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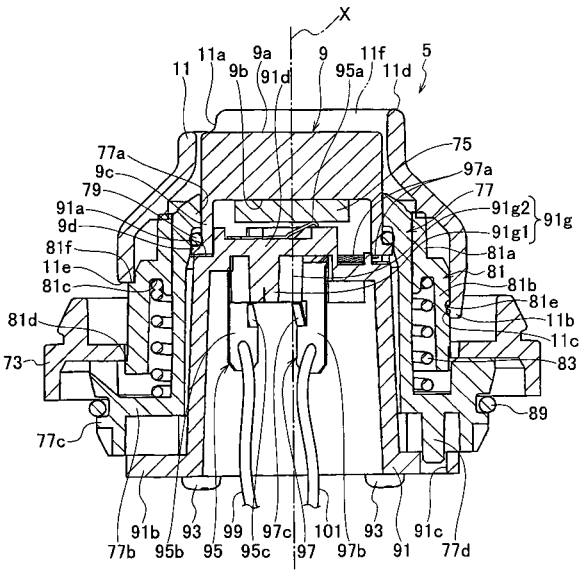
(54) **Ultrasonic cosmetic device**

(57) An ultrasonic cosmetic device including: an ultrasonic vibrator (75) for generating ultrasonic vibrations; a probe head (9) for transmitting the ultrasonic vibrations generated by the ultrasonic vibrator to a skin surface, the probe head having a contact surface (9a) to be brought into contact with the skin surface when the probe head is pressed forward in a first direction to the skin surface; and an impurity remover (11) provided around the contact surface of the probe head for removing impurities from the skin surface, the impurity remover having a front end (11d) which protrudes forward of the contact surface of the probe head in the first direction.

FIG. 6



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Description

BACKGROUND INVENTION

Field of the Invention

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

Description of the Related Art

[0002] In general, an ultrasonic cosmetic device is used with its probe head being in contact with the skin surface. The probe head transmits ultrasonic vibrations to the skin surface which softens plugs in pores, and makes the skin firmer. Japanese Patent Application Publication No. 2000-197518 discloses a skincare machine which has a suction pump for removing sebum and dirt from the skin.

[0003] The conventional ultrasonic cosmetic device using ultrasonic vibrations is capable of softening plugs with its ultrasonic vibrations, but is incapable of removing the plugs thus softened. As a result, the plugs are left in the pores, thereby insufficiently tightening the pores.

[0004] On the other hand, the skincare machine having the suction pump is capable of suctioning and thus removing plugs and dirt in the pores through suctioning the skin, but leaves the pores open after removing the plugs and dirt, failing to provide a pore tightening effect.

SUMMARY OF THE INVENTION

[0005] The present invention has been made with the foregoing problems taken into consideration. An object of the present invention is to provide an ultrasonic cosmetic device capable of removing impurities, such as plugs in pores, and concurrently capable of providing an effect of tightening the pores after removing the impurities.

[0006] An aspect of the present invention is an ultrasonic cosmetic device comprising: an ultrasonic vibrator for generating ultrasonic vibrations; a probe head for transmitting the ultrasonic vibrations generated by the ultrasonic vibrator to a skin surface, the probe head having a contact surface to be brought into contact with the skin surface when the probe head is pressed forward in a first direction to the skin surface; and an impurity remover provided around the contact surface of the probe head for removing impurities from the skin surface, the impurity remover having a front end which protrudes forward of the contact surface of the probe head in the first direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The invention will now be described with reference to the accompanying drawings wherein:

Fig. 1 is a front view of an ultrasonic cosmetic device according to an embodiment of the present invention.
Fig. 2 is a rear view of Fig. 1.
Fig. 3 is a front view of the ultrasonic cosmetic device shown in Fig. 1 with caps being attached thereto.
Fig. 4 is an exploded, perspective view of the ultrasonic cosmetic device shown in Fig. 1.
Fig. 5 is a cross-sectional view taken along the V-V line of Fig. 2.
Fig. 6 is a cross-sectional view of a first head unit.
Fig. 7 is an exploded, perspective view of the first head unit.
Fig. 8 is a cross-sectional view showing how the first head unit is connected to a head base.
Fig. 9 is a cross-sectional view showing how the attachment shown in Fig. 6 moves backward.
Fig. 10 is a front view of a first head unit from which an attachment is detached.
Fig. 11 is a front view of the first head unit, the front view obtained by omitting the illustrations of the first head ring, the probe spring cover, the probe head spring and the attachment from Fig. 6.
Fig. 12 is a front, cross-sectional view corresponding to Fig. 11.
Fig. 13 is a cross-sectional view taken along the line XIII-XIII of Fig. 12.
Fig. 14 is a plan view of a probe base shown in Fig. 13.
Fig. 15 is a bottom view of the probe base shown in Fig. 13.
Fig. 16 corresponds to Fig. 12 and is a cross-sectional view showing a case where coil springs are provided instead of connecting metal fittings.
Fig. 17 is a cross-sectional view of a second head unit.
Fig. 18 is an exploded, perspective view of the second head unit.
Fig. 19 is a cross-sectional view showing how the second head unit is connected to the head base.
Fig. 20 is an external view showing how the second head unit is connected to the head base.
Fig. 21 is a cross-sectional view showing how the second head unit shown in Fig. 17 moves backward.
Fig. 22 is a cross-sectional view showing how the second head unit shown in Fig. 17 tilts while swinging.
Fig. 23 corresponds to Fig. 17, and is a cross-sectional view showing a case where a hollow ring is provided instead of a head spring.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0008] Descriptions will be provided hereinbelow for the embodiment of the present invention on the basis of

the drawings.

[0009] Fig. 1 is a front view of an ultrasonic cosmetic device according to the embodiment of the present invention.

[0010] This ultrasonic cosmetic device includes: a main body unit 1 designed to be grasped by the hand of a user; a head base unit 3 located in the front end (the uppermost end in Fig. 1) of the main body unit 1; and a first head unit 5 and a second head unit 7 which protrude in such a way as to branch from the head base unit 3 to the left and right in Fig. 1, respectively. The first head unit 5 and the second head unit 7 constitute multiple head units. As shown in the front view of Fig. 1, the first head unit 5 and the second head unit 7 are directed in their respective slightly upper diagonal directions from the head base unit 3 located in the uppermost end of the main body unit 1. As a whole, the ultrasonic cosmetic device is shaped like an alphabet Y.

[0011] The first head unit 5 is brought into direct contact with the human nose, gives the ultrasonic vibrations to the nose, and thereby offers a skincare effect, through a first probe head 9 (see Fig. 6) provided in a front end of the first head unit 5 for transmitting ultrasonic vibrations to the nose, the first probe head 9 being made of an electrically-conductive material, and an attachment 11 surrounding the first probe head 9 which functions as an impurity remover. On the other hand, the second head unit 7 offers a skincare effect as follows. When the second head unit 7 is brought into contact with a chief part, such as the cheek, in the human face, a second probe head 13 provided in a front end of the second head unit 7 and made of an electrically-conductive material transmits ultrasonic vibrations to the chief part.

[0012] Fig. 2 is a rear view of the ultrasonic cosmetic device shown in Fig. 1. A switch 15 is provided in an upper portion of the main body unit 1. The switch 15 constitutes a switch section configured to operate the first head unit 5 and the second head unit 7 through selectively switching therebetween. A switch panel 17 is provided in outer periphery of the switch 15.

[0013] As shown in Fig. 1, the main body unit 1 is provided with LEDs (light-emitting diodes) 19, 21, 23, 25. The LED 19 indicates the charging status of the ultrasonic cosmetic device, whereas the LEDs 21, 23, 25 are provided above the LED 19, and indicate the operating states of the first head unit 5 and the second head unit 7.

[0014] As shown in Fig. 3, the ultrasonic cosmetic device includes caps 27, 29 which are respectively attached to the first head unit 5 and the second head unit 7 when not in use.

[0015] Fig. 4 is an exploded, perspective view of the ultrasonic cosmetic device. Fig. 5 is a cross-sectional view of the ultrasonic cosmetic device taken along the V-V line of Fig. 2. A circuit board 33 is housed in a housing 31 of the main body unit 1. By use of ribs 33a, a main body circuit substrate 35 is fixed to the opposite side of the circuit board 33 from the side on which the switch 15 is provided. The circuit board 33 is fixed to a head base 61, which will be described later, by use of screws 37 which are inserted in screw holes 33b provided in an upper portion of the circuit board 33. Reference numeral 36 in Fig. 4 denotes an vibrator controlling circuit substrate which includes a controlling circuit for making a first ultrasonic vibrator 75 and a second ultrasonic vibrator 107, which will be described later, generate ultrasonic vibrations at a single ultrasonic frequency. The vibrator controlling circuit substrate 36 is connected to the main body circuit substrate 35 by wiring.

[0016] In the housing 31, a battery charger assembly 39 is housed in a lower portion of the circuit board 33 on the side in which the switch 15 is provided. A battery positive-electrode metal piece 41 and a battery negative-electrode metal piece 43 are arranged in the circuit board 33. The battery positive-electrode metal piece 41 and the battery negative-electrode metal piece 43 are located respectively at a lowermost portion and an uppermost portion of the battery charger assembly 39 shown in Fig. 4.

[0017] Corresponding to the switch 15, a switch substrate 45 is attached to the circuit board 33 by screwing screws 47 into screw holes 33c through the switch substrate 45. Together with the switch panel 17, the switch substrate 45, a switch pressing plate 49 and a switch rubber 51, the switch 15 constitutes the switch section. The switch rubber 51 is 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. This makes the structure of the switch section water-tight. If the structure of the switch section can be securely made water-tight, the switch panel 17, the switch pressing plate 49 and the switch rubber 51 may be fixed to the housing 31 by use of an engagement structure consisting of a protrusion and a concave, or by use of fixture fittings such as screws.

[0018] As an end cover, a lower cover 53 is attached to a lower opening of the housing 31, which houses the main body circuit substrate 35, the battery charger assembly 39 and the like, by use of a waterproof screw 55. As a sealing member, a lower cover O-ring 57 is set between the housing 31 and the lower cover 53. As a sealing member, an O-ring 59 is set between the waterproof screw 55 and its screw hole. Hereinafter, a screw with a structure in which an O-ring is provided between the screw and its screw hole will be referred to as a "waterproof screw."

[0019] The head base unit 3 includes a three-pronged hollow head base 61. The head base 61 includes head connecting parts 61a, 61b respectively designed to be connected to the first head unit 5 and the second head unit 7. In addition, the head base 61 includes a main body connecting part 61c designed to be connected to the housing 31 in its lower portion under a joining portion where the head connecting parts 61a, 61b are joined together.

[0020] As shown in Fig. 5, the main body connecting part 61c is inserted into, and fixed to, the inside of an uppermost part 31a of the housing 31. A sealing member,

a main body O-ring 63 is set between the main body connecting part 61c and the uppermost part 31a of the housing 31.

[0021] Paired head cases 65, 67 are attached to the two side portions of the head base 61 with the head base 61 being interposed in between. In Fig. 1, the two side portions of the head base unit 3 respectively correspond to the front and rear sides in a direction perpendicular to the sheet. As shown in Fig. 5, uppermost portions of the head cases 65, 67 are engaged and fixed together by use of their engagement parts 69, respectively. Lowermost portions of the head cases 65, 67 form a structure in which the lowermost portions thereof are located in the outer periphery of the uppermost part 31a of the housing 31, and in which the uppermost part 31a is interposed between the main body connecting part 61c of the head base 61 and each of the lowermost portions of the head cases 65, 67.

[0022] In this state, the head cases 65, 67 are fixed to each other by inserting a waterproof screw 71 in a screw insertion hole 67a in the head case 67, and thereafter by screwing the thus-inserted waterproof screw 71 into a screw hole 65a provided in the head case 65. At this time, as shown in Fig. 5, the head cases 65, 67 have a structure in which a boss part 67b including the screw insertion hole 67a in the head case 67 and a boss part 65b including the screw hole 65a in the head case 65 are inserted into a through-hole 61d provided in the head base 61, and in which the tip portions of the boss part 67b and the boss part 65b abut each other in the through-hole 61d.

[0023] In addition, an accent ring 72 is provided between the head cases 65, 67 and a stepped part 31b formed in a base end of the uppermost part 31a of the housing 31. Moreover, a first head ring 73 is provided to the outer peripheries of opening edge portions of the head cases 65, 67, the opening edge portions being those to which the first head unit 5 is attached. On the other hand, a second head ring 74 is provided to the outer peripheries of the other opening edge portions of the head cases 65, 67, the opening edge portions being those to which the second head unit 7 is attached. Thus, the head cases 65, 67 are fixed to each other.

[0024] Fig. 6 is a cross-sectional view of the first head unit 5 and its vicinity. Fig. 7 is an exploded, perspective view of parts used in the first head unit 5 and its vicinity. Fig. 8 is a cross-sectional view showing how the first head unit 5 is connected to the head connecting part 61a of the head base 61.

