is mounted in a position outside the anodal connecting metal fitting 117.

[0108] A head end contact piece 117a at the head end of the anodal connecting metal fitting 117 is elastically pressed to and thereby contacts the backface of the second ultrasonic oscillator 107, while a back end connection piece 117b is connected to a first end of a lead wire 121 (see Fig. 19 and Fig. 22).

[0109] Meanwhile, the cathodal connecting metal fitting 119 has such a structure that a head end contact piece 119a is elastically pressed to and thereby contacts the backface 13b of the second probe head 13 larger in diameter than the second ultrasonic oscillator 107 and that a back end connection piece 119b is connected to a first end of a lead wire 123 (see Fig. 19 and Fig. 22).

[0110] As shown in Fig. 22, a second end of each of the lead wire 121 and the lead wire 123 extends downward in such a configuration as to pass through a boss part 113d (to be described afterward), a rubber cover 129 (to be described afterward) and a head stopper 131 (to be described afterward), and is then connected to the body circuit board 35 in Fig. 4.

[0111] As shown in Fig. 18, the cathodal connecting metal fitting 119 has three head end contact pieces 119a which are formed annular and disposed along the outer periphery of the cathodal connecting metal fitting 119.

[0112] Meanwhile, the anodal connecting metal fitting 117 disposed inside the cathodal connecting metal fitting 119 is formed into substantially a half-arc and has one head end contact piece 117a.

[0113] The head base 113 has such a structure that the lower end face 113dA (serving as a base end part of the second head part 7) of the boss part 113d in the center of the head base 113 is movably inserted into a through hole 127a in the center of a spring base 127 (base part) and that the rubber cover 129 as an elastic body is fixed (or mounted) to the lower end face 113dA of the boss part 113d by means of a screw 133 which is inserted into the rubber cover 129 via a plate part 131a of the head stopper 131.

[0114] Herein, an O-ring 130 as a third seal member of the second head part 7 is disposed around the outer peripheral face of the spring base 127 in such a configuration as to seal an area between the spring base 127's outer periphery and the head connector 61b of the head substrate 61 shown in Fig. 19.

[0115] In addition, the second head ring 74 is screwed on the head connector 61b of the head substrate 61 shown in Fig. 19, thus fixing the second head ring 74.

[0116] Around the outer peripheral end of the rubber cover 129, a bent annular elastic deformation 129a is provided. A further outside part of the elastic deformation 129a is interposed between an annular rubber presser 135 and the spring base 127. In this state, the elastic deformation 129a is fixed by means of a screw 137.

[0117] In addition, as shown in Fig. 18, the screws 137 (four in Fig. 18) are tightened by means of protrusions 135a (four in Fig. 18) which are disposed circumferentially outside the rubber cover 129 and protrude downward.

[0118] In the above structure, the head stopper 131 is disposed in the annular rubber presser 135 as shown in Fig. 18, and the lower end face of the boss part 113d is substantially on the same level with the lower end of the through hole 127a of the spring base 127 as shown in Fig. 17.

[0119] As shown in Fig. 17, a cylindrical spring cover 139 to which the boss part 113d of the head base 113 is inserted is disposed at the upper part inside the spring base 127. A head spring 141 as an elastic member is disposed between the spring cover 139 and the boss part 113d. As shown in Fig. 17, the head spring 141 presses the head base 113 upward relative to the spring base 127.

[0120] In addition, the lower end of the spring cover 139 is inserted into the through hole 127a of the spring base 127. In this state, a gap 140 is formed between the spring cover 139's lower end and the boss part 113d.

[0121] With the above structure, the second head part 7 is movable in a direction substantially perpendicular (upward and downward in Fig. 17) to the spring base 127 (base part) to which the second head part 7 is mounted, and the second head part 7 is swingable with respect to the center axis in the above perpendicular direction.

[0122] For facilitating the above swingable operation of the second head part 7, the lower face of the head base 113 has a protrusion curve 113e. Corresponding to the protrusion curve 113e, the second head ring 74 has a dent curve 74a which is a face opposing the head base 113.

[0123] The material of each of the spring cover 139

and the rubber cover 129 is any of EPDM (ethylene propylen dien monomer), NBR (nitrile-butadien rubber) and silicon rubber.

[0124] Moreover, like the probe head spring 83 (see Fig. 8) of the first head part 5, the head spring 141 (see Fig. 17) of the second head part 7 is made of elastic material such as SWPA, SWPB, SUS304 and SUS304WPB and has an inner diameter about 16.0 mm.

[0125] Moreover, the head spring 141's load when the contact face 13a of the second probe head 13 contacts the skin of the user may be about 5.0 N, preferably 2.0 N to 4.0 N and more preferably 2.5 N to 3.0 N.

[0126] The head spring 141's mounting load may be 0.5 N to 2.0 N, and preferably 1.0 N to 1.5 N.

[0127] Moreover, when being pressed to the skin of the user, the contact face 13a of the second probe head 13 has movement amount (float amount) of 1.0 mm to 7.0 mm, preferably 2.0 mm to 6.0 mm and more preferably 3.0 mm to 5.0 mm.

[0128] Compared with Fig. 17, Fig. 21 shows a state that pressing the second probe head 13 to the skin of the user deforms the head spring 141 such that the second head part 7 approaches the spring base 127.

[0129] Compared with Fig. 17, Fig. 22 shows that the second head part 7 is swung and thereby is inclined relative to the spring base 127. Fig. 22 shows a cross section which is viewed from an angle different from that of Fig. 17 (or Fig. 21).

[0130] The head stopper 131 has such a structure that the lower face of the plate part 131a has a motor mounting part 131b for mounting a vibrating motor 143.

[0131] A board 125 is mounted to the motor mounting part 131b by means of a screw 145. In this structure, the vibrating motor 143 is sandwiched between the board 125 and a dent circular arc 131 c, where the dent circular arc 131 c is formed at the motor mounting part 131b and corresponds to the profile of the vibrating motor 143.

[0132] The board 125 is connected with a second end of a motor lead wire 147 having a first end connected to the vibrating motor 143. Moreover, the board 125 is connected with the body circuit board 3 5 (see Fig. 4) by a lead wire 151.

[0133] The vibrating motor 143 has an eccentricity balancer 153 and is capable of causing a vibration to an entirety of the second head part 7.

[0134] Preferably, the vibrating motor 143 has the number of revolutions of 4400 rpm to 7000 rpm and more preferably about 5700 rpm.

[0135] Fig. 23 is a cross sectional view showing a cylindrical hollow ring 155 which is an elastic member made of resin such as urethane or the like, thus replacing the head spring 141 in Fig. 17.

[0136] Specifically, the example in Fig. 23 uses the cylindrical hollow ring 155 in place of the head spring 141 and spring cover 139 in Fig. 17, with other structural members same as those in Fig. 17. Otherwise, an air suspension (not shown in Fig. 23) may be used as an elastic member in place of the head spring 141.

[0137] Use of the cylindrical hollow ring 155 in Fig. 23 can decrease the number of components compared with the use of the head spring 141 in Fig. 17, thus making a simpler structure.

[0138] Like the rubber cover 129, the cylindrical hollow ring 155 is made of such materials as EPDM, NBR and silicon rubber.

[0139] In Fig. 17, the following structures by eliminating the spring cover 139 is acceptable:

1) Mounting an elastic body such as rubber, elastomer or the like to at least one of: i) the protrusion curve 113e of the head base 113 and ii) the dent curve 74a of the second head ring 74.

2) An elastic body such as resin is formed integrally with at least one of: i) the protrusion curve 113e of the head base 113 and ii) the dent curve 74a of the second head ring 74.

3) Implementing rubber coating or urethane coating on at least one of: i) the protrusion curve 113e of the head base 113 and ii) the dent curve 74a of the second head ring 74.

<Operation mode of ultrasonic esthetic impalement 10>

[0140] Then, an operation mode of the ultrasonic esthetic implement 10 having the above structure is to be set forth.

[0141] At first, pressing once the switch 15 in Fig. 2 lightens the LED 21, showing that a power source of the body part 1 is inputted. As such, the first ultrasonic oscillator 75 of the first head part 5 capable of caring the noise causes an ultrasonic vibration, thus transmitting the ultrasonic vibration to the first probe head 9 (see Fig. 6).

[0142] With an elapse of 5 minutes after the pressing (once) of the switch 15, the power source of the body part 1 is automatically turned off.

[0143] Meanwhile, pressing the switch 15 again within the above 5 minutes stops the ultrasonic vibration of the first probe head 9 which was so far operated and then the second ultrasonic oscillator 107 of the second head part 7 capable of caring the face causes an ultrasonic vibration, thus transmitting the ultrasonic vibration to the second probe head 13 and simultaneously driving the vibrating motor 143. In this case, the LED 23 is lighted while the LED 21 is turned out.

[0144] With an elapse of 6 minutes in the above state, the power source of the body part 1 is automatically turned off.

[0145] Meanwhile, pressing the switch 15 again within the above 6 minutes stops the vibrating motor 143 and the second ultrasonic oscillator 107 alone is operated, thus continuing the ultrasonic vibration of the second probe head 13.

[0146] In this case, the LED 25 is lighted while the LED 23 is turned out.

[0147] Making any one of the following operations will

turn off the power source of the body part 1, thus turning out the LED 25:

1) pressing the switch 15 once more.
2) keeping the second probe head 13 from the skin (i.e., no load to skin) for 2 minutes and 30 seconds.
3) pressing the second probe head 13 to the skin for 10 minutes for skin care.

[0148] As such, with the ultrasonic esthetic implement 10 of the present invention, operating the switch 15 of the body part 1 can switchably operate the first head part 5 and the second head part 7.

[0149] Moreover, according to the embodiment of the present invention, the ultrasonic esthetic implement 10 has such a structure that the same ultrasonic frequency is supplied from the same control circuit of the control circuit board 36 in the operation of the first probe head 9 or second probe head 13, thus making the ultrasonic esthetic implement 10 small in size in its entirety.

[0150] Moreover, the ultrasonic esthetic implement 10 having substantially the alphabetical Y-shape in its entirety as shown in Fig. 1 accomplishes the following operation of the user:

[0151] With the body part 1 naturally gripped by the user, the contact faces 9a and 13a of the respective first and second probe heads 9 and 13 which are disposed at the head ends of the respective first and second head parts 5, 7 can contact the skin surface with ease. As such, the alphabetical Y-shape of the body part 1 can improve user's operability over an alphabetical T-shape of the body part 1.

<Operation of first head part 5>

[0152] Then, operation of caring the nasal part by using the first head part 5 is to be set forth.

[0153] With the body part 1 gripped with hand, pressing the switch 15 once as set forth above causes the ultrasonic vibration to the first probe head 9. In this state, the first head part 5 is moved toward and then pressed to the upper part (close to right below glabella) of the noise. In this case, the cutout 11a of the attachment 11 is disposed lower as shown in Fig. 1. In this state, applying a certain pressing load or over via the attachment 11 to the upper part of the noise moves back the attachment 11 opposing the elastic force of the probe head spring 83 (see Fig. 6).

[0154] Herein, a contact part 11d of the attachment 11 has an inner diameter of 17.0 mm and an outer diameter of 20.0 mm. Fig. 9 shows an example of a cross sectional view showing that the attachment 11 is moved back by 1.5 mm.

[0155] In the state of Fig. 9 where the attachment 11 and the first probe head 9 which has the ultrasonic vibration applied thereto contact the skin, the ultrasonic vibration of the first probe head 9 softens the horny plug or the pore contaminant and thereby pushes out the horny plug or the pore contaminant to the skin surface.

[0156] In this state, sliding the ultrasonic esthetic implement 10 gradually toward the head end of the noise allows the inner periphery of the attachment 11 to remove the horny plug or the pore contaminant (each of which was softened and pushed out as set forth above) in such a manner as to exfoliate them.

[0157] Herein, the attachment 11 has the cutout 11a on the forward side of the movement, while the cutout 11a's opposite side has a round inner periphery for contacting the noise. As such, the noise care can be such that scratches to the skin is - decreased and simultaneously the ultrasonic vibration can bring about such an effect as tightening the pore after the removal of the horny plug or the pore contaminant.

[0158] In addition, the attachment 11 which is circular can be moved to various directions, without causing any inconveniences.

[0159] The attachment 11 having the above structure and operation is removable. As such, the thus removed attachment 11 can be water-washed alone, improving cleaning property and continuously keeping a clean state.

[0160] In addition, it is preferable that the backward movement amount (float amount) of the attachment 11 when the attachment 11 is being pressed is 2.0 mm at maximum. With the above maximum backward movement amount, the inner face of the attachment 11 contacts the head end of the probe cover 77 at an abutting part P as shown in Fig. 9.

[0161] Moreover, the attachment 11's protrusion amount α from the contact face 9a of the first probe head 9 when the first head part 5 is used is 0.3 mm or over, and preferably 0.5 mm.

[0162] The attachment 11's float amount over 2.0 mm enlarges the stroke for pressing the attachment 11 to the skin, thus causing an inconvenience.

[0163] In addition, the protrusion amount α over 0.5 mm when using the first head part 5 causes the first probe head 9 to be less likely to contact the skin.

[0164] Moreover, the pressing load of the attachment 11 is preferably 0.686 N to 1.078 N, and more preferably 0.784 N to 0.98 N.

[0165] Moreover, the above attachment 11 is so configured to float by means of the probe head spring 83. However, the attachment 11 may have a fixed structure. Otherwise, the attachment 11 may be rectangular, instead of being circular.

<Operation of second head part 7>

[0166] Then, operation of caring the face by using the second head part 7 is to be set forth.

[0167] With the first head part 5 being operated as set forth above, pressing the switch 15 once more causes the ultrasonic vibration to the second probe head 13 and operates the vibrating motor 143, thus bringing about a vibration function.

[0168] In this state, the second head part 7 is to be made closer, for example, to the cheek of the face and then pressed to the cheek.