[0025] As described above, the first head unit 5 includes the first probe head 9. When the first probe head 9 is pressed against the surface of the human skin by moving the first probe head 9 forward in the axial direction X of the first probe head 9 (upward in Fig. 6), the surface of the first probe head 9 which surface is located in the front end in the axial direction X (in the uppermost end in Fig. 6) constitutes a contact surface 9a designed to come in contact with the surface of the human skin. The contact surface 9a is almost perpendicular to the axial direction X of the first probe head 9, and has a circular shape when viewed in the axial direction X. The first ultrasonic vibrator 75 is mounted on a rear face 9b of the first probe head 9, the rear face 9b being located in the opposite side of the first probe head 9 from the contact surface 9a (in the rear side of the first probe head 9 in the axial direction X). The first ultrasonic vibrator 75 generates ultrasonic vibrations when a drive voltage is applied to the first ultrasonic vibrator 75 from the vibrator controlling circuit substrate 36 in the main body unit 1. In response to this, the first probe head 9 is ultrasonically vibrated, and thus transmits the ultrasonic vibrations to the skin surface through the contact surface 9a.

[0026] The first probe head 9 includes a cylindrical part 9c which protrudes in a direction opposite to the direction of the contact surface 9a (backward in the axial direction X) from the outer peripheral edge in the rear face 9b. A flange 9d protruding to bend outward is formed in an end portion of the cylindrical part 9c, the end portion thereof being located backward in the axial direction X (the lowermost end portion of the cylindrical part 9c shown in Fig. 6).

[0027] A probe cover 77 is provided around the cylindrical part 9c and the flange 9d in such a way as to cover the outer peripheries respectively of the cylindrical part 9c and the flange 9d. The probe cover 77 is a main-body-side member which is almost cylindrical in shape. The probe cover 77 includes a bending part 77a in its front end portion in the axial direction X. The bending part 77a protrudes inward in the radial direction of the probe cover 77. The bending part 77a has its radial inner sidewall being in contact with the outer peripheral surface of the first probe head 9. As a sealing member, an O-ring 79 is provided in a gap between the bending part 77a and the flange 9d.

[0028] A probe spring cover 81 which is almost cylindrical in shape is provided around the radial outside of the probe cover 77 so as to be movable in the axial direction X (in the upward and downward directions in Fig. 6) relative to the probe cover 77. The probe spring cover 81 includes a slide part 81a in its front end in the axial direction X (in the uppermost portion of the probe spring cover 81 in Fig. 6). The slide part 81a comes in sliding contact with the outer peripheral surface of the probe cover 77. In addition, the probe spring cover 81 includes a cover part 81b in its remaining rear end portion. The cover part 81b is larger in radius than the slide part 81a. As an elastic member, a probe head spring 83 is housed in the radial inside of the cover part 81b.

[0029] The probe head spring 83 is made of an elastic material such as SWP-A (JIS G 3522), SWP-B (JIS G 3522), SUS304 (JIS G 4314) and SUS304WPB (JIS G 4314). The inner diameter of the probe head spring 83 is approximately 22.0 mm.

[0030] The probe head spring 83 is set between a spring receiving part 81c and a spring receiving part 77b. The spring receiving part 81c is formed between the slide part 81a and the cover part 81b of the probe spring cover

81. The spring receiving part 77b protrudes outward in the radial direction of the probe cover 77 from a tip portion of the probe cover 77, the tip portion being located backward in the axial direction X (downward in Fig. 6). The probe head spring 83 pushes the probe spring cover 81 and the attachment 11 forward in the axial direction X (upward in Fig. 6).

[0031] An engagement part 81d is formed in a rear end portion, in the axial direction X, of the cover part 81b in the probe spring cover 81. The engagement part 81d protrudes outward in the radial direction. The rear end portion of the cover part 81b is inserted in the first head ring 73, and the engagement part 81d is thus engaged to a radial inner end portion of the first head ring 73. This engagement mechanism prevents the probe spring cover 81 from coming off forward in the axial direction X (upward in Fig. 6).

[0032] The attachment 11 for removing impurities from the skin surface is attached to a front end of the probe spring cover 81, the front end being located forward in the axial direction X (upward Fig. 6). The attachment 11 is almost truncated-conical in shape, and includes a front end 11d in its front end in the axial direction X. The front end 11d is provided so as to surround the outer periphery of the contact surface 9a of the probe head 9, and protrudes forward in the axial direction X from the contact surface 9a of the prove head 9. The opening in the front end of the attachment 11 in the axial direction X is smaller than the opening in the rear end of the attachment 11 in the axial direction X. A cut-out (or a notch) 11a is formed in a part of the front end 11d in the circumferential direction around the central axis of the first head unit 5 (the outer peripheral edge of the opening in the front end in the axial direction X). In other words, the front end 11d of the attachment 11 includes a part whose axial distance from the contact surface 9a constituting the surface of the first probe head 9 is different from axial distances of other parts therefrom.

[0033] Instead of the cut-out 11a, an inclined front edge 11f may be provided to the front end 11d of the attachment 11. As indicated by a long dashed double-short-dashed line in Fig. 6, the inclined front edge 11f is inclined with respect to the contact surface 9a of the first probe head 9. The inclined front edge 11f is inclined in a way that the axial position of its first portion (its left end portion in Fig. 6) corresponding to the cut-out 11a is closest to the contact surface 9a of the first probe head 9, and that the axial position of its second portion (its right end portion in Fig. 6) diametrically opposite to its first portion corresponding to the cut-out 11a is farthest from the contact surface 9a.

[0034] Multiple engagement pieces 11b are respectively formed in multiple circumferential locations in the peripheral edge of the opening in the rear end of the attachment 11. The engagement pieces 11b protrude backward in the axial direction X (downward in Fig. 6). An engagement protrusion 11c is formed on the radial inner surface of each engagement piece 11b. The engagement protrusion 11c protrudes inward in the radial direction. Each engagement protrusion 11c is engaged to its corresponding engagement concave part 81e provided in the outer peripheral surface of the probe spring cover 81. Thereby, the attachment 11 is fixed to the probe spring cover 81.

[0035] In this engaging structure of the engagement protrusions 11c and the engagement concave parts 81e, the engagement protrusions 11c can be easily detached from the respective engagement concave parts 81 when a user applies a force to the attachment 11 in the axial direction X.

[0036] While the attachment 11 is engaged and fixed to the probe spring cover 81 as described above, each lower end 11e in the peripheral edge of the opening in the axial rear end abuts on its corresponding stepped part 81f provided in an upper portion in the outer periphery of the cover part 81b in the probe spring cover 81.

[0037] With the above-described mechanism, the attachment 11 is pushed (biased) forward in the axial direction X (upward in Fig. 6) by the probe head spring 83 via the probe spring cover 81. When the attachment 11 under the condition shown in Fig. 6 is pressed backward in the axial direction (downward in Fig. 6) against the force of the probe head spring 83, the attachment 11 can be moved in the axial direction X toward the first probe head 9 with the probe head spring 83 being compressed, as shown in Fig. 9.

[0038] Although not specifically illustrated, the probe spring cover 81 is provided with an anti-rotation device for keeping the probe spring cover 81 from rotating about the axis X to the first head ring 73. In addition, as shown in Fig. 8, the first head ring 73 is fixed to the head connecting part 61a of the head base 61 in such a way as to be screwed onto the head connecting part 61a. Thereby, the first head ring 73 is kept from rotating relative to the head base 61.

[0039] For this reason, when being attached, the attachment 11 maintains a state where, as shown in Figs. 1, 2 and 8, the cut-out 11a is located at a circumferential position facing the main body unit 1.

[0040] An outer peripheral cylindrical part 77c is provided in an outer periphery side of the spring receiving part 77b in a lower end of the probe cover 77, the lower end being in the base end side of the probe cover 77 (in the rear end side of the probe cover 77 in the axial direction X). The outer peripheral cylindrical part 77c extends in the axial direction X from the outer periphery of the spring receiving part 77b. A front end portion, in the attachment 11 side, of the outer peripheral cylindrical part 77c abuts on the first head ring 73 (the front end portion being located forward in the axial direction X). In addition, as a sealing member, an O-ring 89 is provided on the outer peripheral surface of the outer peripheral cylindrical part 77c in order to seal a connecting portion between the outer peripheral surface of the outer peripheral cylindrical part 77c and the head connecting part 61a of the head base 61.

[0041] A probe base 91 is arranged under the first ultrasonic vibrator 75. As shown in Fig. 6, the probe base 91 is so shaped in the form of a cup as to be opened in its lowermost end. A stepped part 91a is formed in an outer periphery of the probe base 91 in a portion located forward in the axial direction X (upward in Fig. 6). The lowermost end of the cylindrical part 9c of the first probe head 9 is placed on the stepped part 91a. The stepped part 91a supports the first probe head 9 with the flange 9d of the first probe head 9 being interposed between the probe cover 77 and the stepped part 91a.

[0042] Fig. 10 is a front view of the first head unit 5 from which the attachment 11 is detached. Fig. 11 is a front view of the first head unit 5, the front view obtained by omitting 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 front, cross-sectional view of the first head unit 5 shown in Fig. 11. As shown in Fig. 12, a flange 91b protruding outward in the radial direction is formed in the lowermost end portion of the probe base 91. By inserting screws 93 into the flange 91b, the probe cover 77 and the probe base 91 are fastened and fixed to each other. 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.

[0043] Connecting metal fittings 95, 97 are attached to an uppermost wall 91d of the probe base 91. The connecting metal fitting 95 is in contact with the rear face of the first ultrasonic vibrator 75, and serves as a positive electrode. The connecting metal fitting 97 is in contact with the rear face of the flange 9d of the first probe head 9, and serves as a negative electrode.

[0044] Fig. 13 is a cross-sectional view of the first head unit 5 taken along the line XIII-XIII of Fig. 12. Fig. 14 is a plan view of the probe base 91 shown in Fig. 13. Fig. 15 is a bottom view of the probe base 91 shown in Fig. 13.

[0045] The connecting metal fitting 95 is inserted in, and fixed to, an attachment hole 91e provided in the outer periphery side of the uppermost wall 91d of the probe base 91. Contact pieces 95a are projected upward, and thus elastically contact the rear face of the first ultrasonic vibrator 75 by pressure, as shown in Fig. 12. On the other hand, a connecting piece 95b is bent at an angle of 90° to the contact pieces 95a, and is projected downward. An end of a lead line 99 is thus connected to the connecting piece 95b.

[0046] The connecting metal fitting 97 is inserted in, and fixed to, an attachment hole 91f provided in a substantially central portion of the uppermost wall 91d of the probe base 91. Contact pieces 97a are projected upward, and thus elastically contact the undersurface of the flange 9d of the first probe head 9 by pressure, as shown in Fig. 13. On the other hand, a connecting piece 97b is projected downward, and an end of a lead line 101 is thus connected to the connecting piece 97b.

[0047] The other ends of the respective lead lines 99, 101 are connected to the main body circuit substrate 35.

[0048] In addition, as shown in Fig. 15, a cross-shaped insulating rib 91g is provided onto the undersurface of the uppermost wall 91d in order to avoid the connecting metal fittings 95, 97 being brought into contact with each other (short-circuited). Specifically, an end portion of a rib piece 91g1 of the insulating rib 91g is installed close to the connecting metal fitting 95, the end portion being located upward in Fig. 15. In addition, an end portion of a rib piece 91g2 of the insulating rib 91g is installed close to the connecting metal fitting 97, the end portion being located rightward in Fig. 15. Thereby, the insulating rib 91g prevents the connecting metal fittings 95, 97 from moving closer to each other.

[0049] As shown in Fig. 12, the connecting metal fitting 95 is fixed to the probe base 91 by engaging an engagement piece 95c of the connecting piece 95b to the lowermost end of an engagement rib 91h provided on the inner peripheral surface of the probe base 91. The engagement piece 95c is provided in a substantially center portion of the connecting piece 95b in the vertical direction. On the other hand, as shown in Figs. 12 and 13, the connecting metal fitting 97 is fixed to the probe base 91 by engaging an engagement piece 97c to the lowermost end of the rib piece 91g2. The engagement piece 97c is provided in a substantially center portion of the connecting piece 97b in the vertical direction.

[0050] As shown in Fig. 13, the uppermost wall 91d of the probe base 91 to which the connecting metal fittings 95, 97 are attached includes two steps whose levels are different. The connecting metal fitting 97 is attached to a step whose level is lower, and the connecting metal fitting 95 is attached to a step whose level is higher.

[0051] In this respect, press load which the connecting metal fittings 95, 97 apply respectively to the first ultrasonic vibrator 75 and the first probe head 9 should be not less than 0.5N, and desirably, not less than 1.0N. In addition, the amount of bending of each of contact pieces 95a, 97a should be not less that 0.5 mm, and more desirably, not less than 1.0 mm.

[0052] Furthermore, instead of the cross-shaped insulating rib 91g mentioned above, a squared hollow or solid rib may be employed. Moreover, the insulating rib may be provided as a discrete component and be attached to the uppermost wall 91d with a screw or hook.

[0053] Fig. 16 is a cross-sectional view showing a case where, instead of the connecting metal fittings 95, 97, a positive-electrode coil spring 103 and a negative-electrode coil spring 105 are provided. Fig. 16 corresponds to Fig. 12.