[0169] The ultrasonic vibration of the second probe head 13 and the vibration function of the vibrating motor 143 give tension to the pore, promote blood circulation and promote collagen generation and bring about tension to the skin, thus making the pore less visible.

[0170] Applying a certain pressing load or over to the skin with the second probe head 13 deforms the head spring 141 and thereby moves back the second probe head 13, as shown in Fig. 21.

[0171] As such, the head base 113 moves back integrally with the second probe head 13 and the boss part 113d deforms the rubber cover 129. Moreover, the head stopper 131 and the vibrating motor 143 move back integrally with the above members.

[0172] In addition, when the ultrasonic esthetic implement 10 moves along the skin surface, as shown in Fig. 22, the entirety of the above integrated members moved backward is inclined, thus allowing the contact face 13a to contact the skin surface in a continuously natural state.

[0173] In this case, even when the head base 113 interferes with the spring base 127, the spring cover 139 made of an elastic body such as EPDM (ethylene propylen dien monomer) absorbs a lateral vibration caused by the vibrating motor 143, thus preventing an allophone. As such, the skin care can be implemented without discomfort attributable to a rasp or the like.

<First head part 5 and second head part 7>

[0174] Moreover, the first head part 5 has such a structure that the first probe head 9 is disposed on the probe substrate 91 to which the anodal connecting metal fitting 95 and the cathodal connecting metal fitting 97 are mounted, as shown in Fig. 6.

[0175] Then, the probe cover 77 covers the thus assembled parts and the probe substrate 91 and the probe cover 77 are fixed by means of the screw 93.

[0176] As such, the first probe head 9 is pressed to the probe substrate 91, thereby deforming the contact pieces 95a, 97a of the respective anodal and cathodal connecting metal fittings 95, 97, such that the contact piece 95a contacts the first ultrasonic oscillator 75 while the contact piece 97a contacts the lower face of the flange 9d of the first probe head 9.

[0177] As such, the contact state can be kept preferably, thus stably transmitting the electric signal from the body circuit board 35 (see Fig. 4) to the first ultrasonic oscillator 75.

[0178] Moreover, the anodal connecting metal fitting 95 and the cathodal connecting metal fitting 97 are isolated from each other by means of the insulating rib 91 g which is cross-shaped, as shown in Fig. 15, thus securely preventing contact with each other. As such, the short circuit between the anodal connecting metal fitting 95 and the cathodal connecting metal fitting 97 can be prevented, to thereby prevent a possible failure such as breakage of the control circuit.

[0179] With regard to the first head part 5: For implementing skin care by using liquid such as gel, the liquid is likely to enter the first head part 5 via the first probe head 9 or attachment 11. In this case, however, the O-ring 79 and the O-ring 89 prevent the above liquid entry, thus keeping a good operating condition of the first head part 5.

[0180] Moreover, with the above water-proof structure of the first head part 5, the liquid or solid adhered to the first probe head 9 or to parts surrounding the first probe head 9 can be washed with water and a possible failure of the control circuit of the body part 1 can be prevented.

[0181] Meanwhile, with regard to the second head part 7: For implementing skin care by using liquid such as gel, the liquid is likely to enter the second head part 7 via the second probe head 13 or head cover 109. In this case, however, the O-ring 111, the O-ring 115, the rubber cover 129 and the O-ring 130 prevent the above liquid entry, thus keeping a good operating condition of the second head part 7.

[0182] Moreover, with the above water-proof structure of the second head part 7, the liquid or solid adhered to the second probe head 13 or to parts surrounding the second probe head 13 can be washed with water and a possible failure of the control circuit of the body part 1 can be prevented.

<Body part 1>

[0183] With regard to the body part 1: For implementing skin care by using liquid such as gel, the liquid is likely to enter the body part 1 via the head case 65, head case 67 or body part housing 31 (see Fig. 4). In this case, however, the body O-ring 63, the switch rubber 51 and the lower cover O-ring 57 prevent the above liquid entry, thus keeping a good operating condition of the body part 1.

[0184] As such, with the above water-proof structure of the body part 1, the liquid or solid adhered to the body part 1 or to parts surrounding the body part 1 can be washed with water and a possible failure of the control circuit of the body part 1 can be prevented.

[0185] Moreover, the second head part 7 in Fig. 17 has such a structure that the head stopper 131 to which the vibrating motor 143 and board 125 are mounted is fixed to the boss part 113d of the head base 113 and the above members are integrally movable (frontward and backward) relative to the spring base 127 or swingable relative to the spring base 127, thus preventing breakage of the motor lead wire 147 which is formed relatively thin and connects the vibrating motor 143 with the board 125.

[0186] Herein, the motor lead wire 147 for connecting the vibrating motor 143 with the board 125 may be replaced with the followings:

1) contact between connecting metal fittings provid-

ed respectively for the vibrating motor 143 and the board 125, and
2) contacting the connecting metal fitting (provided for the vibrating motor 143) with a plated contact on the board 125 side.

[0187] Although the present invention has been described above by reference to a certain embodiment, the present invention is not limited to the embodiment described above. Modifications and variations of the embodiment described above will occur to those skilled in the art, in light of the above teachings.
[0188] The scope of the present invention is defined with reference to the following claims.

Claims

1. An ultrasonic esthetic implement (10), comprising:

a body part (1);
a plurality of head parts (5, 7) mounted to the body part (1) and respectively including:

probe heads (9, 13) respectively having contact faces (9a, 13a) each for contacting a skin surface, the contact faces (9a, 13a) being different from each other in scale, and ultrasonic oscillators (75, 107) respectively mounted to the probe heads (9, 13), the ultrasonic oscillators (75, 107) being configured to receive a same ultrasonic frequency from a same control circuit (36) so that an ultrasonic vibration from each of the ultrasonic oscillators (75, 107) is transmitted to the skin surface via one of the respective probe heads (9, 13).

2. The ultrasonic esthetic implement (10) according to claim 1, wherein
the head parts (5, 7) mounted to the body part (1) are two in number, and
the body part (1) and the two head parts (5, 7) in combination form substantially an alphabetical Y-shape in front view.

3. The ultrasonic esthetic implement (10) according to claim 2, wherein
one (7) of the two head parts (5, 7) is movable in a direction substantially perpendicular to a base part (127) to which the one (7) of the two head parts (5, 7) is mounted, and
the one (7) of the two head parts (5, 7) is swingable with respect to a center axis in the substantially perpendicular direction.

4. The ultrasonic esthetic implement (10) according to claim 3, wherein
the one (7) of the two head parts (5, 7) is supported to the base part (127) via an elastic member (141, 155) in such a configuration as to move in the substantially perpendicular direction, and
the one (7) of the two head parts (5, 7) includes a head base (113) which has such a structure that a base end part (113dA) of a boss part (113d) in a substantially center of the head base (113) is movably inserted into a through hole (127a) in a substantially center of the base part (127) and that an elastic body (129) is mounted to the base end part (113dA) of the boss part (113d).

5. The ultrasonic esthetic implement (10) according to any one of claims 2 to 4, wherein the plurality of the head parts (5, 7) each have a water-proof structure.

6. The ultrasonic esthetic implement (10) according to claim 5, wherein
one (7) of the two head parts (5, 7) has the water-proof structure where a first seal member (111) is provided between:

the probe head (13), and
a head end side (109a) of a probe cover (109) for fixing an outer periphery (13c) of the probe head (13).

7. The ultrasonic esthetic implement (10) according to claim 6, wherein
a head base (113) is disposed on a base end side (109c) of the probe cover (109), and
a second seal member (115) of the one (7) of the two head parts (5, 7) is disposed between:

the head base (113), and
the probe cover (109),

to thereby form the water-proof structure.

8. The ultrasonic esthetic implement (10) according to any one of claims 5 to 7, wherein
a third seal member (130) of the one (7) of the two head parts (5, 7) is disposed between:

the base part (127), and
the body part (1) side (61b) to which the base part (127) is mounted,

to thereby form the water-proof structure.

9. The ultrasonic esthetic implement (10) according to any one of claims 5 to 8, wherein another (5) of the two head parts (5, 7) has the water-proof structure including:

a first seal member (79) between:

the probe head (9), and
a head end side (77a) of a probe cover (77) for fixing an outer periphery (9d) of the probe head (9), and

a second seal member (89) between:

a base end side (77c) of the probe cover (77), and
the body part (1) side (61a) to which the base end side (77c) is mounted.

10. The ultrasonic esthetic implement (10) according to any one of claims 1 to 9, wherein
an end cover (53) is disposed at an end on a side opposite to a side of the head parts (5, 7),
a first seal member (57) of the body part (1) is disposed between:

the end cover (53), and
a housing (31) of the body part (1),
to thereby form a water-proof structure, and

a second seal member (51) of the body part (1) is disposed at a switch part (15) disposed at the body part (1), to thereby form a water-proof structure.

11. The ultrasonic esthetic implement (10) according to any one of claims 1 to 10, wherein
the ultrasonic esthetic implement (10) is so configured that operating a switch part (15) disposed in the body part (1) switchably operates the plurality of the head parts (5, 7).

12. The ultrasonic esthetic implement (10) according to any one of claims 9 to 11, wherein
the other (5) of the two head parts (5, 7) has a first contact face (9a) of the contact faces (9a, 13a),
the one (7) of the two head parts (5, 7) has a second contact face (13a) of the contact faces (9a, 13a), and
the second contact face (13a) is larger than the first contact face (9a).