[0054] In this case, the positive-electrode coil spring 103 is contained in an annular concave part 910a formed in the uppermost surface of a probe base 910 corresponding to the probe base 91 shown in Fig. 12, and the uppermost end of the positive-electrode coil spring 103 contacts the rear face of the first ultrasonic vibrator 75. In addition, the negative-electrode coil spring 105 is contained in an annular stepped part 910b formed in an upper outer periphery of the probe base 910, and the uppermost

end of the negative-electrode coil spring 105 contacts the rear face of the flange 9d of the first probe head 9. In this respect, the negative-electrode coil spring 105 is larger in diameter than the positive-electrode coil spring 103.

[0055] The lead lines 99, 101 are connected to the positive-electrode coil spring 103 and the negative-electrode coil spring 105, respectively.

[0056] The rest of the configuration in the case shown in Fig. 16 is identical with that shown in Fig. 6. In the configuration shown in Fig. 16, the cross-shaped insulating rib 91g as shown in Fig. 15 is not needed, thereby simplifying the configuration of the first head unit.

[0057] Alternatively, the lead lines 99, 101 may be respectively connected to the first ultrasonic vibrator 75 and the first probe head 9 directly, without providing the connecting metal fittings and the coil springs.

[0058] 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 how the second head unit 7 is connected to the head connecting part 61b of the head base 61. Fig. 20 is an external view showing how the second head unit 7 is connected to the head connecting part 61b of the head base 61.

[0059] As described above, the second head unit 7 includes the second probe head 13. The surface of the second probe head 13 constitutes a contact surface 13a designed to come in contact with the human skin. A second ultrasonic vibrator 107 is attached to a rear face 13b of the second probe head 13, the rear face 13b being the opposite side of the second probe head 13 from the contact surface 13a. The second ultrasonic vibrator 107 generates ultrasonic vibrations when a drive voltage is applied to the second ultrasonic vibrator 107 from the vibrator controlling circuit substrate 36 in the main body unit 1. In response to this, the second probe head 13 ultrasonically vibrates.

[0060] The contact surface 13a of the second probe head 13 is formed in a way that the area of the contact surface 13a is larger than that of the contact surface 9a of the first probe head 9.

[0061] A flange 13c protruding outward is provided in an outer peripheral edge of the second probe head 13, the outer peripheral edge being located closer to the rear face 13b to which the second ultrasonic vibrator 107 is attached.

[0062] An almost cylindrical head cover 109 as a probe cover is provided so as to cover the flange 13c. In its front end, the head cover 109 brings a bending part 109a into contact with the outer peripheral surface of the second probe head 13. To this end, the bending part 109a protrudes inward. In addition, as a sealing member, an O-ring 111 is provided in a gap between the bending part 109a and the flange 13c.

[0063] When the upper end of a head base 113 is inserted into the head cover 109, an engagement protrusion 113a of the head base 113 is engaged into an engagement concave part 109b of the head cover 109. Thereby, the head cover 109 is fixed to the head base 113. As a sealing member, an O-ring 115 is set between the head cover 109 and the head base 113. In this respect, the head base 113 is opened in its upper portion.

[0064] A metal fitting attachment rib 113b is formed in the inside of the head base 113. A connecting metal fitting 117 serving as a positive electrode and a connecting metal fitting 119 serving as a negative electrode are attached to the metal fitting attachment rib 113b in a way that the connecting metal fitting 119 is located in the outer periphery of the connecting metal fitting 117. A front end portion of the connecting metal fitting 117 constitutes a contact piece 117a, which elastically contacts the rear face of the second ultrasonic vibrator 107 by pressure. A rear end portion of the connecting metal fitting 117 constitutes a connecting piece 117b, to which an end of a lead line 121 is connected.

[0065] On the other hand, a front end portion of the connecting metal fitting 119 constitutes contact pieces 119a, which are elastically pressed to contact the rear face 13b of the second probe head 13 which is larger in diameter than the second ultrasonic vibrator 107. A rear end portion of the connecting metal fitting 119 constitutes a connecting piece 119b, to which an end of a lead line 123 is connected. The other ends of the respective lead lines 121, 123 are connected to the main body circuit substrate 35 by extending the lead lines 121, 123 downward while penetrating a boss part 113d as well as a rubber cover 129 and a head stopper 131, which will be described later, as shown in Fig 22 for which descriptions will be provided later.

[0066] As shown in Fig. 18, the connecting metal fitting 119 is shaped almost like a ring, and three contact pieces 119a are provided to the periphery of the connecting metal fitting 119. On the other hand, the connecting metal fitting 117, which is shaped like a half arc, is located inside the connecting metal fitting 119, and is provided with one contact piece 117a.

[0067] A lower end portion of the boss part 113d located in the center portion of the head base 113 is movably inserted in a through-hole 127a provided in the center portion of a spring base 127 serving as a base part. As an elastic body, the rubber cover 129 is fixed to the lower end surface of the boss part 113d by use of a screw 133 with a plate-shaped part 131a of the head stopper 131 being interposed in between. As a sealing member, an O-ring 130 is provided to the outer peripheral surface of the spring base 127 in order to seal the gap between the spring base 127 and the head connecting part 61b of the head base 61. In addition, a second head ring 74 is fixed to the head connecting part 61b of the head base 61 shown in Fig. 18 in such a way as to be screwed onto the head connecting part 61b.

[0068] An annular elastic deformation part 129a having a curved shape in section is provided around the outer peripheral portion of the rubber cover 129. The elastic deformation part 129a is fixed to the spring base 127 by

use of screws 137 with the outer side of the elastic deformation part 129 being held between an annular rubber-cover press 135 and the spring base 127. In this respect, as shown in Fig. 18, the screws 137 are fastened to the spring base 127 by use of protrusions 135a respectively protruding downward from multiple circumferential locations (four circumferential locations in this case) of the rubber-cover press 135 in the outer periphery of the rubber cover 129.

[0069] At this time, the head stopper 131 is located inside the rubber-cover press 135. Thus, the location of the lower end surface of the boss part 113d almost coincides with the location of the lower edge of the through-hole 127a of the spring base 127.

[0070] A cylindrical spring cover 139 is provided above the inner periphery of the spring base 127. The boss part 113d of the head base 113 is inserted in the spring cover 139. As an elastic member, a head spring 141 is set between the spring cover 139 and the boss part 113d. The head spring 141 presses the head base 113 upward in Fig. 17 relative to the spring base 127.

[0071] The lower end portion of the spring cover 139 is inserted in the through-hole 127a of the spring base 127. When the lower end portion of the spring cover 139 is inserted in the through-hole 127a of the spring base 127, a gap 140 is formed between the spring cover 139 and the boss part 113d.

[0072] The foregoing configuration enables the second head unit 7 to move in a direction at a right angle to the spring base 127 serving as the base to which the second head unit 7 is attached (upward and downward directions in Fig. 17), and to swing relative to the center axis extending in the direction at the right angle.

[0073] For the purpose of allowing the second head unit 7 to swing easily, the lower surface of the head base 113 is formed as a convex curved surface 113e. In response to this, a surface portion, facing the head base 113, of the second head ring 74 is formed as a concave curved surface 74a.

[0074] A material for the spring cover 139 and the rubber cover 129 is any one of an ethylene-propylene-diene monomer (EPDM) rubber, a nitrile-butadien rubber (NBR) and a silicone rubber. In addition, like the probe head spring 83, the head spring 141 is made of an elastic material such as SWPA, SWPB, SUS304 and SUS 304WPB. The inner diameter of the head spring 141 is approximately 16.0 mm.

[0075] Load which the head spring 141 applies to the second probe head 13 when the contact surface 13a of the second probe head 13 is brought into intimate contact with the skin may be approximately 5.0N. It is desirable that the load be 2.0N to 4.0N, and more preferably, 2.5N to 3.0N. The attachment load of the head spring 141 may be approximately 0.5N to 2.0N. It is desirable that the attachment load be 1.0N to 1.5N. Furthermore, the amount of movement (the amount of float) of the second probe head 13 when pressed against the skin may be 1.0 mm to 7.0 mm. It is desirable that the amount of movement be 2.0 mm to 6.0 mm, and more preferably, 3.0 mm to 5.0 mm.

[0076] Fig. 21 corresponds to Fig. 17 and shows how the second head unit 7 comes closer to the spring base 127 with the head spring 141 being deformed when the second probe head 13 is pressed against the skin. Fig. 22 corresponds to Fig. 17 and shows how the second head unit 7 tilts relative to the spring base 127 while swinging. Note that Fig. 22 is a cross-sectional view viewed at an angle different from an angle at which the second head unit 7 is viewed in Fig. 17.

[0077] A motor mounting part 131b in which a vibration motor 143 is mounted is provided to the undersurface of the plate-shaped part 131a of the head stopper 131. A base board 125 is attached to the motor mounting part 131b by use of screws 145. At this time, the vibration motor 143 is held between the base board 125 arranged under the vibration motor 143 and an arced part 131c formed in the motor mounting part 131b. The arced part 131c is shaped like an arc so as to correspond to the external shape of the vibration motor 143.

[0078] Ends of the respective motor lead lines 147 are connected to the vibration motor 143, and the other ends of the respective motor lead lines 147 are connected to the base board 125. In addition, the base board 125 and the main body circuit substrate 35 are connected together by use of lead lines 151.

[0079] The vibration motor 143 is provided with an eccentric balancer 153, and thus plays a function of generating vibrations throughout the second head unit 7. It is desirable that the appropriate number of revolutions of the vibration motor 143 be 4400 rpm to 7000 rpm, and more preferably, approximately 5700 rpm.

[0080] Fig. 23 is a cross-sectional view corresponding to Fig. 17, and shows a case where, as the elastic member, a hollow ring 155 is provided instead of the head spring 141. The hollow ring 155 is made of an elastic resin such as urethane.

[0081] Specifically, in this case, instead of the head spring 141 and the spring cover 139, the hollow ring 155 which is cylindrical in shape is provided. The rest of the configuration shown in Fig. 23 is identical with that shown in Fig. 17. Alternatively, as the elastic member, an air suspension may be used instead of the head spring 141.

[0082] Use of the hollow ring 155 makes it possible to reduce the number of parts, as compared with a case where the head spring 141 is used. Accordingly, a simple configuration is achieved. Like the material for the rubber cover 129, the material for the hollow ring 155 is any one of EPDM, NBR and the silicone rubber.

[0083] Moreover, in exchange for eliminating the spring cover 139 shown in Fig. 17, the following alternative measures may be taken. That is, at least any one of the convex curved surface 113e of the head base 113 and the concave curved surface 74a of the second head ring 74 may be attached with an elastic body such as a rubber and an elastomer, may be integrally molded of an elastic body such as a resin, or may be coated with a

rubber or urethane.

[0084] Next, descriptions will be provided for an operating mode of the ultrasonic cosmetic device having the above-described configuration. First of all, when the switch 15 shown in Fig. 2 is pressed once, the LED 21 lights so as to indicate that the main body power supply is turned on. Then, the first ultrasonic vibrator 75 in the first head unit 5 designed to be capable of offering a skin care to the nose starts to generate ultrasonic vibrations, and thus transmits the ultrasonic vibrations to the first probe head 9.

[0085] When five minutes have passed after the switch 15 is pressed once, the main body power supply is automatically turned off. Meanwhile, when the switch 15 is pressed once again within five minutes, the first probe head 9 which has been in operation stops generating the ultrasonic vibrations. Instead, the second ultrasonic vibrator 107 in the second head unit 7 designed to be capable of offering a skin care to the face starts to generate ultrasonic vibrations, and thus transmits the ultrasonic vibrations to the second probe head 13. Simultaneously, the vibration motor 143 also starts to operate. At this time, the LED 23 is turned on, and the LED 21 is turned off.

[0086] The main body power supply is automatically turned off when 6 minutes have passed in this state. When the switch 15 is pressed once again within 6 minutes, the vibration motor 143 stops, and only the second ultrasonic vibrator 107 continues operating so that the ultrasonic vibrations of the second probe head 13 continue. At this time, the LED 25 is turned on, and the LED 23 is turned off.

[0087] The main body power supply is turned off and the LED 25 is turned off in any one of the following cases. That is, if the switch 15 is pressed once again in this state, if the second probe head 13 applies no moving load to the skin for 2 minutes and 30 seconds, or if a skin care continues for 10 minutes with the second probe head 13 being pressed against the skin.

[0088] In the ultrasonic cosmetic device, as described above, the operation of the switch 15 provided in the main body unit 1 makes it possible to operate the first head unit 5 and the second head unit 7 selectively.

[0089] Moreover, in the present embodiment, the ultrasonic cosmetic device has the configuration in which, when the first probe head 9 or the second probe head 13 is operated, the single ultrasonic frequency is supplied from the single controlling circuit in the vibrator controlling circuit substrate 36. For this reason, the overall size of the machine can be reduced.

[0090] As shown in Fig. 1, the ultrasonic cosmetic device is shaped like the alphabet Y as a whole. This design allows a user to easily bring the contact surfaces 9a, 13a of the first and second probe head 9, 13 provided in the front end portions of the first and second head units 5, 7 into contact with the skin surface when the user holds the main body unit 1 naturally. Accordingly, the user can use the ultrasonic cosmetic device more easily and conveniently that the T-shape design.