FIG. 1

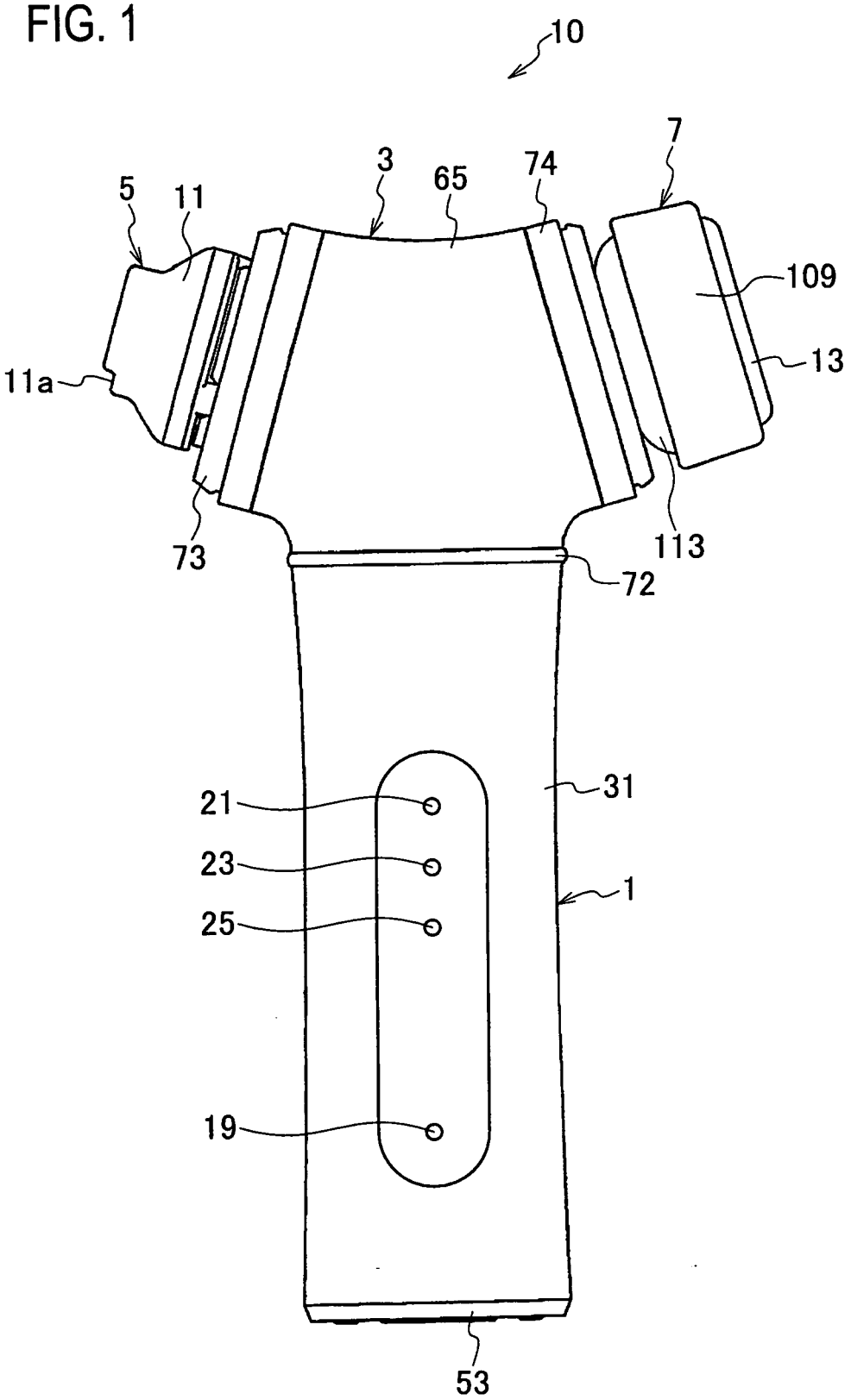


FIG. 2

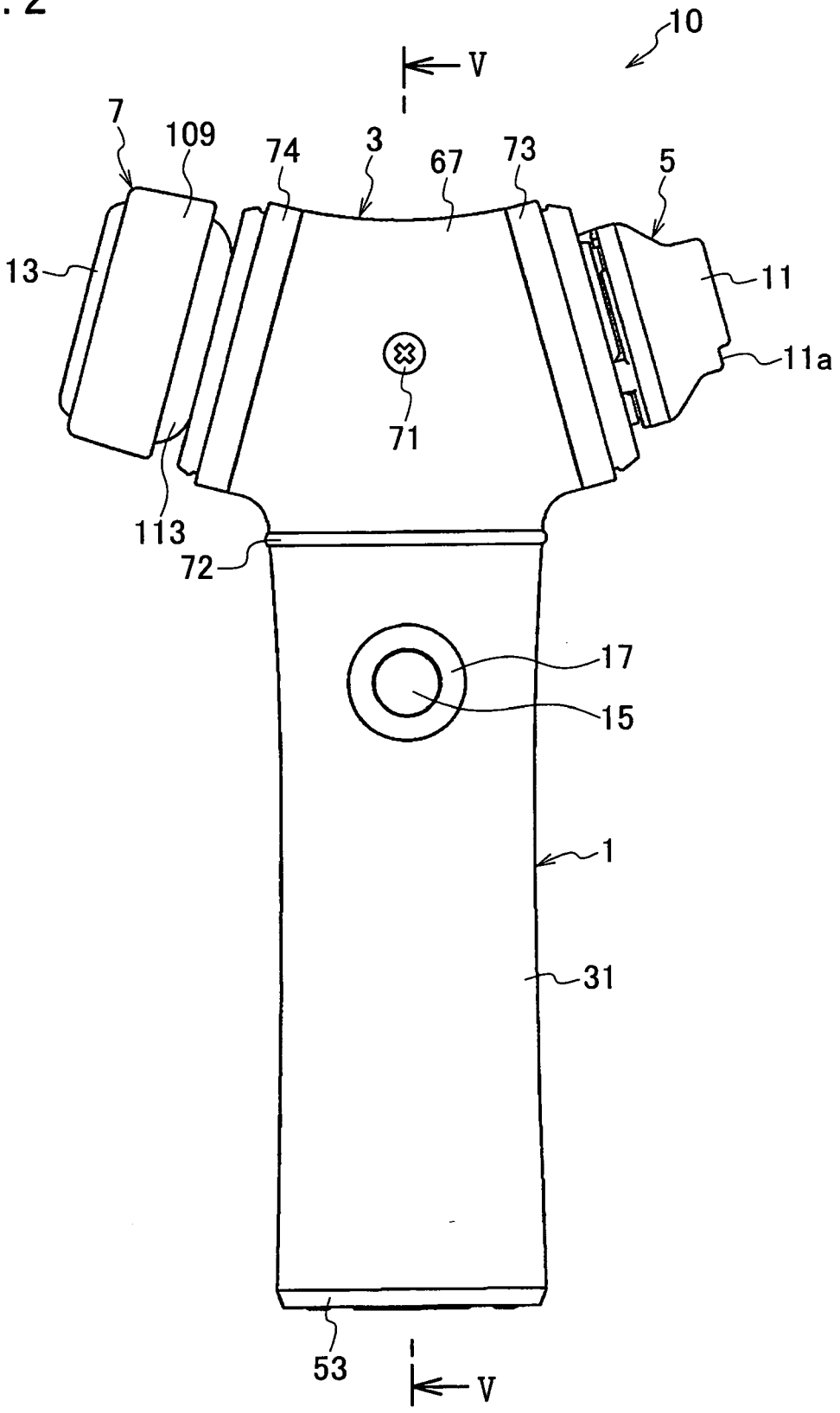


FIG. 3

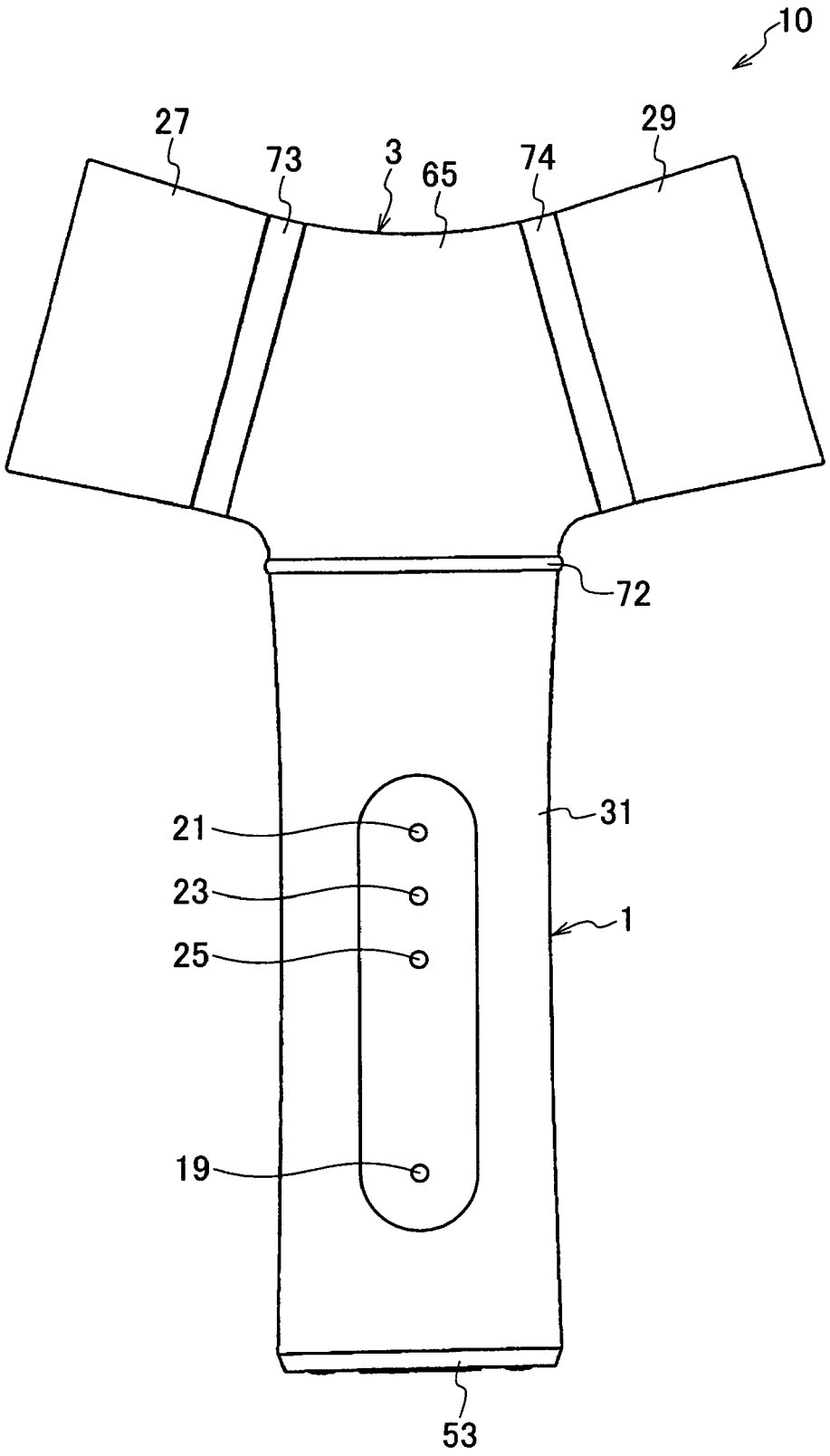
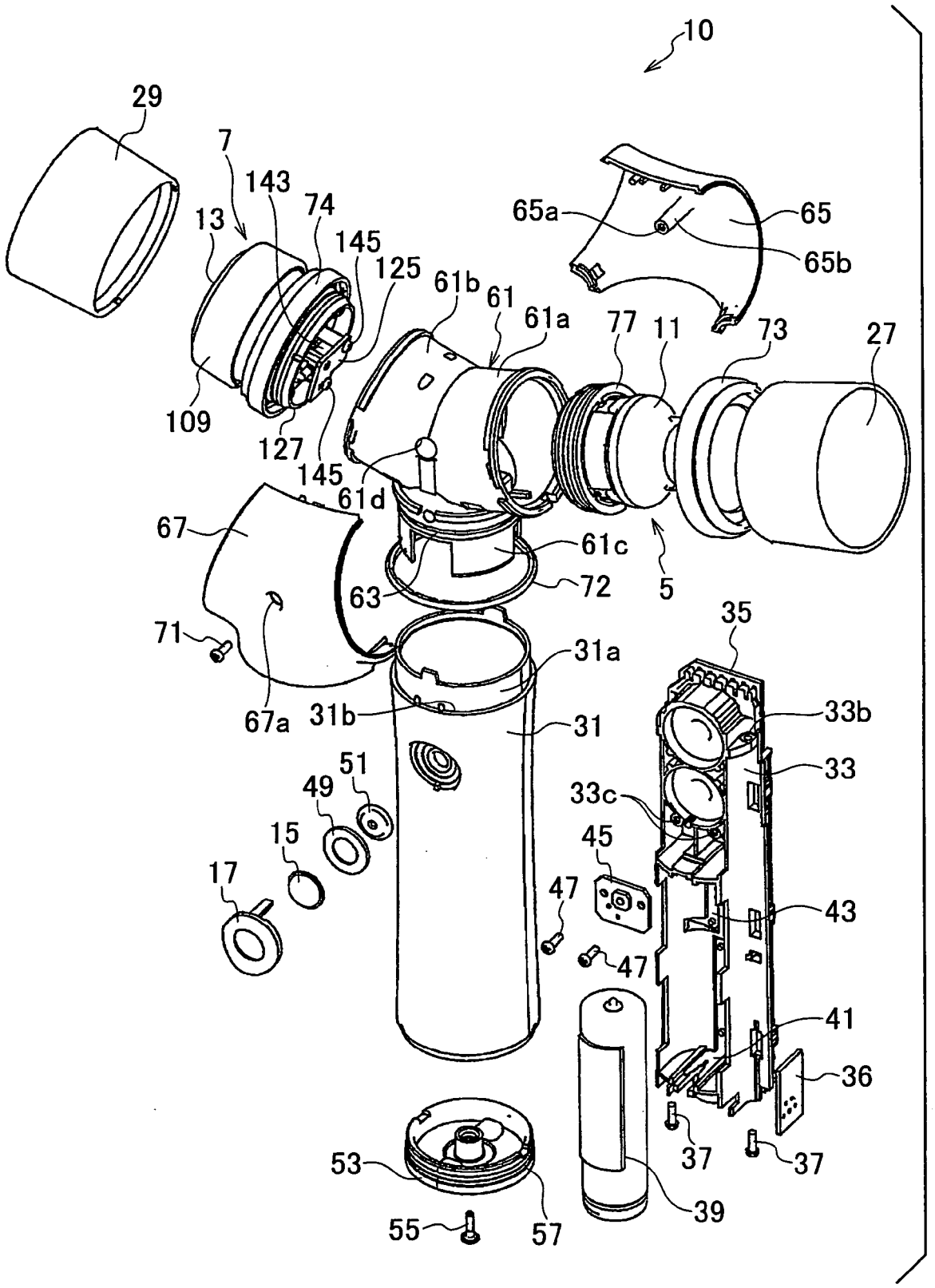


FIG. 4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29
7
143
74
13
145
125
61b
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61a
77
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73
27
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145
61d
67
61c
72
5
63
71
35
31a
67a
31b
31
33b
33
51
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47
43
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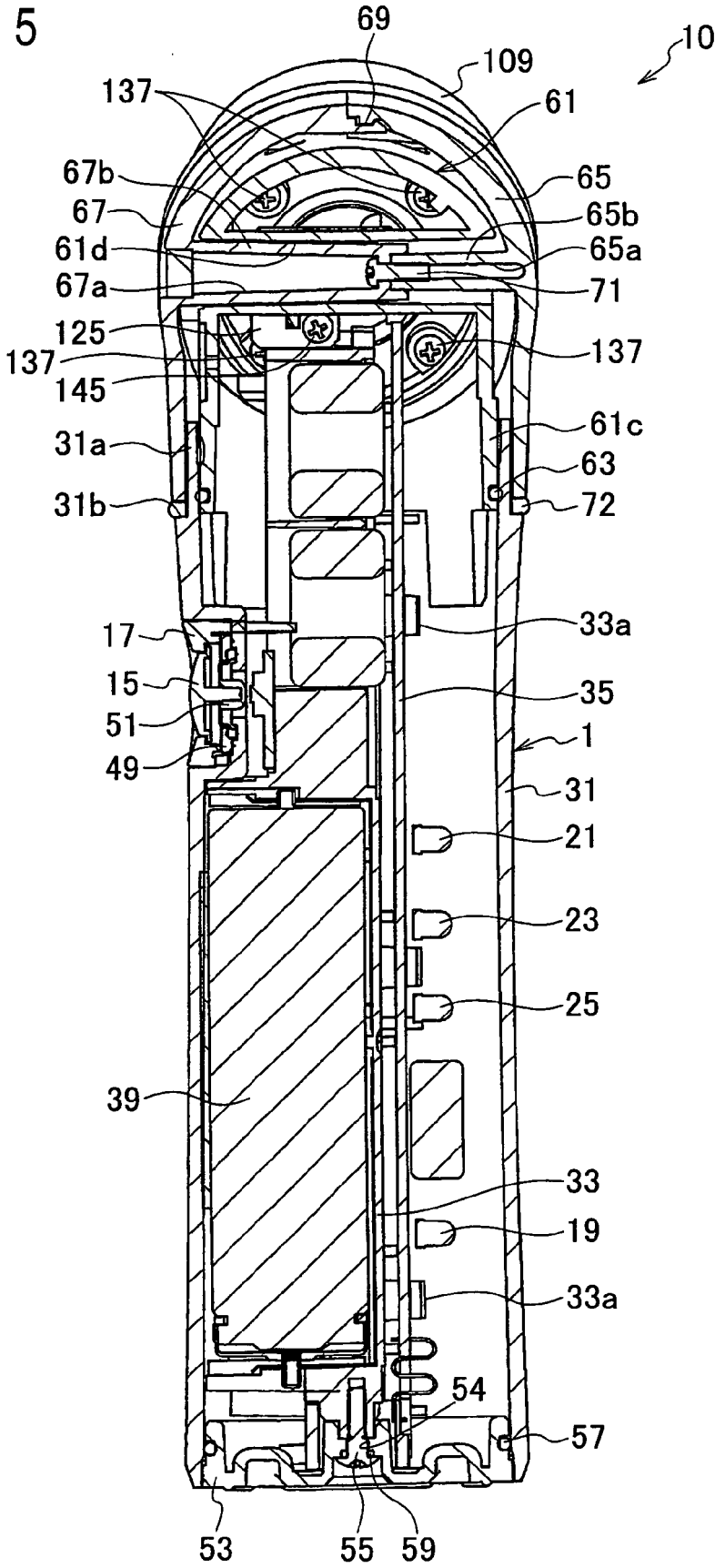
55
57

FIG. 5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65a
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63
31b
72
17
33a
15
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23
25
39
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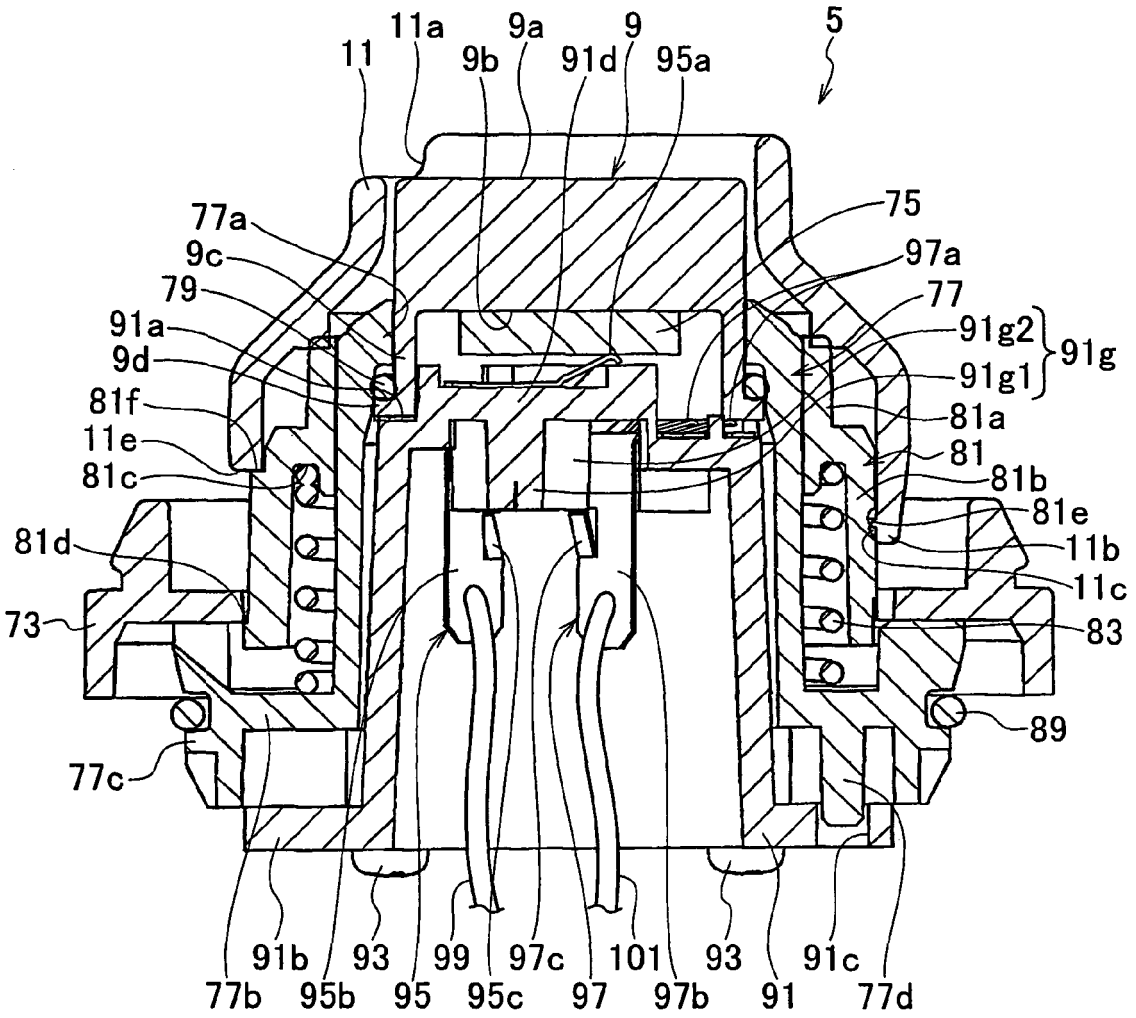
19
33a
54
57
53
55
59

FIG. 6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11a
9b
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91d
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73
77c
75
97a
77
91g2
91g1
91g
81a
81
81b
81e
11b
11c
83
89
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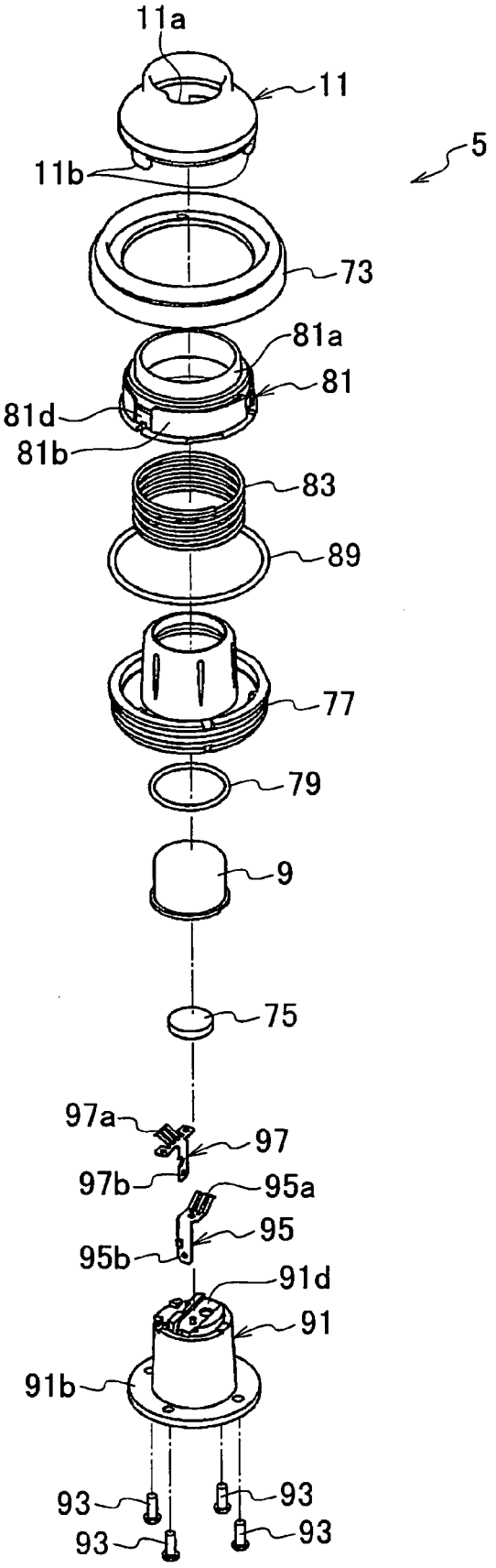
101
93
91c
77b
95b
95
95c
97
97b
91
77d

FIG. 7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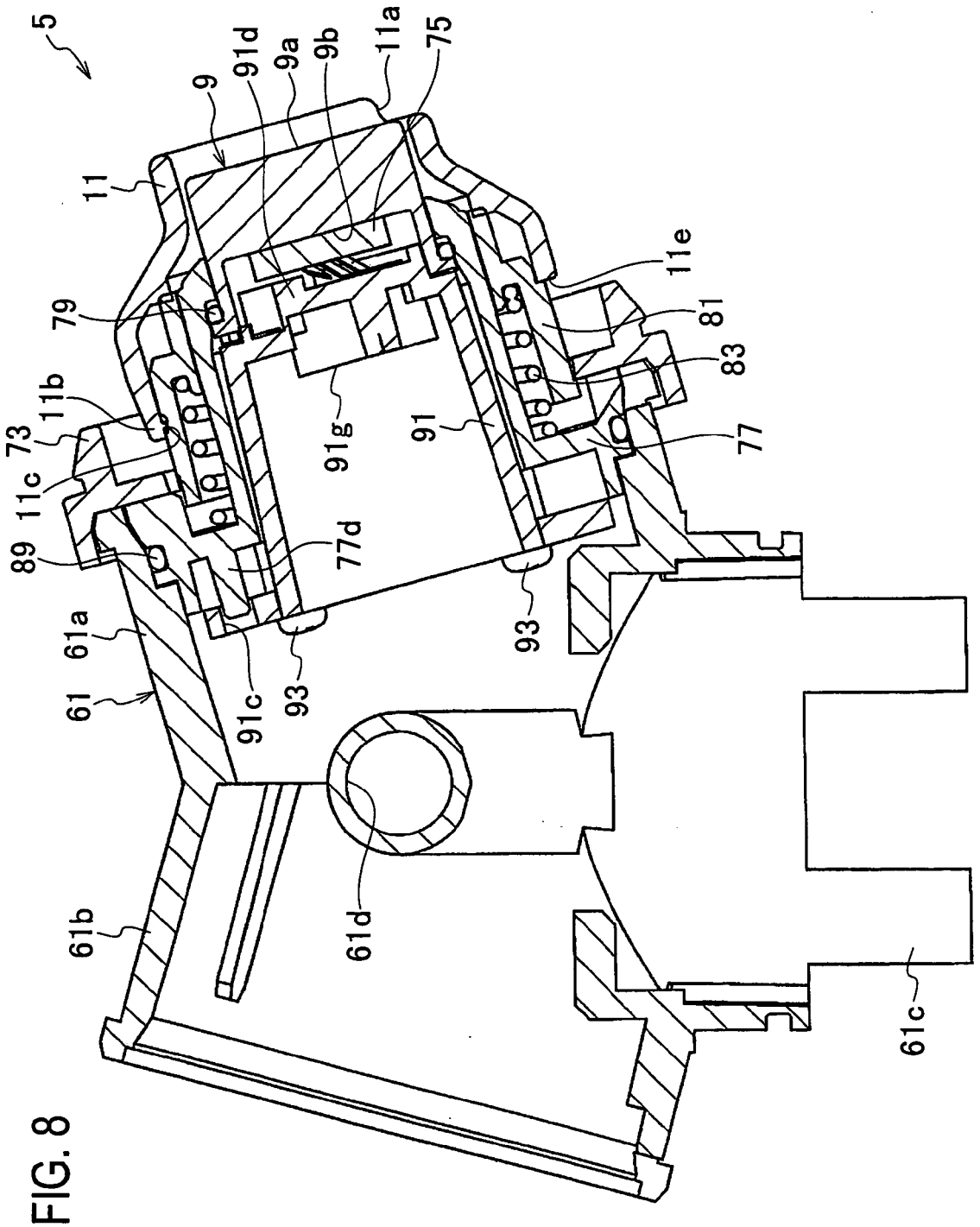
95b
91d
91
91b
93
93
93
93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9
91d
9a
9b
11a
75
11
11e
79
81
83
11b
73
11c
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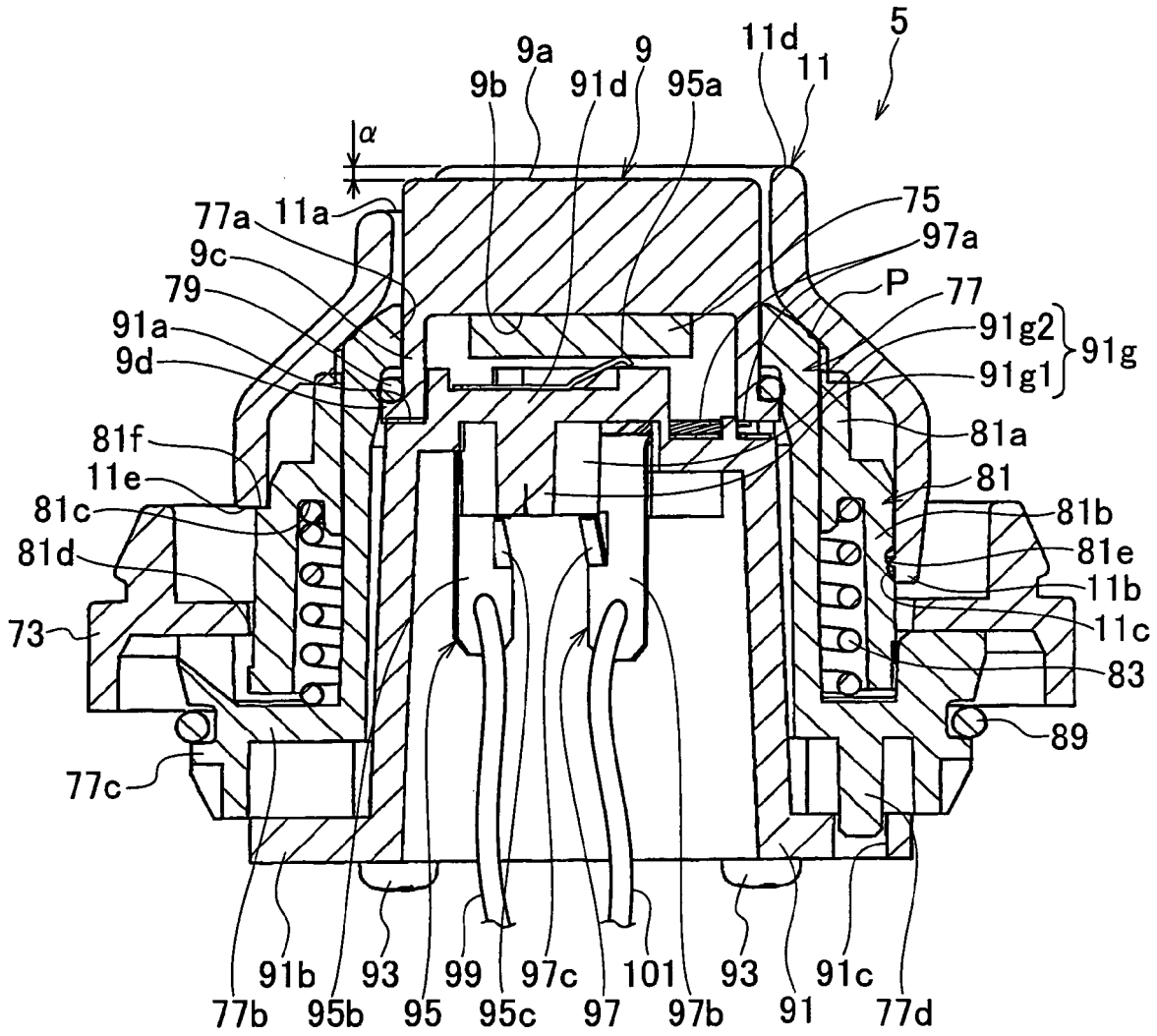
91g
91
77
77d
93
61a
61
91c
93
61d
61b
61c