[0091] Next, descriptions will be provided for how the first head unit 5 shown in Fig. 6 operates when used to offer a skincare to the nose. When, as described above, a user presses the switch 15 once with the main body unit 1 being held by the hand, the first probe head 9 starts to generate ultrasonic vibrations. While the first probe head 9 is generating the ultrasonic vibrations, the first head unit 5 is moved closer to, and pressed against, the skin surface of an upper part of the nose (a part almost immediately under the area between the eyebrows). At this time, the cut-out 11a of the attachment 11 is located downward. When an axial press load more than a certain value is applied to the first head unit 5 in this state, the press load is applied to the attachment 11 because the front end 11d of the attachment 11 protrudes forward of the contact surface 9a of the first probe head 9 in the axial direction X. As a result, the attachment 11 retracts in the axial direction X relative to the first probe head 9 against the elastic force of the probe head spring 83. In other words, as the impurity remover, the attachment 11 is capable of moving back and forth between an advanced position as a first position (a position shown in Fig. 6) and a retracted position (a position shown in Fig. 9) relative to the first probe head 9. The retracted position is that in which the attachment 11 is located when the first probe head 9 is pressed against the skin surface against the elastic force of the probe head spring 83. The attachment 11 is biased forward in the axial direction by the probe head spring 83.

[0092] In this respect, a skin contact part of the attachment 11 has a 17.0-mm inner diameter and a 20.00-mm outer diameter. Fig. 9 shows the cross-sectional view of the first head unit 5 in which the attachment 11 retracts 1.5 mm. When the attachment 11 is located in the retracted position, as shown in Fig. 9, the front end 11d of the attachment 11 protrudes forward of the contact surface 9a of the first probe head 9 in the axial direction by a protrusion amount α. While ultrasonic vibrations are being imparted to the first probe head 9, once the attachment 11 and the first probe head 9 contact the skin surface with their condition as shown in Fig. 9, the ultrasonic vibrations of the first probe head 9 can soften plugs in the skin surface and dirt in pores, and thus can push the plugs and dirt out of the skin.

[0093] While the first head unit 5 is moved toward the front end of the nose with the axial direction X of the first probe head 9 being kept almost perpendicular to the skin surface, plugs and pore dirt thus pushed out are wiped off and thereby removed from the skin by the inner peripheral edge of the attachment 11. Because the cut-out 11a is formed in a portion of the attachment 11 and the portion is located forward in the direction in which the attachment 11 is moved, the contact surface 9a of the first probe head 9 can be easily brought into contact with the surface of the nose. On the other hand, the inner peripheral edge to be in contact with the skin surface of the nose is rounded in another part of the attachment 11, and the rounded inner peripheral edge is located back-

ward in the direction. Accordingly, the ultrasonic cosmetic device can offer a skincare to the nose with a reduced risk of damaging the skin, and simultaneously can offer an effect of tightening open pores through the ultrasonic vibration after removing the plugs and dirt.

[0094] In addition, because the attachment 11 is ring-shaped when viewed in the axial direction, even if the direction in which the attachment 11 is moved is changed, the ultrasonic cosmetic device continues offering the skincare with no difference. Furthermore, being detachable, the attachment 11 can be washed separately from any other component part with water when detached from the first head unit 5. This increases the cleanability of the attachment 11, and thus enables the attachment 11 to be used in a clean condition.

[0095] It is desirable that the retraction stroke (the float amount) of the attachment 11 be approximately 2.0 mm at maximum when the attachment 11 is pressed against the skin. When, as shown in Fig. 9, the attachment 11 retracts back to its maximum retraction position, an abutment part P of the inner surface of the attachment 11 abuts on the front end of the probe cover 77 (the front extremity of the probe cover 77 in the axial direction X). Furthermore, the protrusion amount α by which the attachment 11 protrudes forward of the contact surface 9a of the first probe head 9 when in use should desirably be not less than 0.3 mm, and more preferably, should be 0.5 mm.

[0096] If the float amount exceeds 2.0 mm, the stroke which the attachment 11 makes when pressed against the skin is too large, thereby decreasing the usability. In addition, when the protrusion amount α by which the attachment 11 protrudes forward of the contact surface 9a when in use exceeds 0.5 mm, the larger protrusion amount makes it hard for the first probe head 9 to contact the skin.

[0097] Moreover, the desirable press load of the attachment 11 should be 0.686N to 1.078N, and more preferably, should be 0.784N to 0.98N.

[0098] The attachment 11 has the structure in which the probe head spring 83 makes the attachment 11 capable of floating in the first head unit 5. Instead, the attachment 11 may have a structure in which the attachment 11 is fixed in the first head unit 5. In addition, the attachment 11 is not limited to being ring-shaped, but may be plate-shaped.

[0099] Next, descriptions will be provided for how the second head unit 7 shown in Fig. 17 operates when used to offer a skincare to the face. As described above, when the switch 15 is pressed once again while the first head unit 5 is in operation, the second probe head 13 starts to generate ultrasonic vibrations. Simultaneously, the vibration motor 143 starts to operate, and thereby activates the vibration function. In this state, the second head unit 7 is moved closer to, and pressed against, the cheek of the face, for example.

[0100] The ultrasonic vibrations of the second probe head 13 and the vibration function of the vibration motor 143 tighten pores, increase blood circulation, stimulate skin cells to produce collagen, thus make the skin firmer, and thereby make the pores less visible.

[0101] When a press load more than a certain value is applied to the second probe head 13 by pressing the second probe head 13 against the skin, the head spring 141 deforms, and thus the second probe head 13 retracts, as Fig. 21 shows an example of retraction of the second head unit 7. At this time, the head base 113 retracts together with the second probe head 13, and the boss part 113d of the head base 113 thus causes the rubber cover 129 to deform. Thereby, the head stopper 131 and the vibration motor 143 retract together with the head base 113.

[0102] While the second head unit 7 is moved along the skin surface, as shown in Fig. 22, the component parts which retract together tilt as a whole; accordingly, the contact surface 13a of the second probe head 13 can always be in contact with the skin surface in a natural condition.

[0103] At this time, even if the head base 113 and the spring base 127 interfere with each other, abnormal noises can be prevented from occurring due to this inference. That is because the spring cover 139 made of the elastic body such as EPDM is provided above the inner periphery of the spring base 127, and the spring cover 139 absorbs horizontal vibrations of the vibration motor 143. Accordingly, the second head unit 7 can offer the skincare without giving discomfort such jarring noises to the user.

[0104] In the first head unit 5, as shown in Fig. 6, the first probe head 9 is arranged on the probe base 91 to which the connecting metal fittings 95, 97 are attached. The assembly is covered by the probe cover 77. The probe base 91 and the probe cover 77 are fixed together by use of the screws 93. Thereby, the first probe head 9 is pressed to the probe base 91. By this, the contact piece 95a of the connecting metal fitting 95 and the contact piece 97a of the connecting metal fitting 97 deform, so as to contact the first ultrasonic vibrator 75 and the undersurface of the flange 9d of the first probe head 9, respectively. This maintains a good connecting condition; therefore, an electrical signal can be stably transmitted from the main body circuit substrate 35 to the first ultrasonic vibrator 75.

[0105] In addition, as shown in Fig. 15, the connecting metal fittings 95, 97 are isolated from each other by the cross-shaped insulating rib 91g; the connecting metal fittings 95, 97 can thus be securely avoided contacting each other. For this reason, it is possible to prevent the connecting metal fittings 95, 97 from being short-circuited, and accordingly to prevent troubles such as breakage of the controlling circuit.

[0106] While the first head unit 5 is offering a skin care by use of a fluid such as gel, the O-rings 79, 89 prevent the fluid from entering the first head unit 5 along the first probe head 9 and the attachment 11, and thus make it possible to secure a better condition for the first head unit 5. Furthermore, because the first head unit 5 has

such a water-tight structure, fluids and solids adhered to the first probe head 9 and its surrounding component parts can be washed away with water, and concurrently, the controlling circuit can be prevented from being broken.

[0107] On the other hand, while the second head unit 7 is offering a skin care by use of a fluid such as gel, the O-rings 111, 115 the rubber cover 129 and the O-ring 130 prevent the fluid from entering the second head unit 7 along the second probe head 13 and the head cover 109, and thus make it possible to secure a better condition for the second head unit 7. Furthermore, because the second head unit 7 has such a water-tight structure, fluids and solids adhered to the second probe head 13 and its surrounding component parts can be washed away with water, and concurrently, the controlling circuit can be prevented from being broken.

[0108] While this ultrasonic cosmetic device is offering a skin care by use of a fluid such as gel, the main body O-ring 63, the switch rubber 51 and the lower cover O-ring 57 prevent the fluid from entering the main body along the head cases 65, 67 and the housing 31 which are shown in Fig. 5, and thus make it possible to secure a better condition for the ultrasonic cosmetic device.

[0109] For this reason, also in this case, fluids and solids adhered to the first probe head 9 and the surrounding component parts can be washed away with water, and concurrently, the controlling circuit can be prevented from being broken.

[0110] In the second head unit 7 shown in Fig. 17, the head stopper 131 to which the vibration motor 143 and the base board 125 are attached is fixed to the boss part 113d of the head base 113. Thus, these component parts jointly move back and forth, as well as swing, relative to the spring base 127. This configuration makes it possible to prevent breakage of the motor lead lines 147 with which the vibration motor 143 and the base board 125 are connected together, although the motor lead lines 147 are formed relatively thin.

[0111] The vibration motor 143 and the base board 125 may be electrically connected together with the following alternative structures instead of the motor lead lines 147. In a first structure, connecting metal fittings are respectively provided to the vibration motor 143 and the base board 125, and these connecting metal fittings are brought into contact with each other. In a second structure, a connecting metal fitting is provide to the vibration motor 143 whereas a contact point is formed on the base board 125 by plating, and the connecting metal fitting is brought into contact with the contact point.

[0112] As described above in the embodiment, the ultrasonic cosmetic device according to the present invention includes: the ultrasonic vibrator (75) for generating ultrasonic vibrations; the probe head (9) for transmitting the ultrasonic vibrations generated by the ultrasonic vibrator (75) to the skin surface, the probe head (9) having the contact surface (9a) to be brought into contact with the skin surface when pressed forward in the first direction (X) to the skin surface; and the impurity remover (11) for removing impurities from the skin surface, the impurity remover (11) being provided around the contact surface (9a) of the probe head (9), and including a front end (11d) which protrudes forward of the contact surface (9a) of the probe head (9) in the first direction (X).

[0113] According to the present invention, impurities, such as plugs in pores can be softened by use of the probe head (9) generating ultrasonic vibrations. Then, the impurities thus softened can be wiped off by use of the impurity remover (11) which is moved relative to the skin surface while being pressed against the skin surface. Furthermore, the ultrasonic vibrations of the probe head (9) can provide a pore tightening effect after the impurity removal.

[0114] The impurity remover (11) is attached to the main-body-side member (77) with the elastic member (83) interposed in between. The elastic member (83) biases the impurity remover (11) forward in the first direction (X). The impurity remover (11) is movable back and forth between a first position and a second position relative to the probe head (9). The second position is located backward of the first position in the first direction (X), and the impurity remover (11) is in the second position when the probe head (9) is fully pressed against the skin surface against the forward biasing force of the elastic member (83). When the impurity remover (11) is in the second position, the front end (11d) protrudes forward of the contact surface (9a) of the probe head (9) in the first direction (X).

[0115] According to the present invention, the impurity remover (11) can securely remove impurities from the skin by being pressed against the skin against the elastic member (83).

[0116] Moreover, in the ultrasonic cosmetic device, the front end (11d) of the impurity remover (11) includes a part (11a, 11f) whose distance in the first distance (X) from the contact surface (9a) of the probe head (9) is different from distances of other parts therefrom. For example, the front end (11d) of the impurity remover (11) is formed to have the cut-out (11a) in a part thereof in a circumferential direction thereof. Otherwise, the front end (11d) of the impurity remover (11) is formed to have the inclined front edge (11f) which is inclined with respect to the contact surface (9a) of the probe head (9) .

[0117] According to the present invention, when plugs are to be removed from a projecting part such as the nose, the surface of the probe head (9) can more easily be brought into contact with the surface of the nose by directing, for example, the edge of the cut-out, which is closer to the surface of the probe head (9), to the surface of the projecting front end of the nose.

[0118] Moreover, in the ultrasonic cosmetic device, the impurity remover (11) is detachably attached to the main-body-side member (77).

[0119] According to the present invention, the impurity remover (11) can be detached from the main-body-side member (77) and thus be washed. Accordingly, the

cleanability of the impurity remover can be increased to allow the impurity remover to be always used in a clean condition.

Claims

1. An ultrasonic cosmetic device comprising:

   an ultrasonic vibrator (75) for generating ultrasonic vibrations;
   a probe head (9) for transmitting the ultrasonic vibrations generated by the ultrasonic vibrator (75) to a skin surface, the probe head (9) having a contact surface (9a) to be brought into contact with the skin surface when the probe head (9) is pressed forward in a first direction (X) to the skin surface; and
   an impurity remover (11) provided around the contact surface (9a) of the probe head (9) for removing impurities from the skin surface, the impurity remover (11) having a front end (11d) which protrudes forward of the contact surface (9a) of the probe head (9) in the first direction (X).