FIG. 8

FIG. 9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9a
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9b
91d
95a
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α
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11a
75
97a
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P
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91g
91a
9d
91g1
81f
81a
11e
81
81c
81b
81d
81e
11b
73
11c
83
89
77c
91b
93
99
97c
101
93
91c
77b
95b
95
95c
97
97b
91
77d

FIG. 10

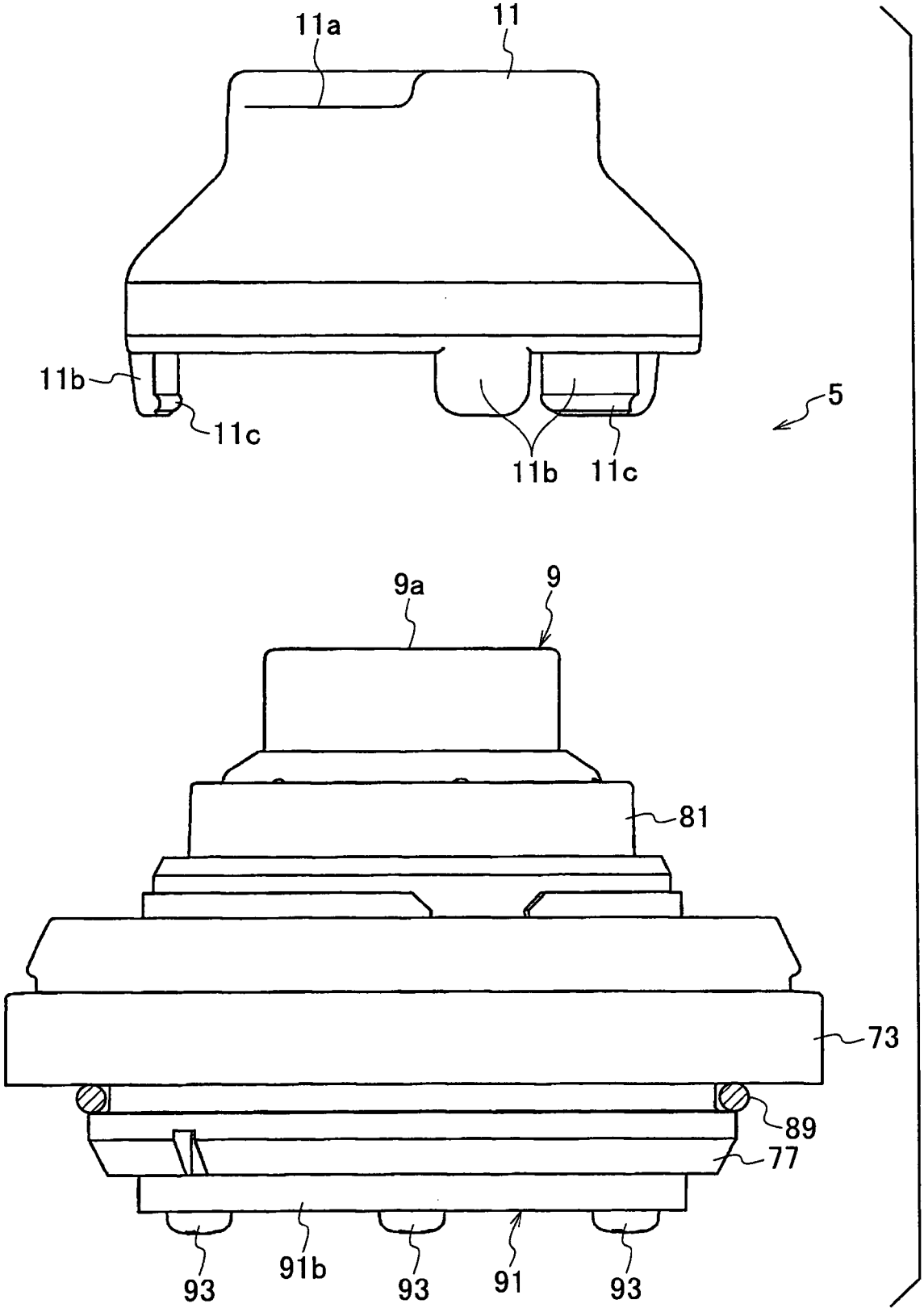


FIG. 11

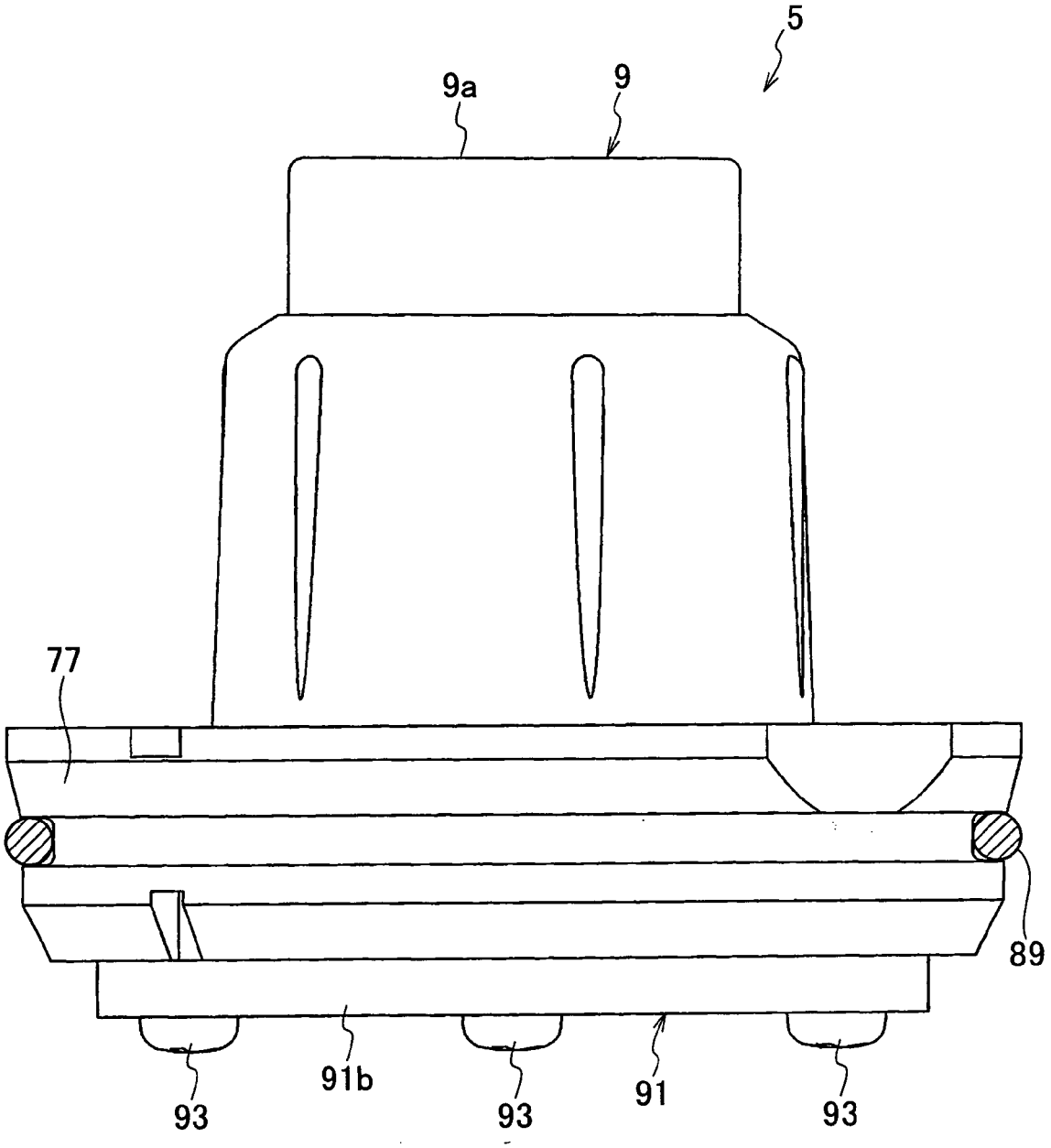
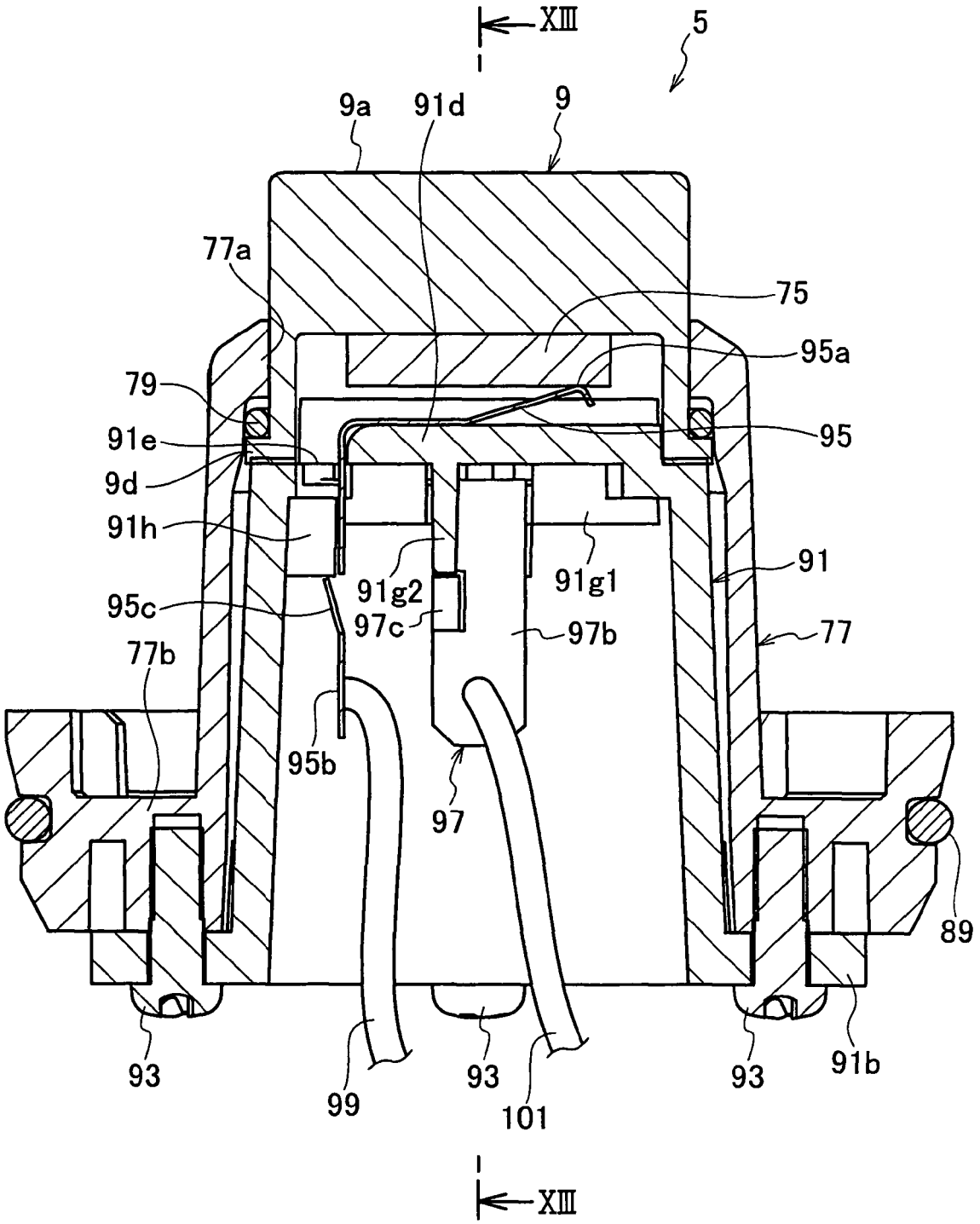