2. The ultrasonic cosmetic device according to claim 1, wherein the impurity remover (11) is attached to a main-body-side member (77) with an elastic member (83) interposed in between, the elastic member (83) biases the impurity remover (11) forward in the first direction (X), and
   the impurity remover (11) is movable relative to the probe head (9), between a first position, and a second position located backward in the first direction (X) of the first position, to which the impurity remover (11) moves when the probe head (9) is pressed against the skin surface against a forward biasing force of the elastic member (83), and
   wherein the front end (11d) of the impurity remover (11) protrudes forward of the contact surface (9a) of the probe head (9) in the first direction (X) when the impurity remover (11) is in the second position.

3. The ultrasonic cosmetic device according to any one of claims 1 and 2,
   wherein the front end (11d) of the impurity remover (11) includes a part (11a, 11f) whose distance in the first direction (X) from the contact surface (9a) of the probe head (9) is different from distances of other parts therefrom.

4. The ultrasonic cosmetic device according to claim 3, wherein the front end (11d) of the impurity remover (11) has a cut-out (11a) in a part thereof in a circumferential direction thereof.

5. The ultrasonic cosmetic device according to claim 3, wherein the front end (11d) of the impurity remover (11) has an inclined front edge (11f) which is inclined with respect to the contact surface (9a) of the probe head (9).

6. The ultrasonic cosmetic device according to any one of claims 1 to 5,
   wherein the impurity remover (11) is detachably attached to the main-body-side member (77).

FIG. 1

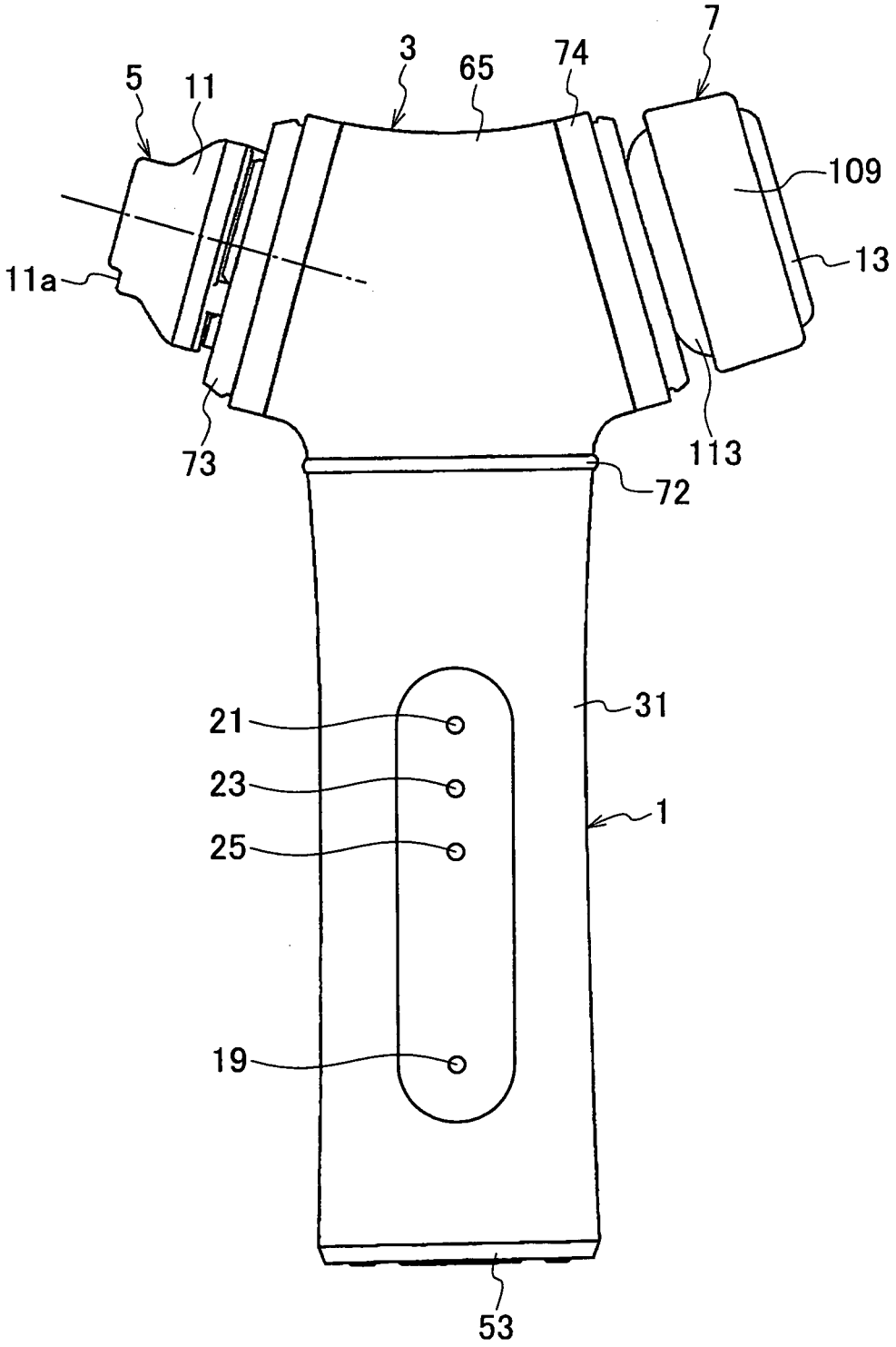


FIG. 2

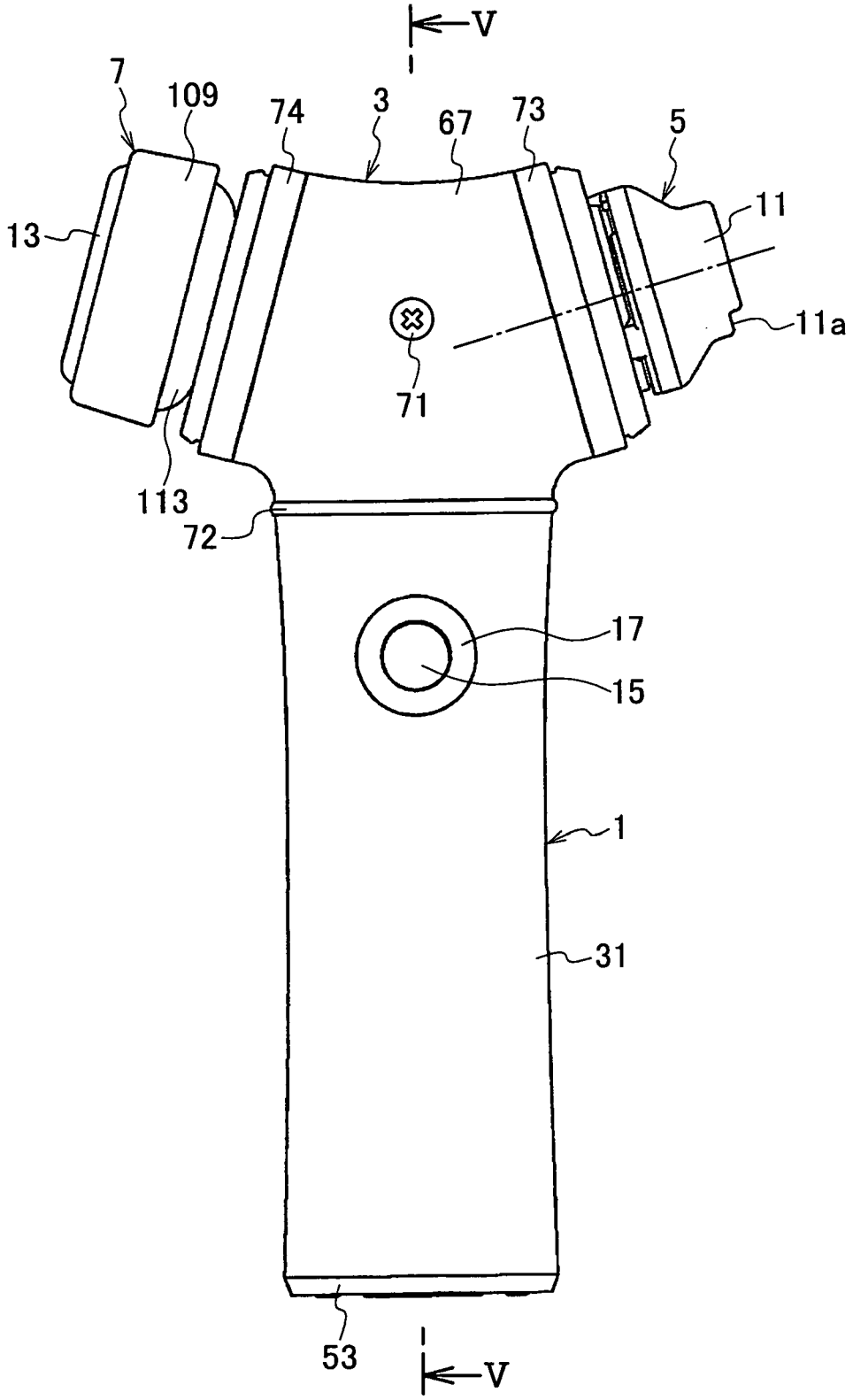


FIG. 3

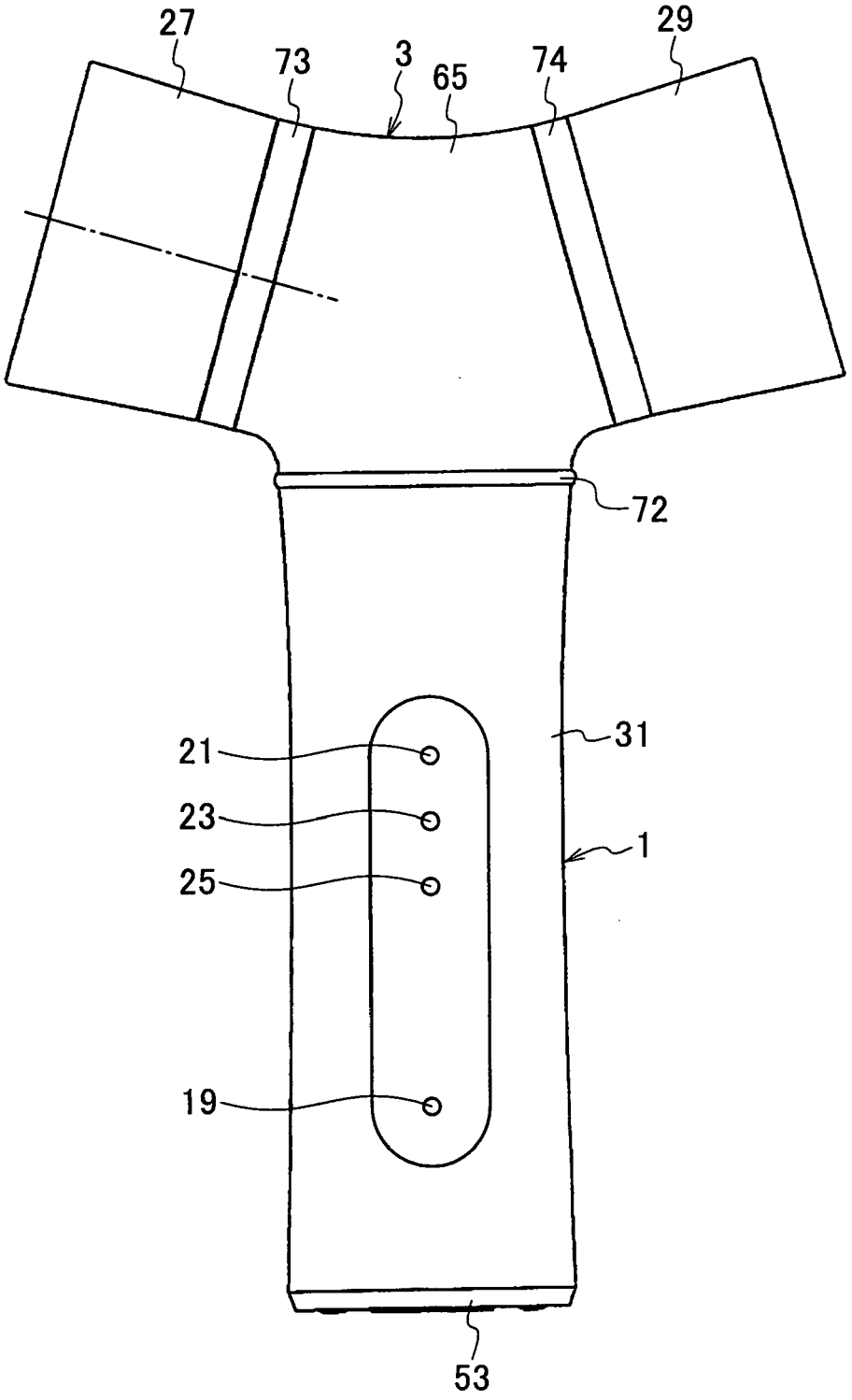
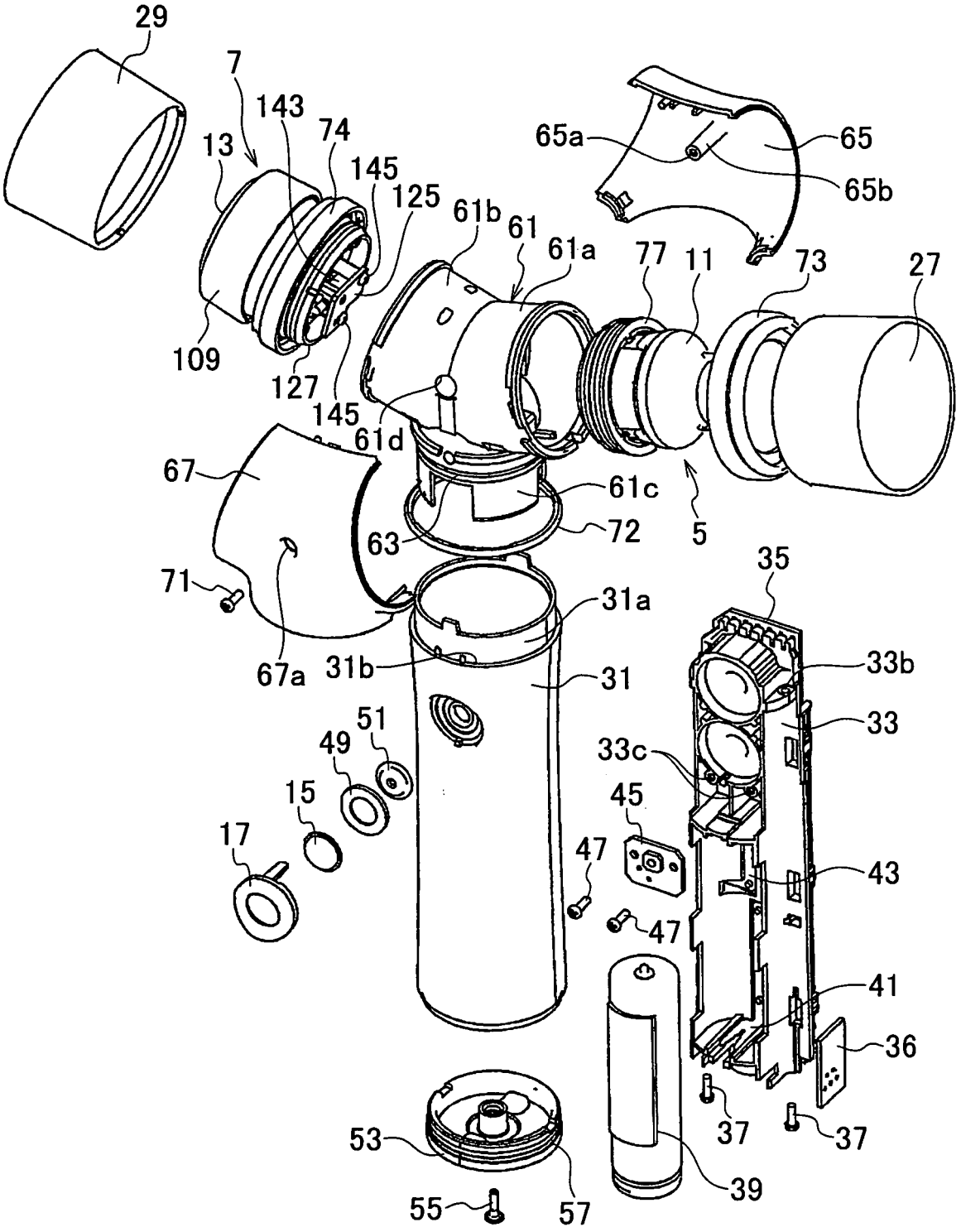


FIG. 4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67a
31b
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33b
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FIG. 5

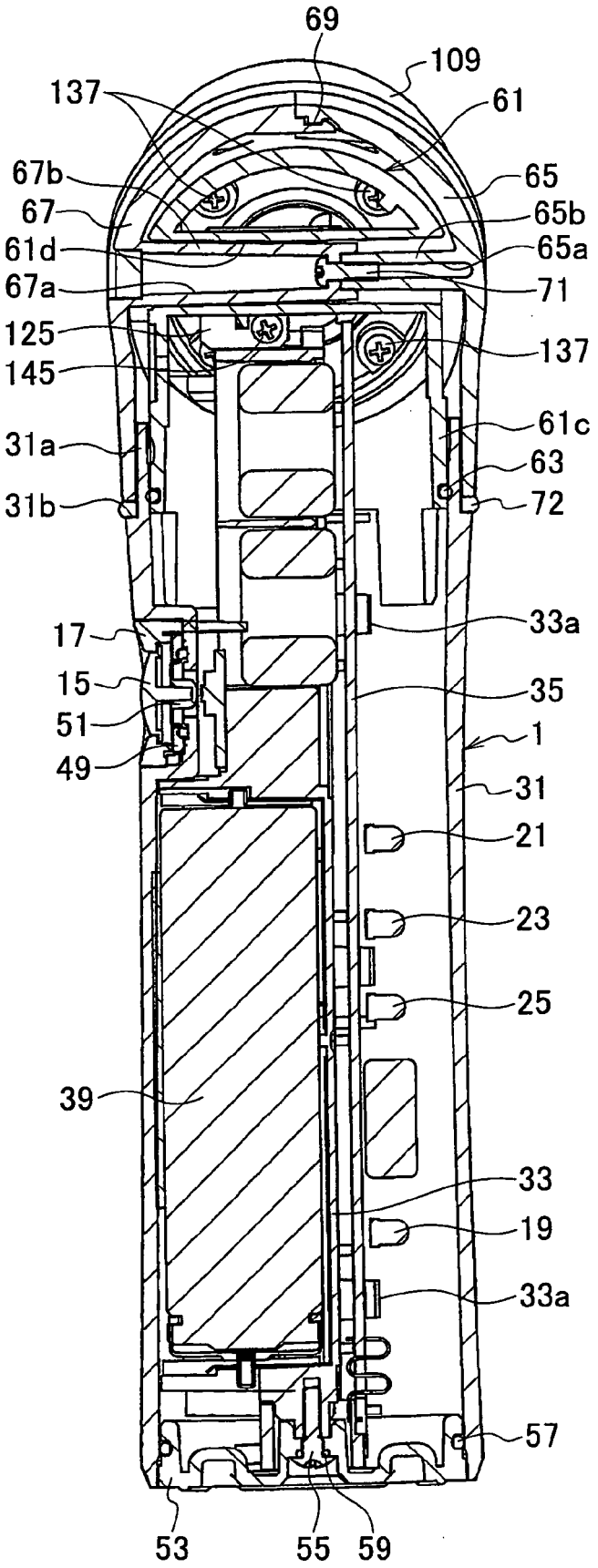
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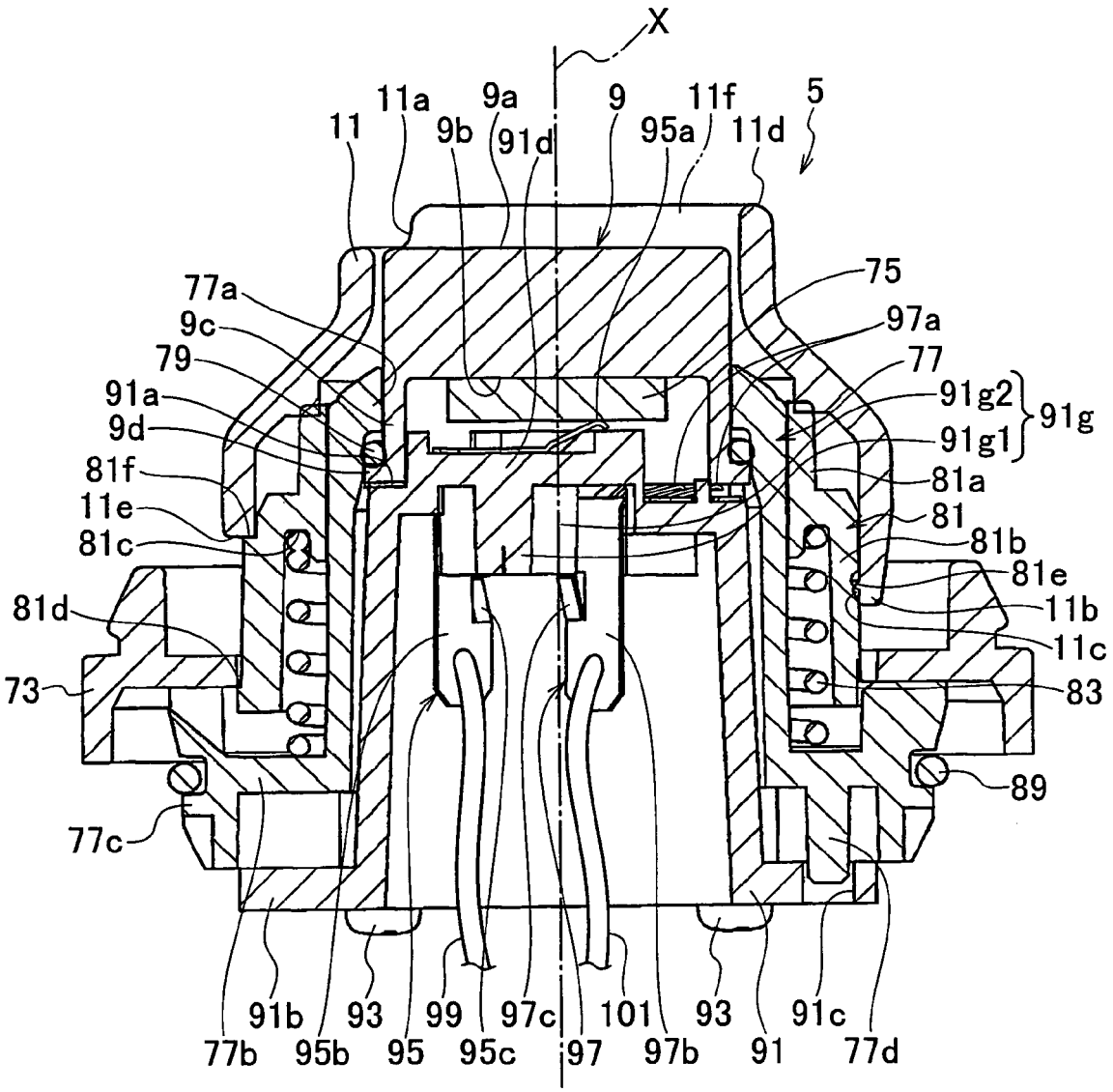
FIG. 6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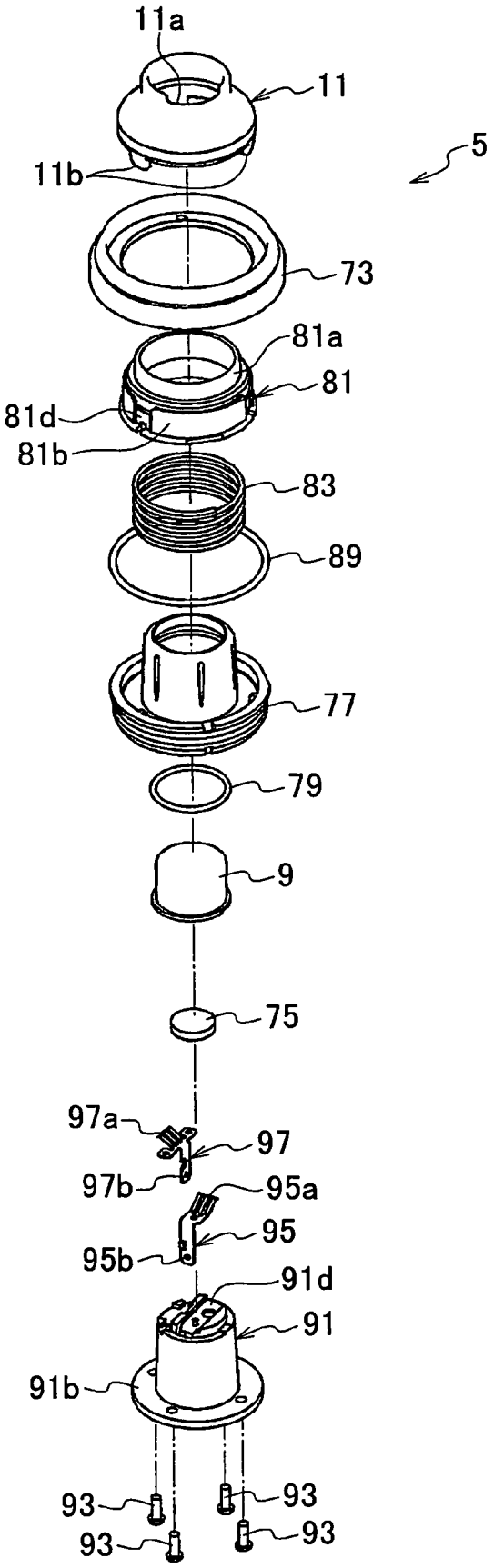
77b
95b
95
95c
97
97b
91
77d