FIG. 12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97b
77
77b
95b
97
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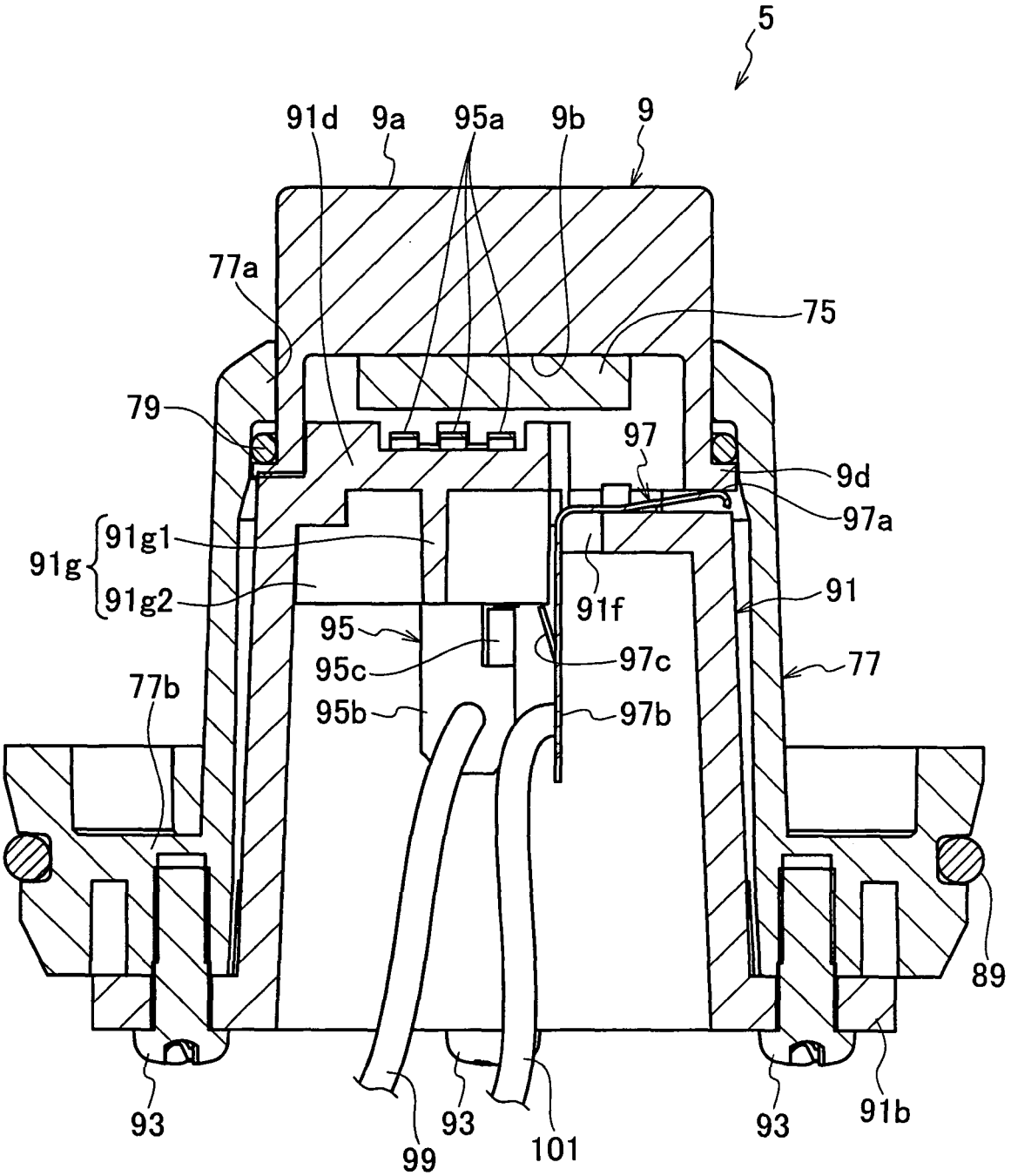
93
99
93
101
93
91b
XIII

FIG. 13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77b
95b
97b
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93
99
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101
93
91b

FIG. 14

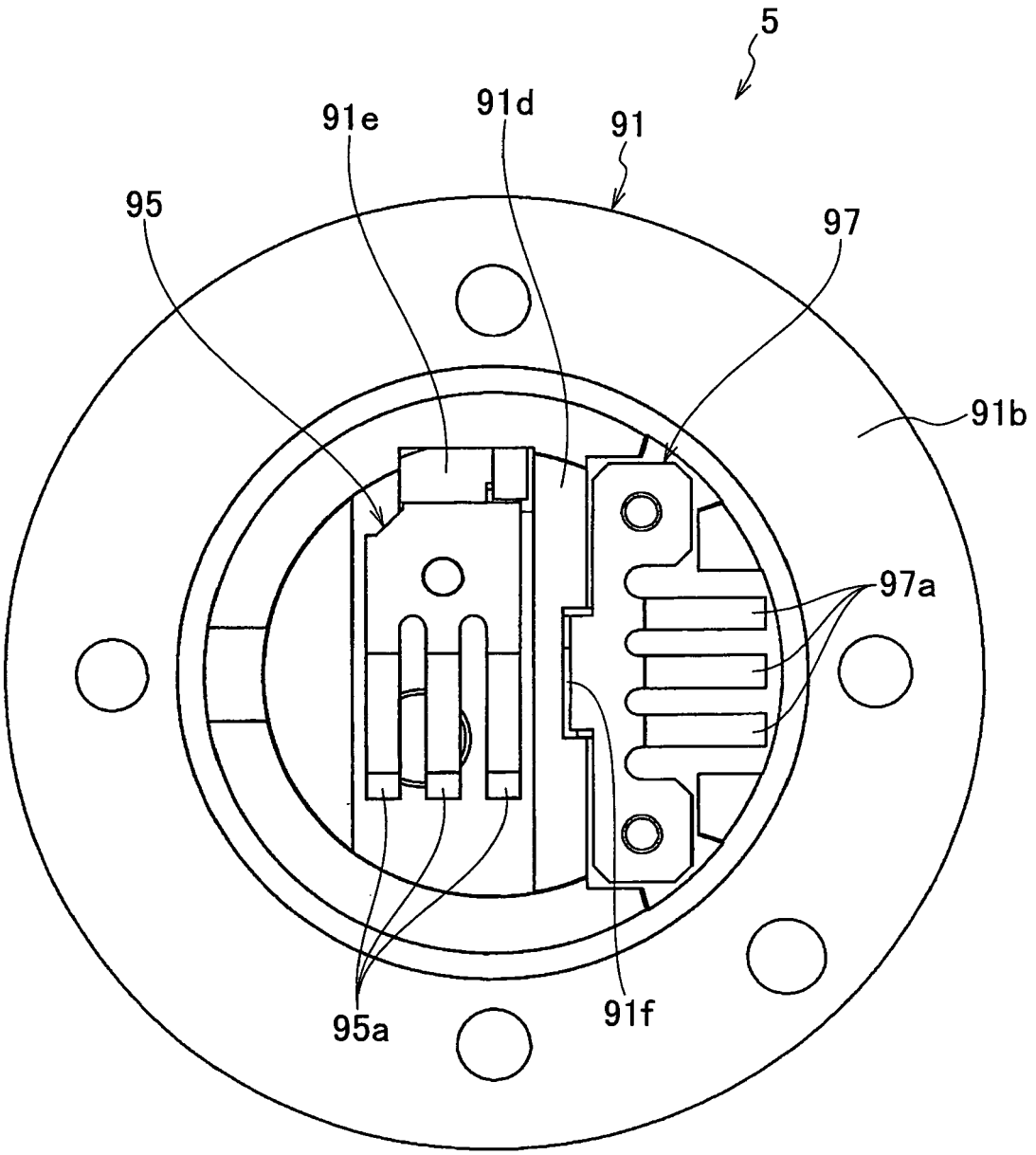


FIG.15

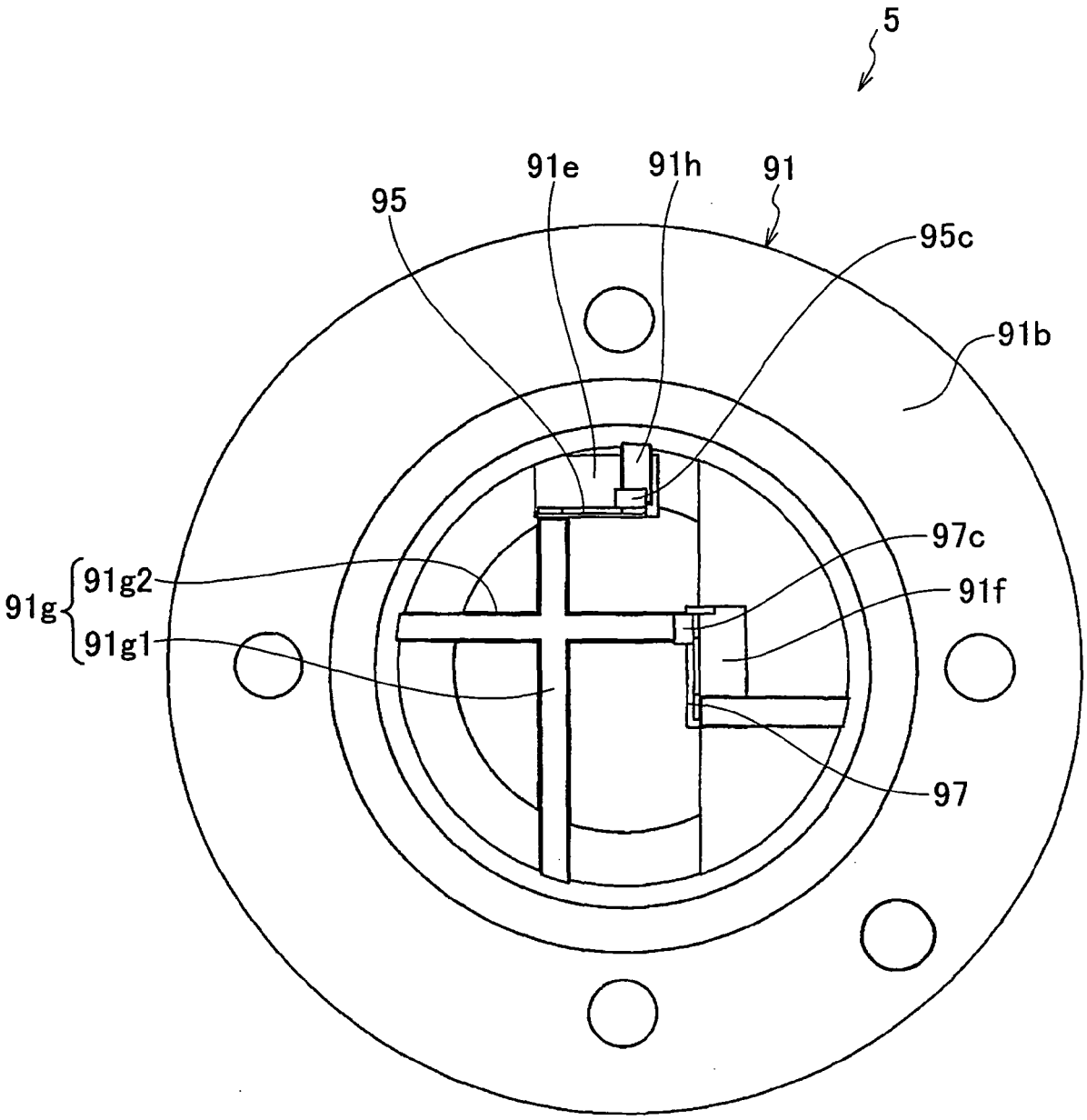
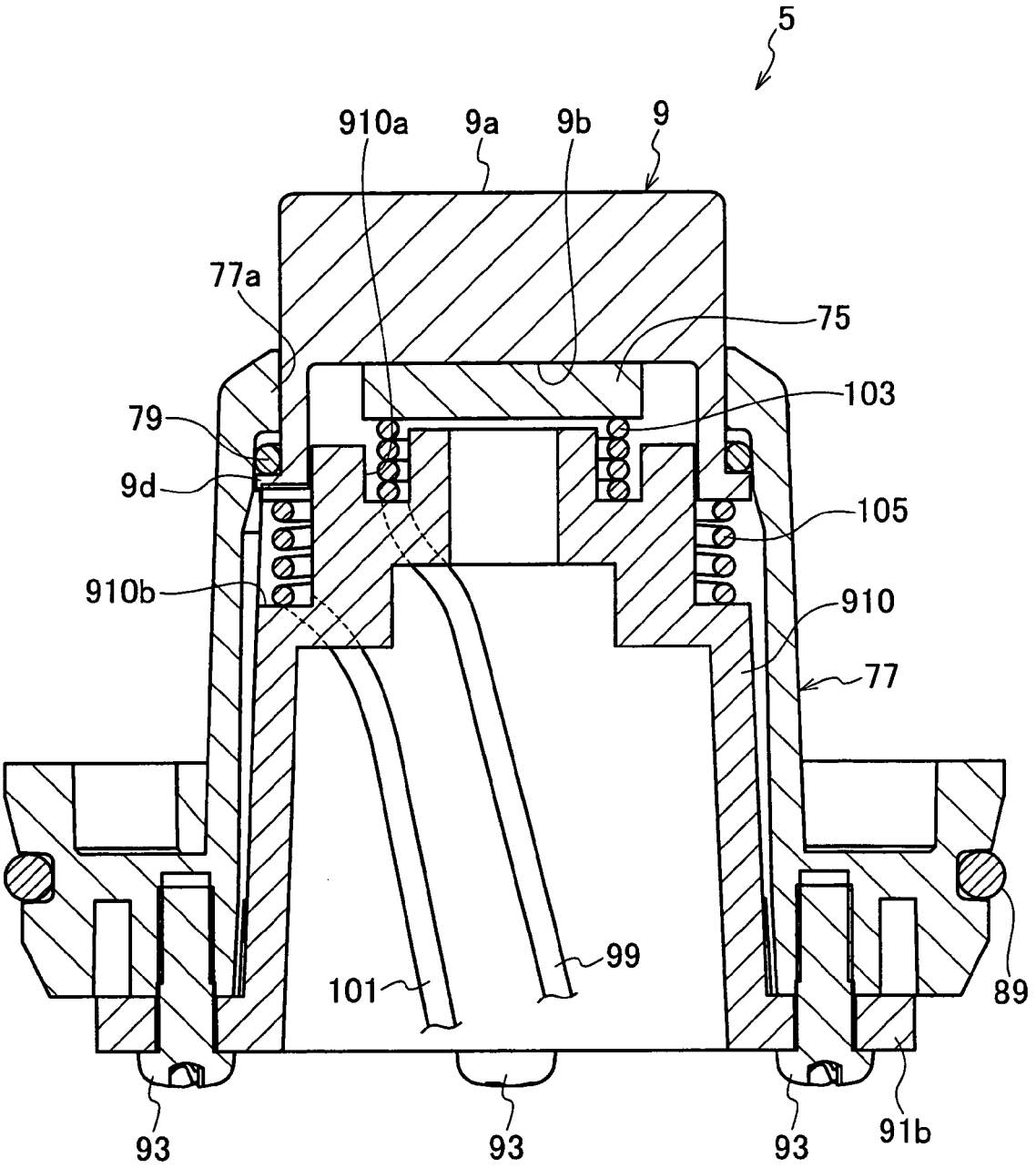


FIG. 16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9a
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77a
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9d
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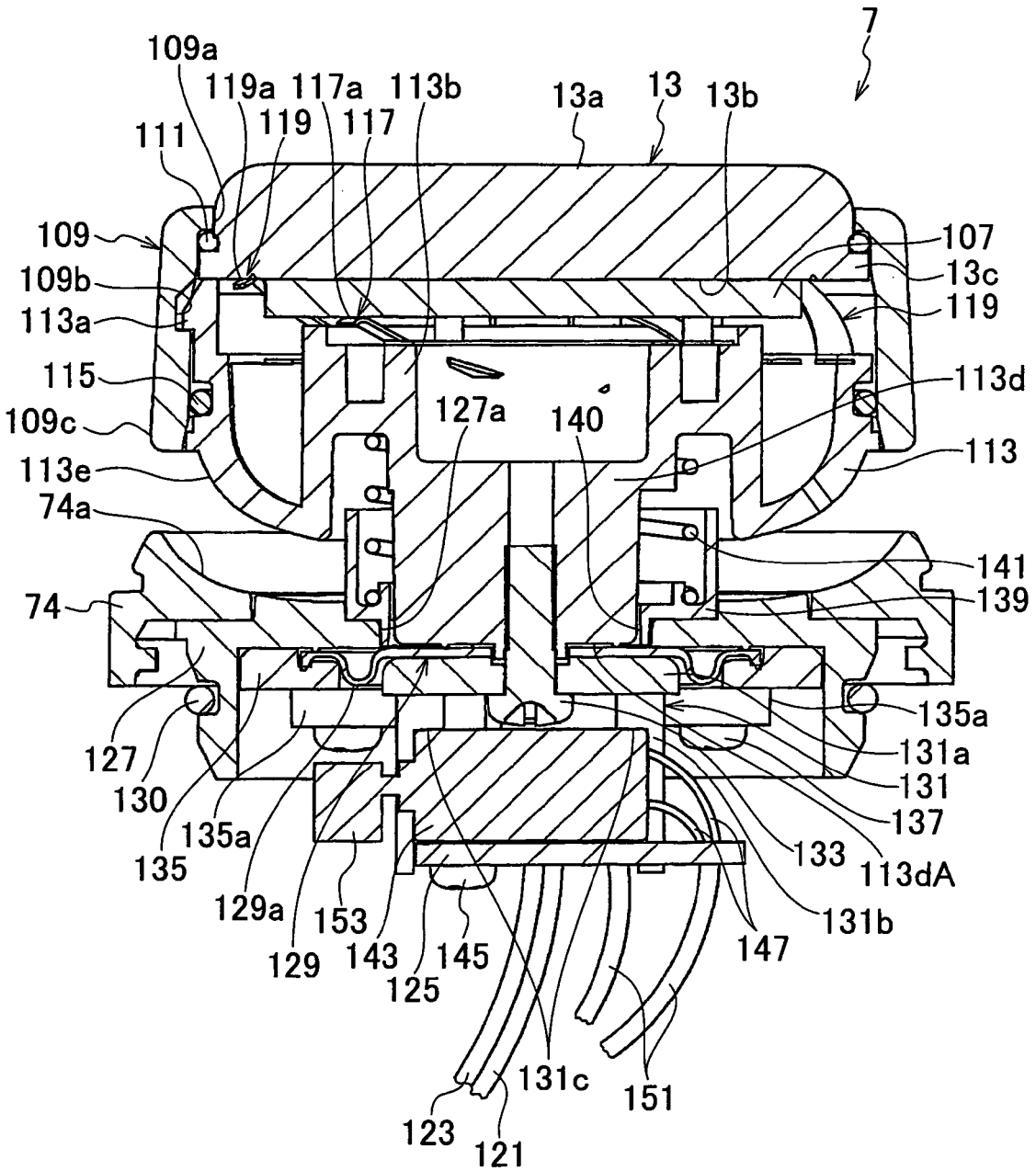
93
91b

FIG. 17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119a
117a
113b
13a
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117
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115
113d
127a
140
109c
113
113e
74a
141
74
139
135a
131a
127
131
130
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135a
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129a
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131b
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143
145
125
131c
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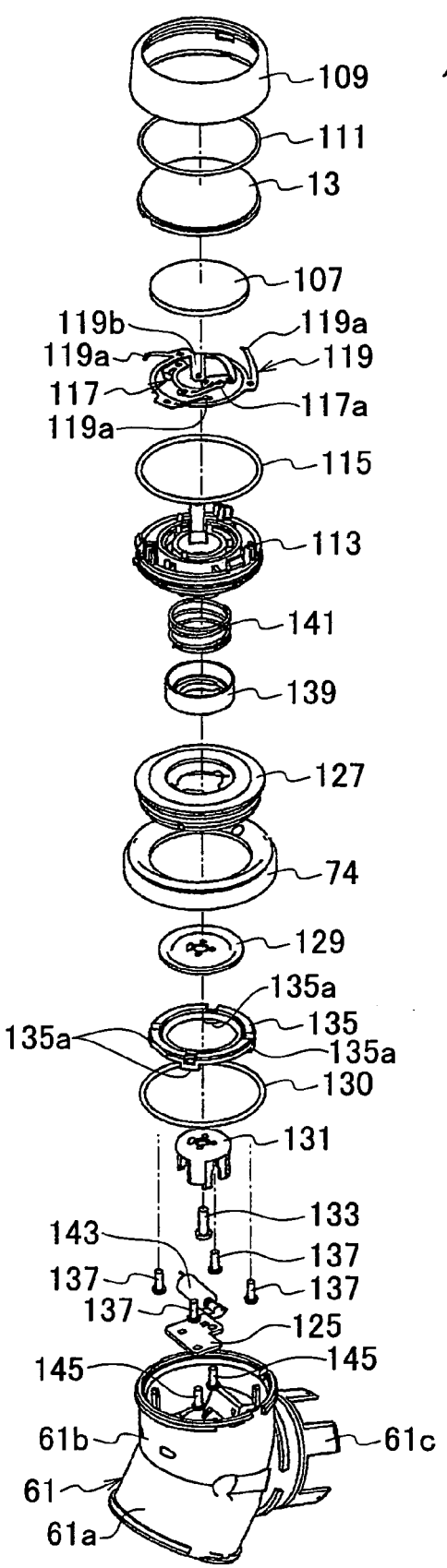
123
121

FIG. 18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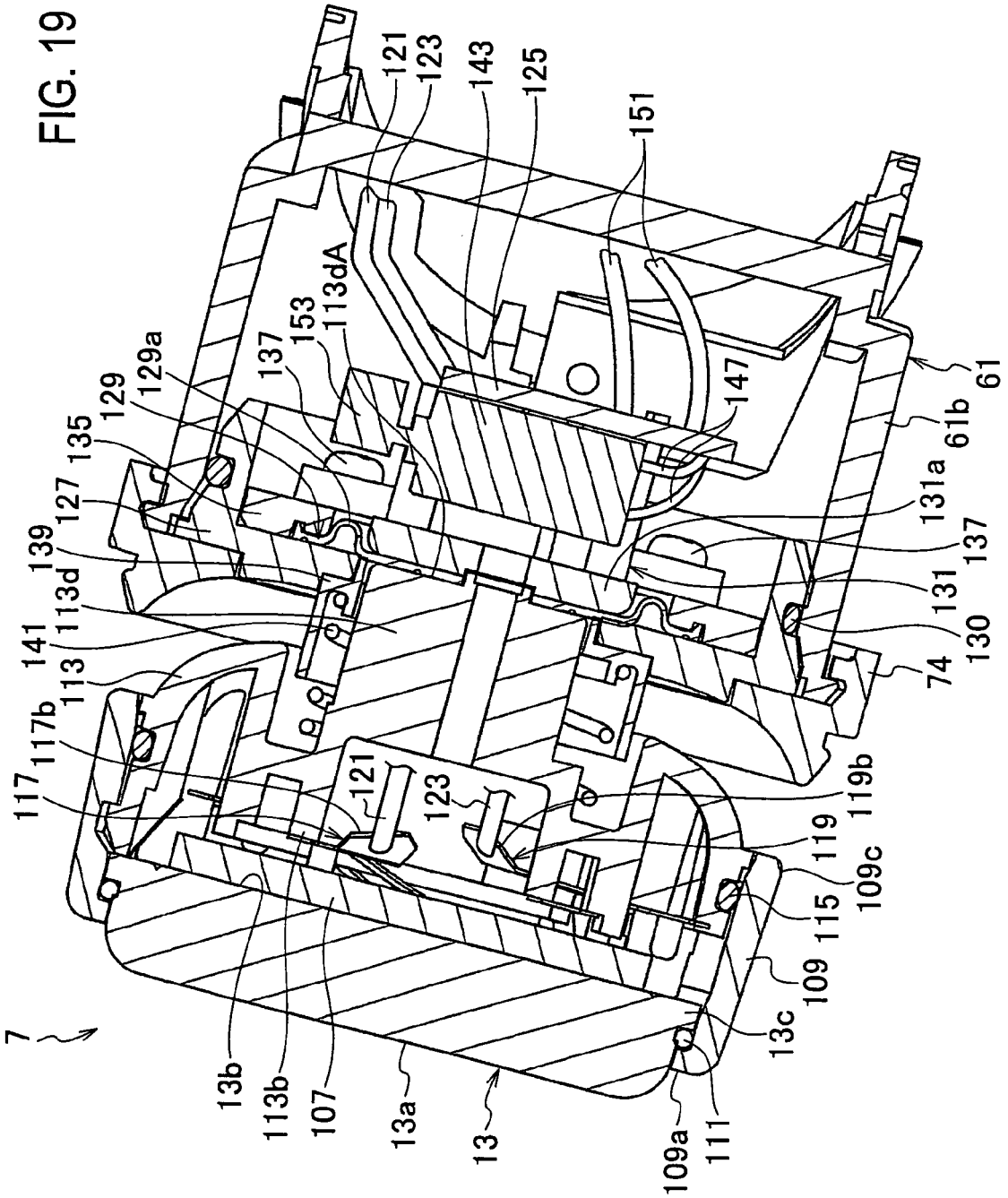
61b
61c
61
61a

FIG. 19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131a
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FIG. 20