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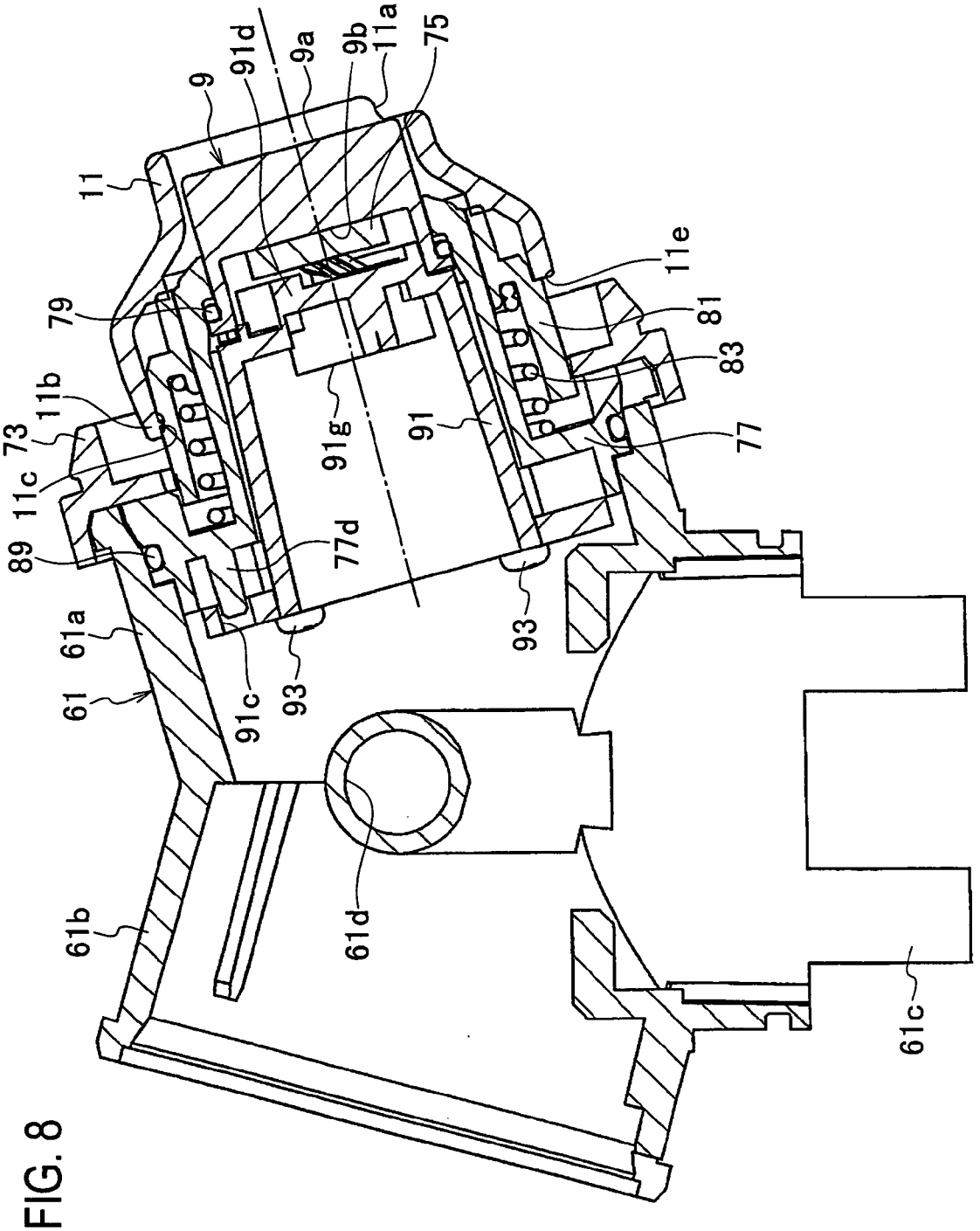
93
93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9b
11a
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11e
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83
11b
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91g
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77d
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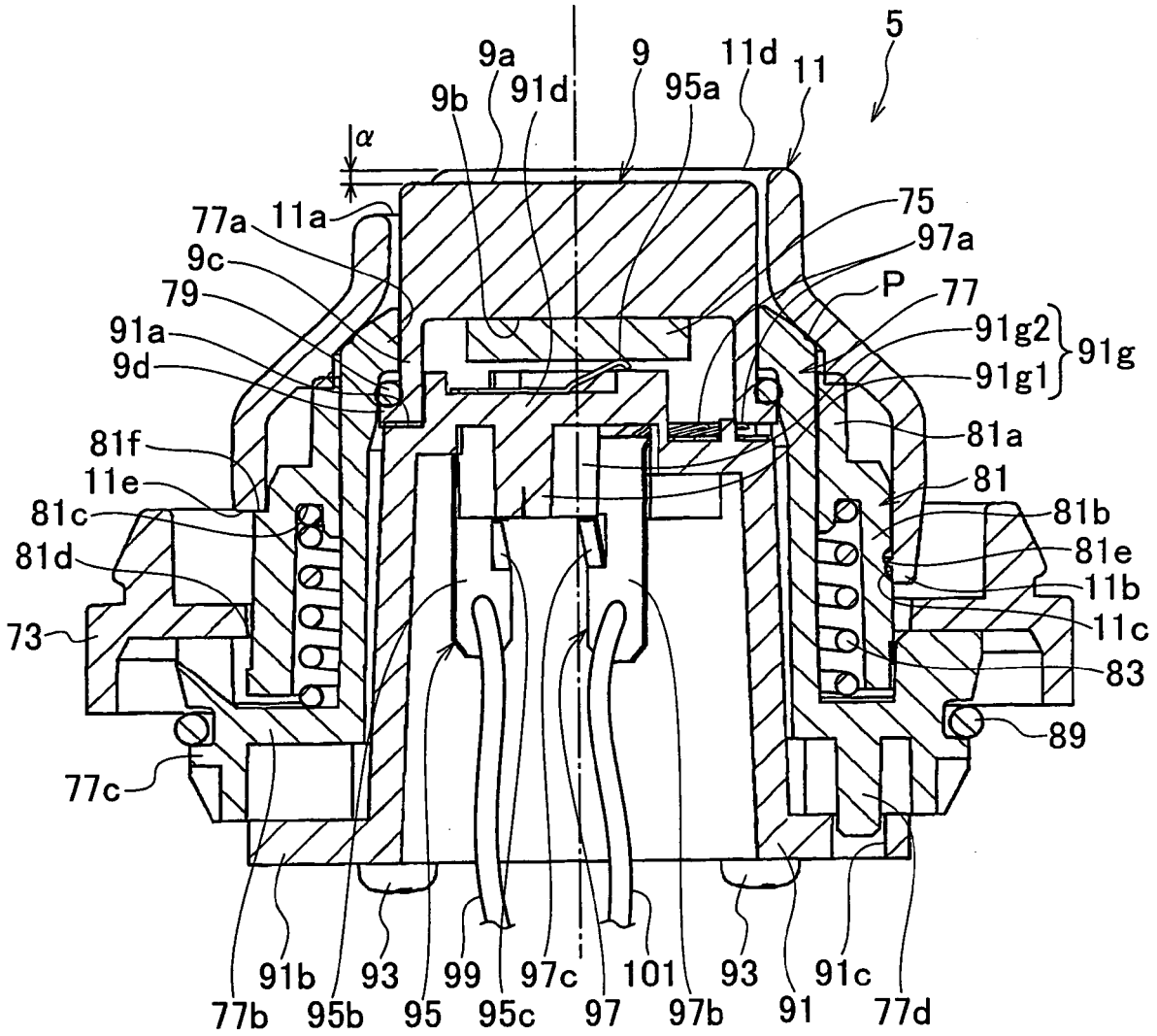
61a
61
91c
93
61d
61b
61c