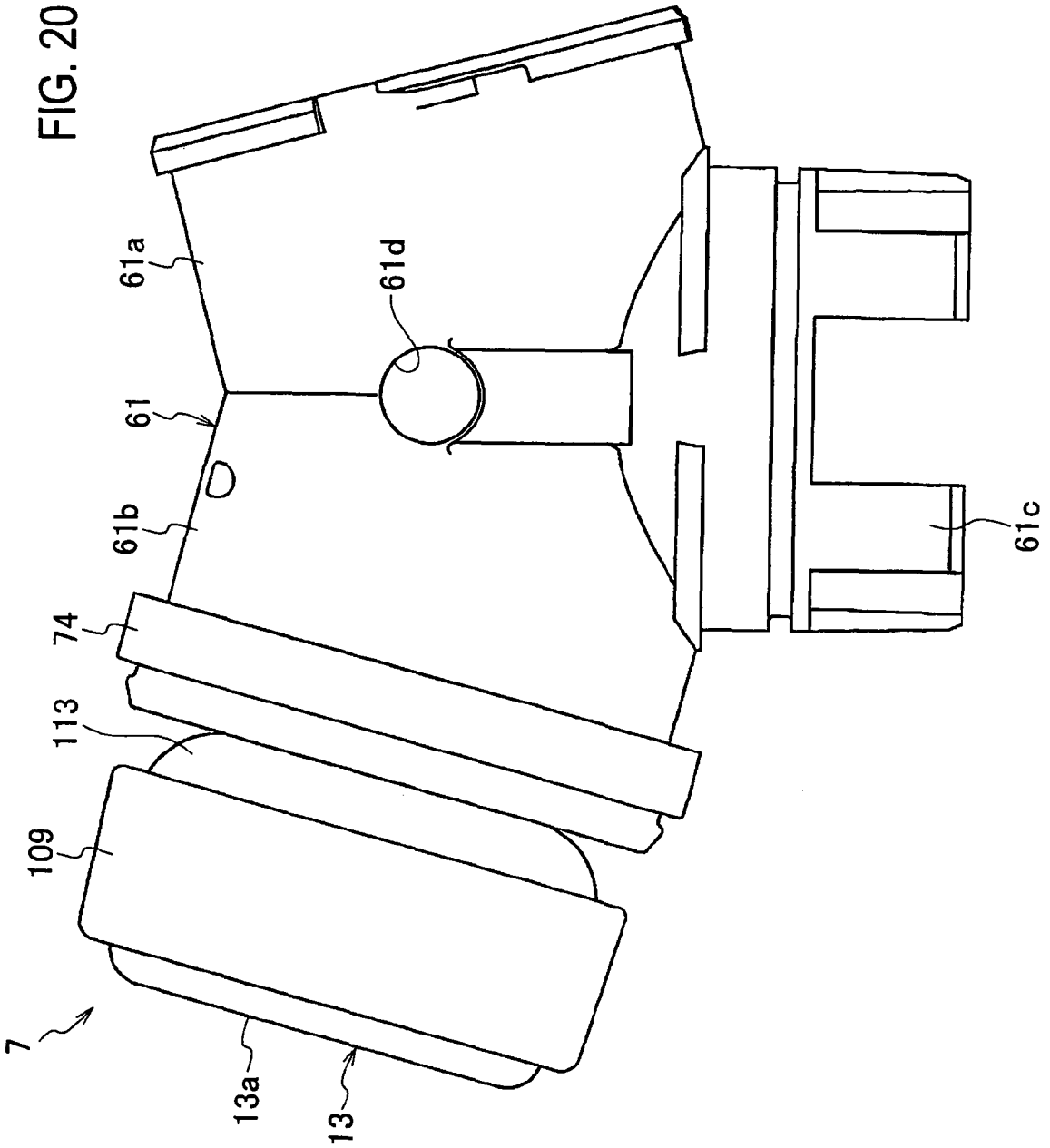
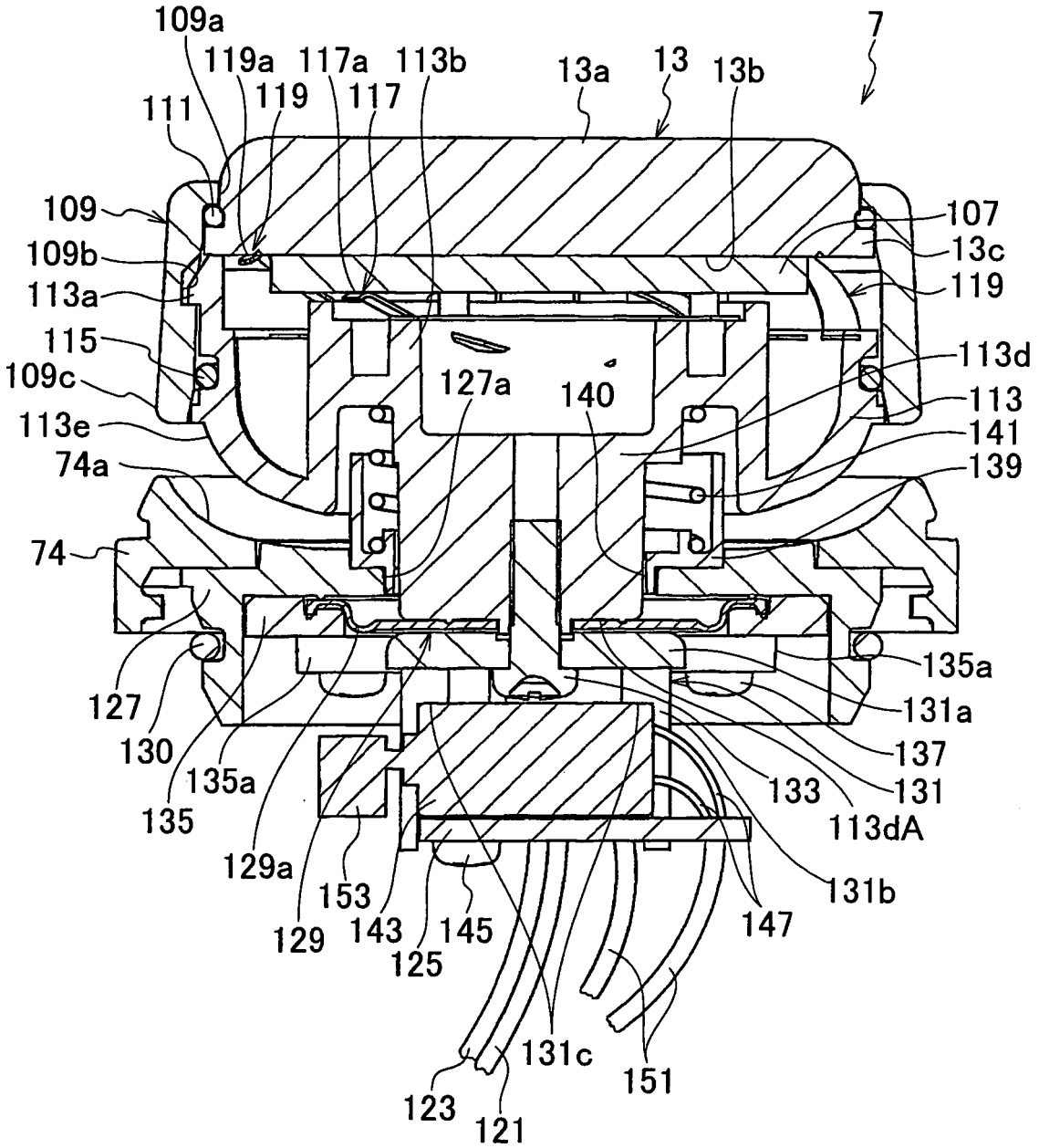


FIG. 21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109c
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113
113e
141
74a
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74
135a
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131a
130
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129a
131b
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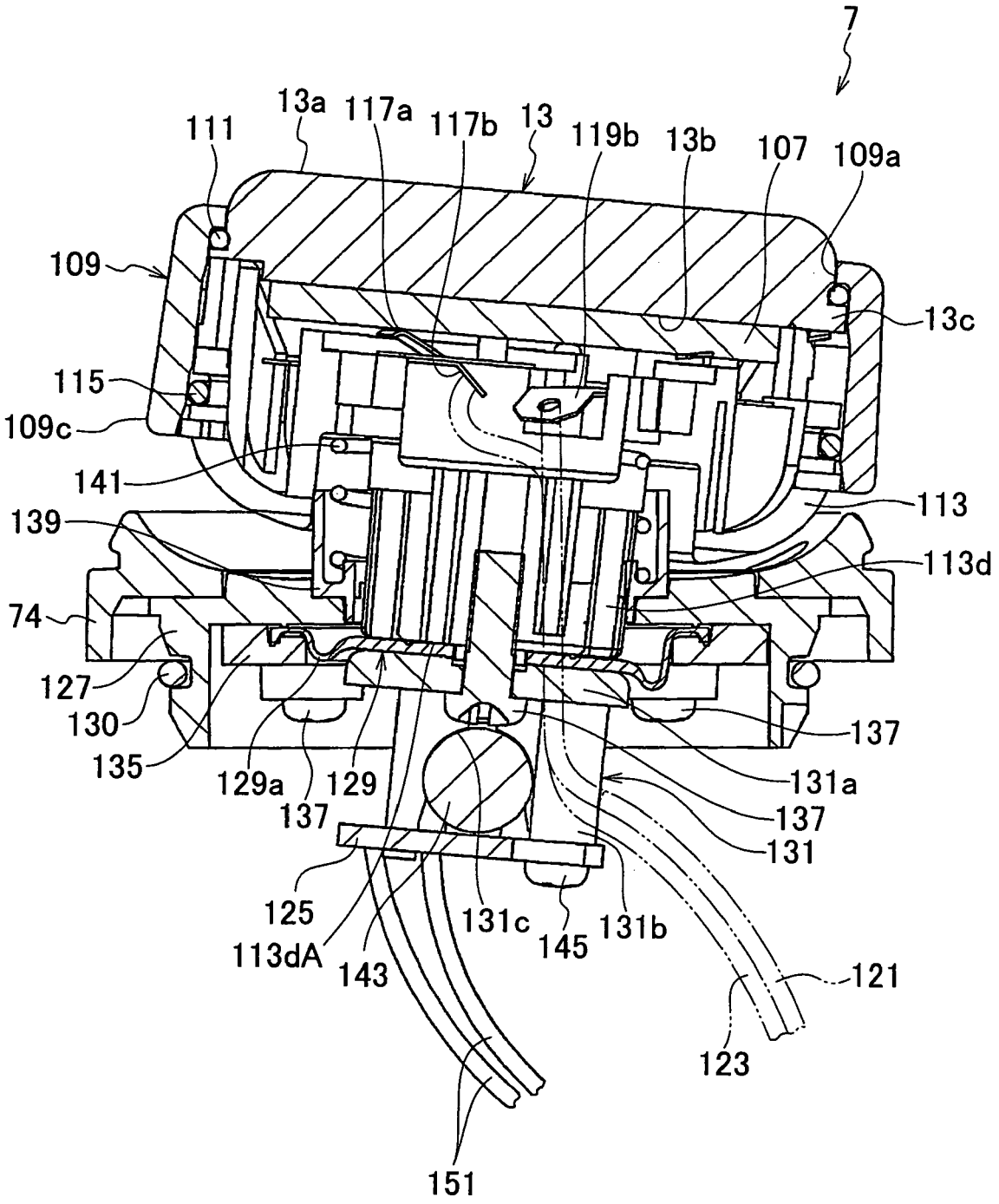
123
121

FIG. 22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123
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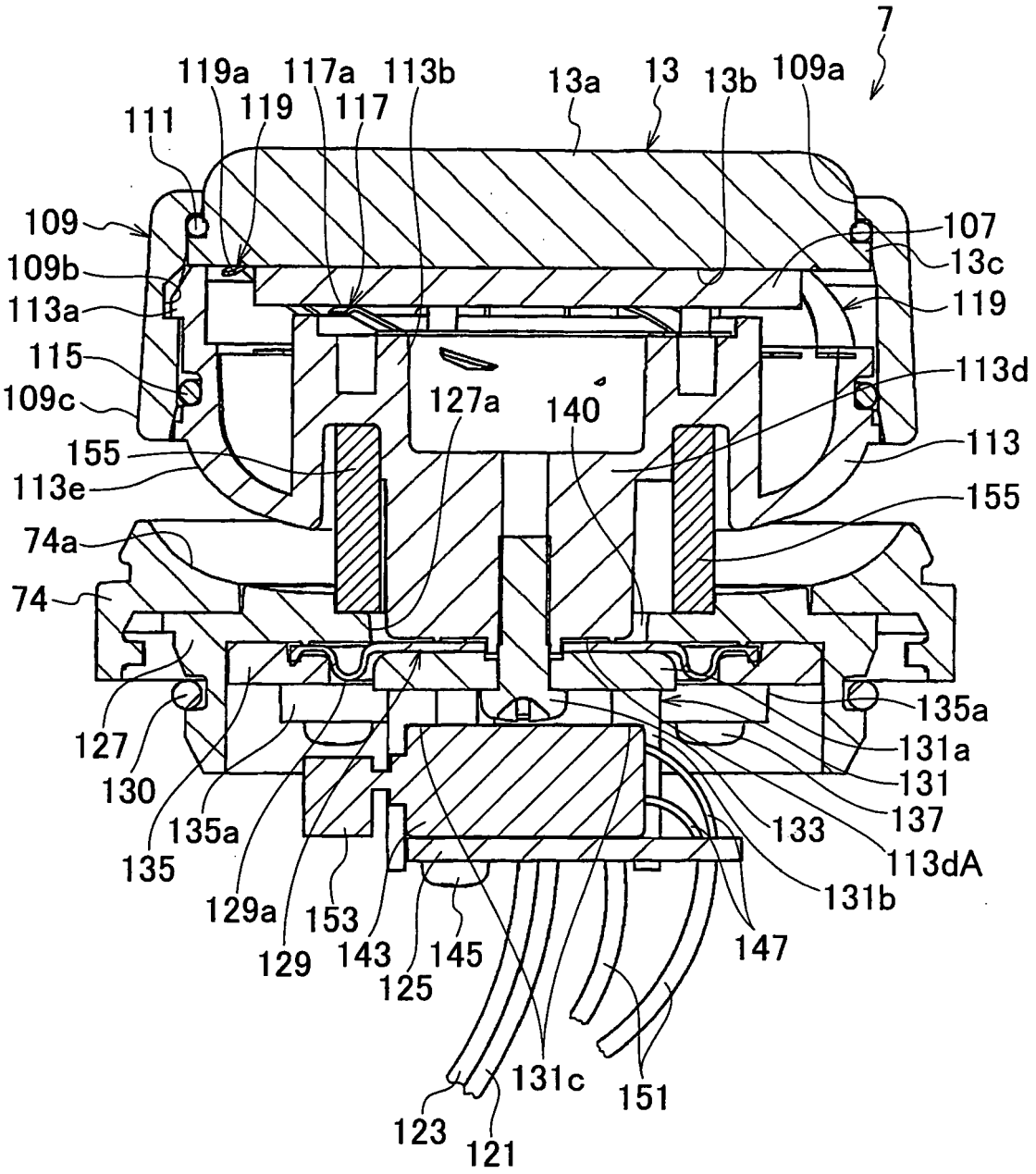
FIG. 23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EUROPEAN SEARCH REPORT

Application Number
EP 08 01 6708

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 2 706 293 A (SATELEC SA [FR]) 23 December 1994 (1994-12-23) * page 3, lines 1-18 * * page 4, line 29 - page 5, line 13 * * page 6, line 28 - page 7, line 28; figures 1,2,5,6 *	1,10-12	INV. A61H7/00 A61H23/02
X	US 5 558 623 A (CODY G LEE [US]) 24 September 1996 (1996-09-24) * column 4, lines 10,11 * * column 5, line 53 - column 6, line 7; figures 1,2 *	1,2,5-12	
Y		3,4	
Y	JP 2006 204767 A (MATSUSHITA ELECTRIC WORKS LTD) 10 August 2006 (2006-08-10) * paragraph [0003]; figures *	3,4	
Y	JP 2006 034651 A (JAPAN GIYARUZU KK) 9 February 2006 (2006-02-09) * abstract; figures *	3,4	
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A	JP 2000 233005 A (YA MAN LTD) 29 August 2000 (2000-08-29) * abstract; figure 1 *	1-12	A61H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 December 2008	Fischer, Elmar

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- JP 2001252323 B **[0002]**