FIG. 8

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

FIG. 10

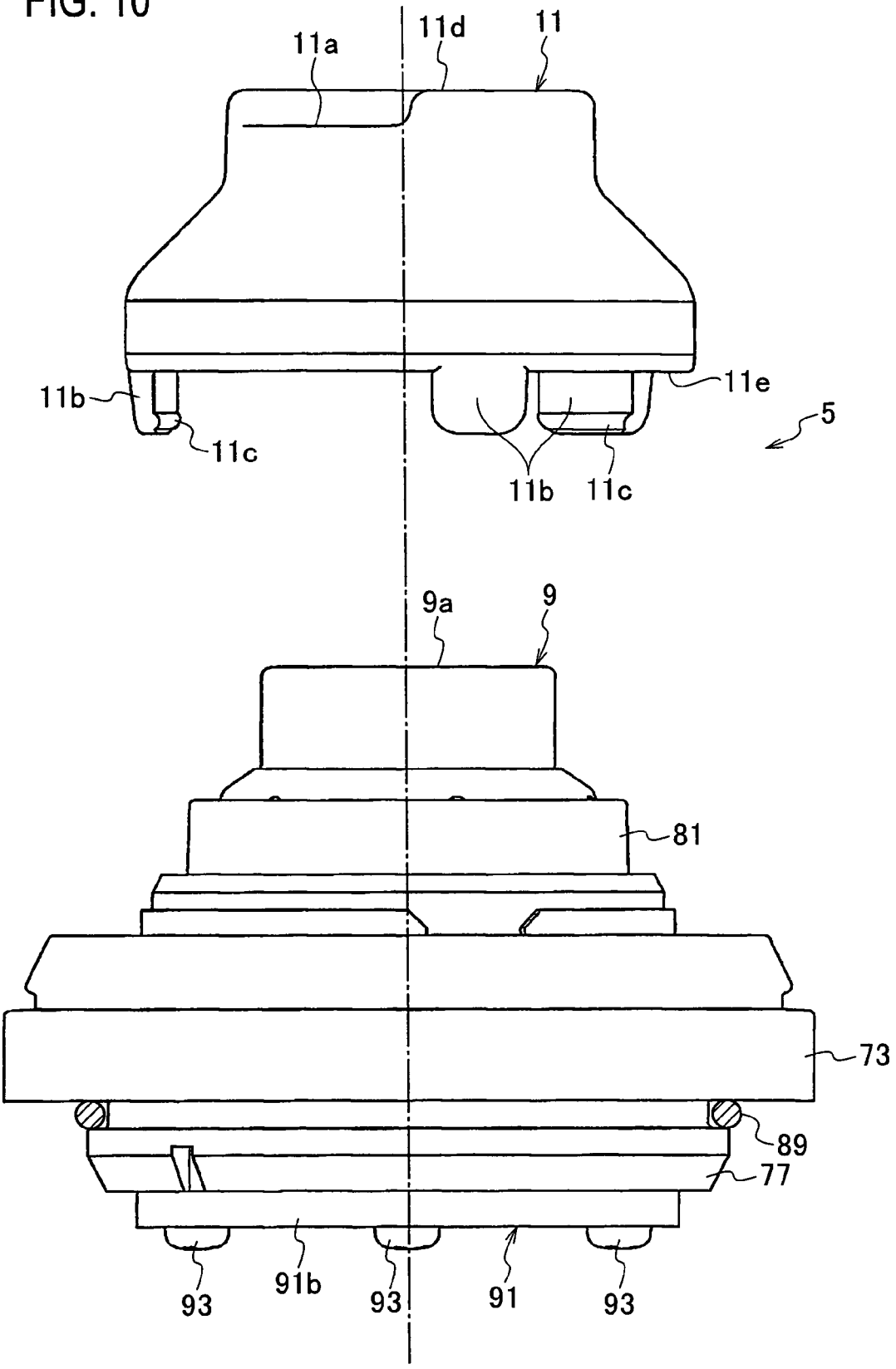


FIG. 11

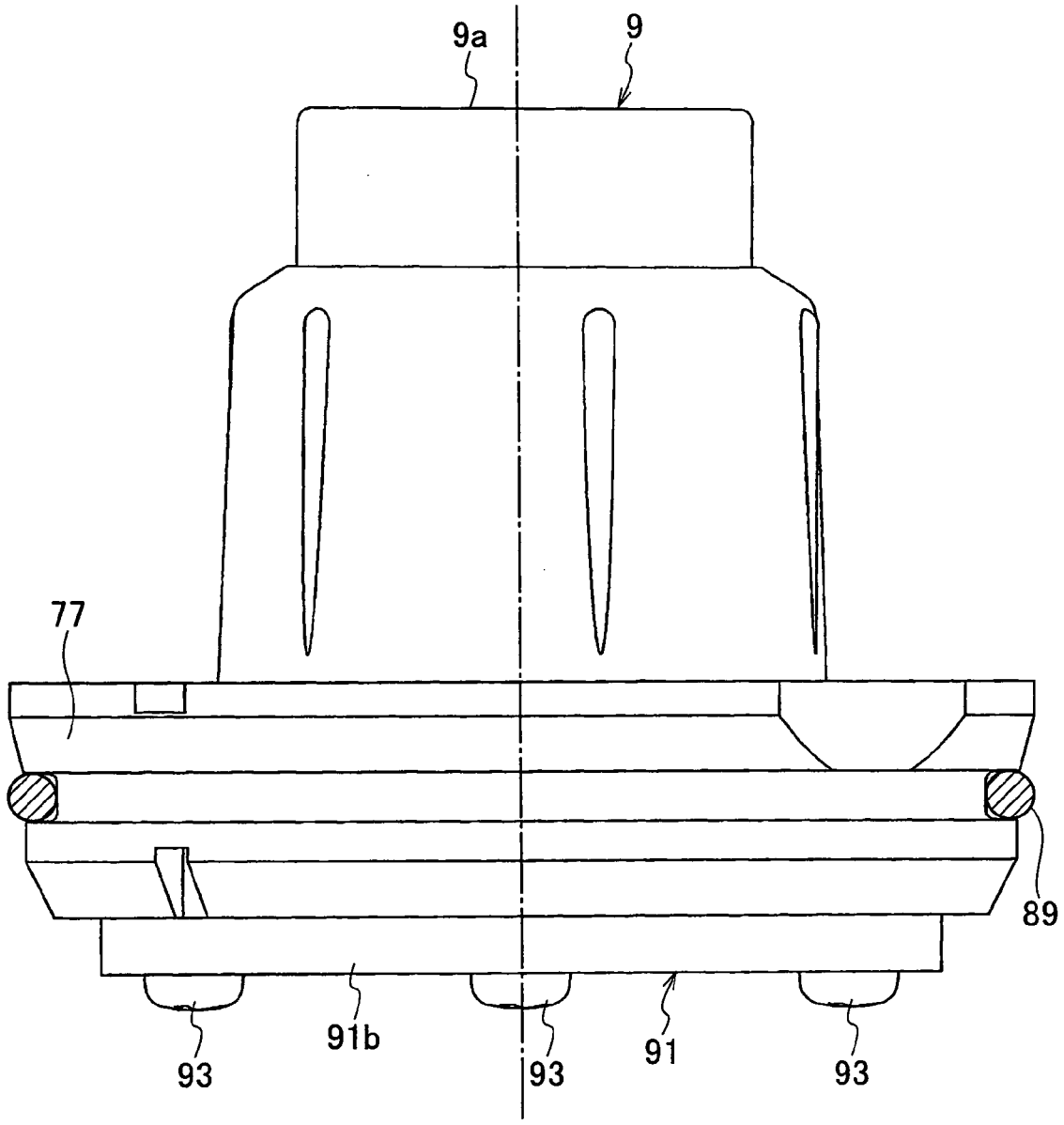
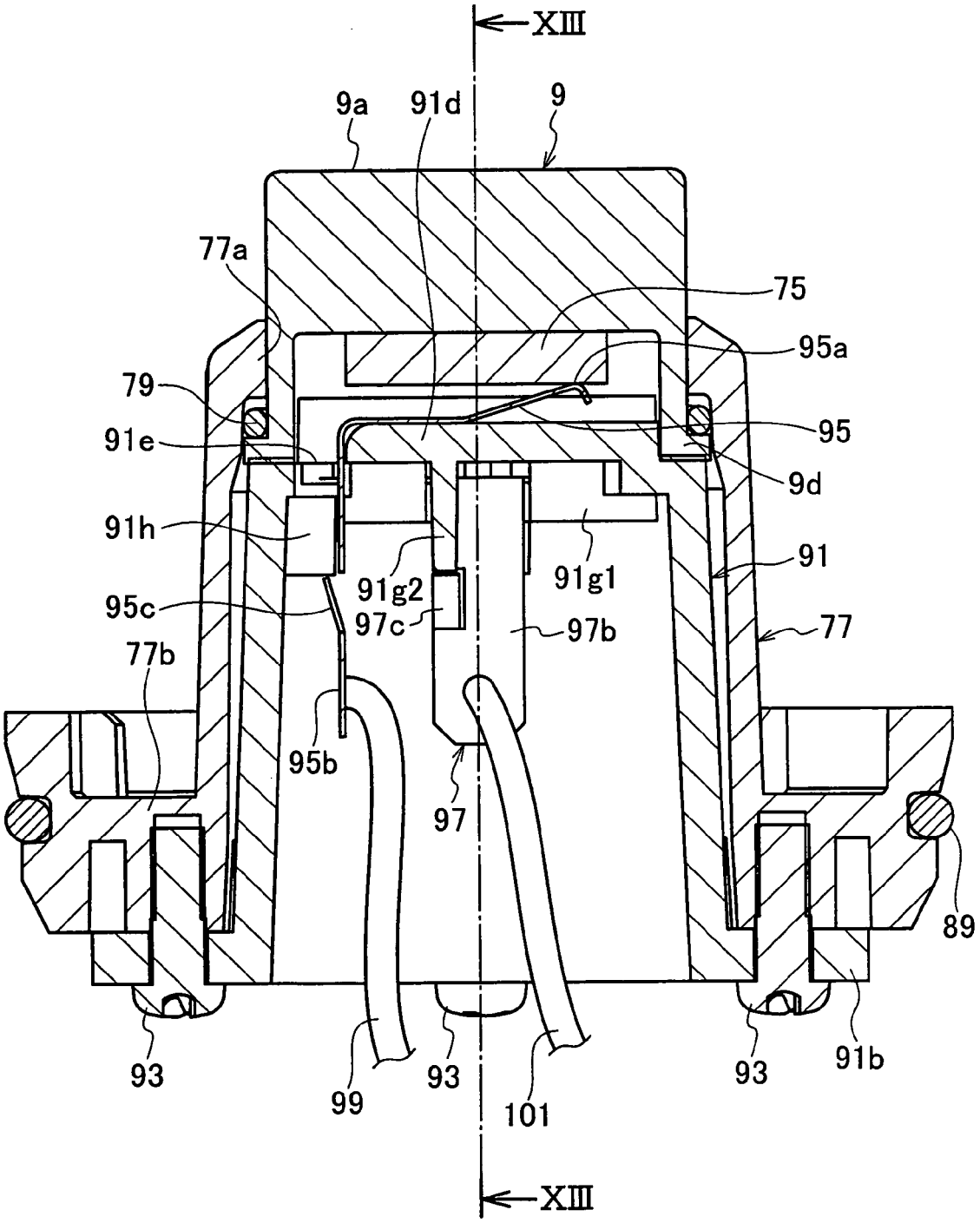


FIG. 12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95a
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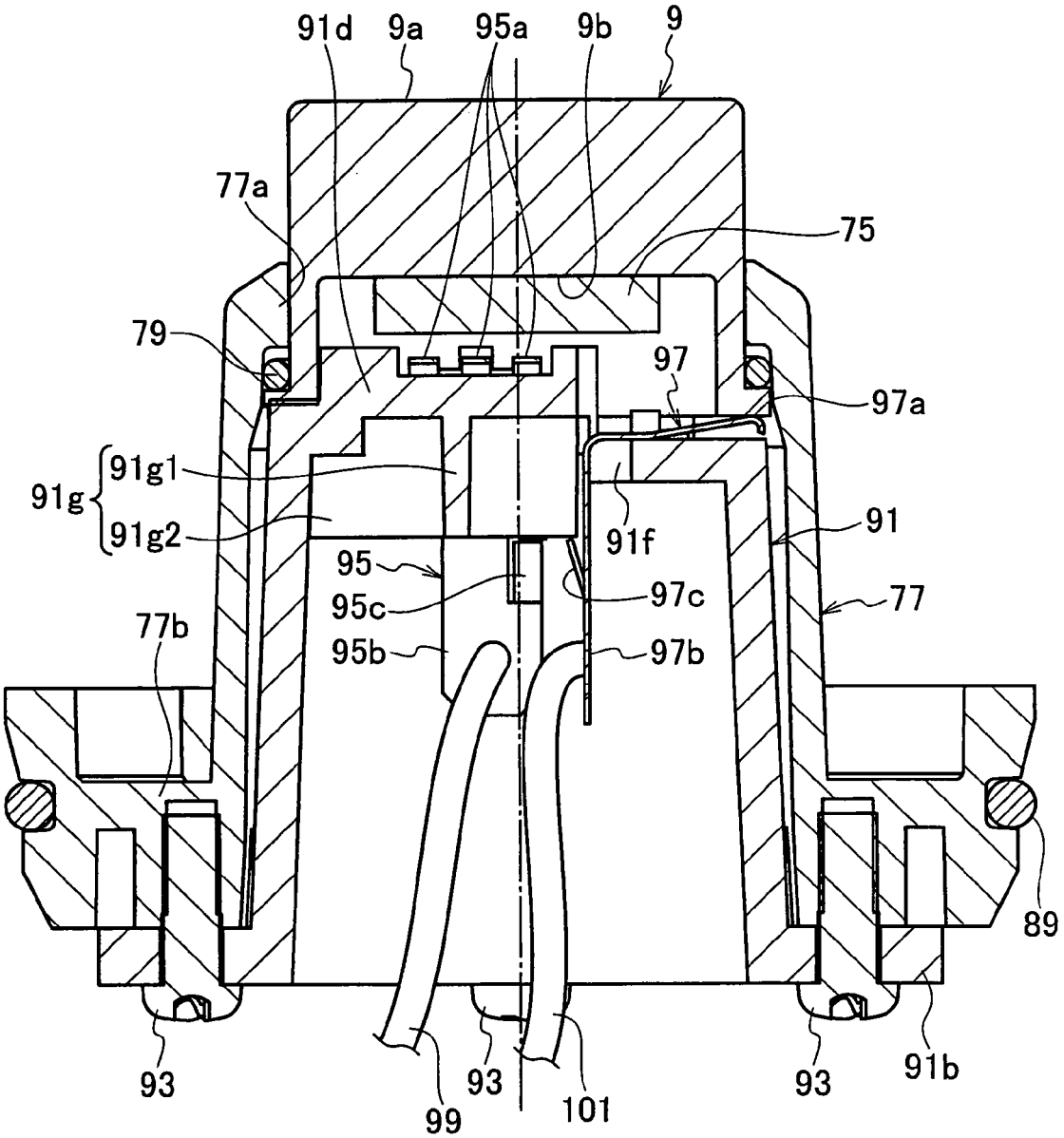
95
91e
9d
91h
91
91g2
91g1
95c
97c
97b
77
77b
95b
97
89
93
99
93
101
93
91b
XIII

FIG. 13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91g
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97c
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77b
95b
97b
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101
93
91b

FIG. 14

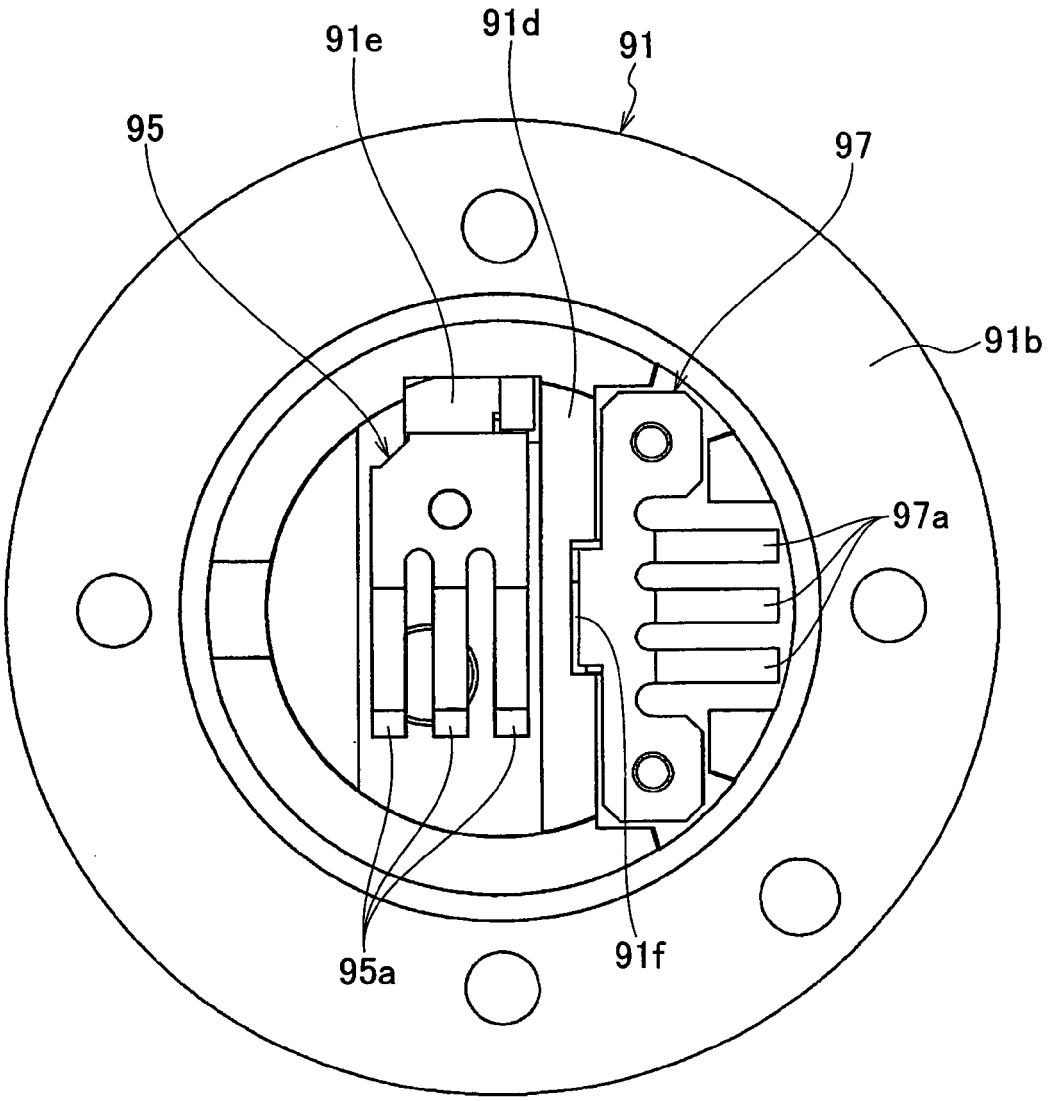


FIG. 15

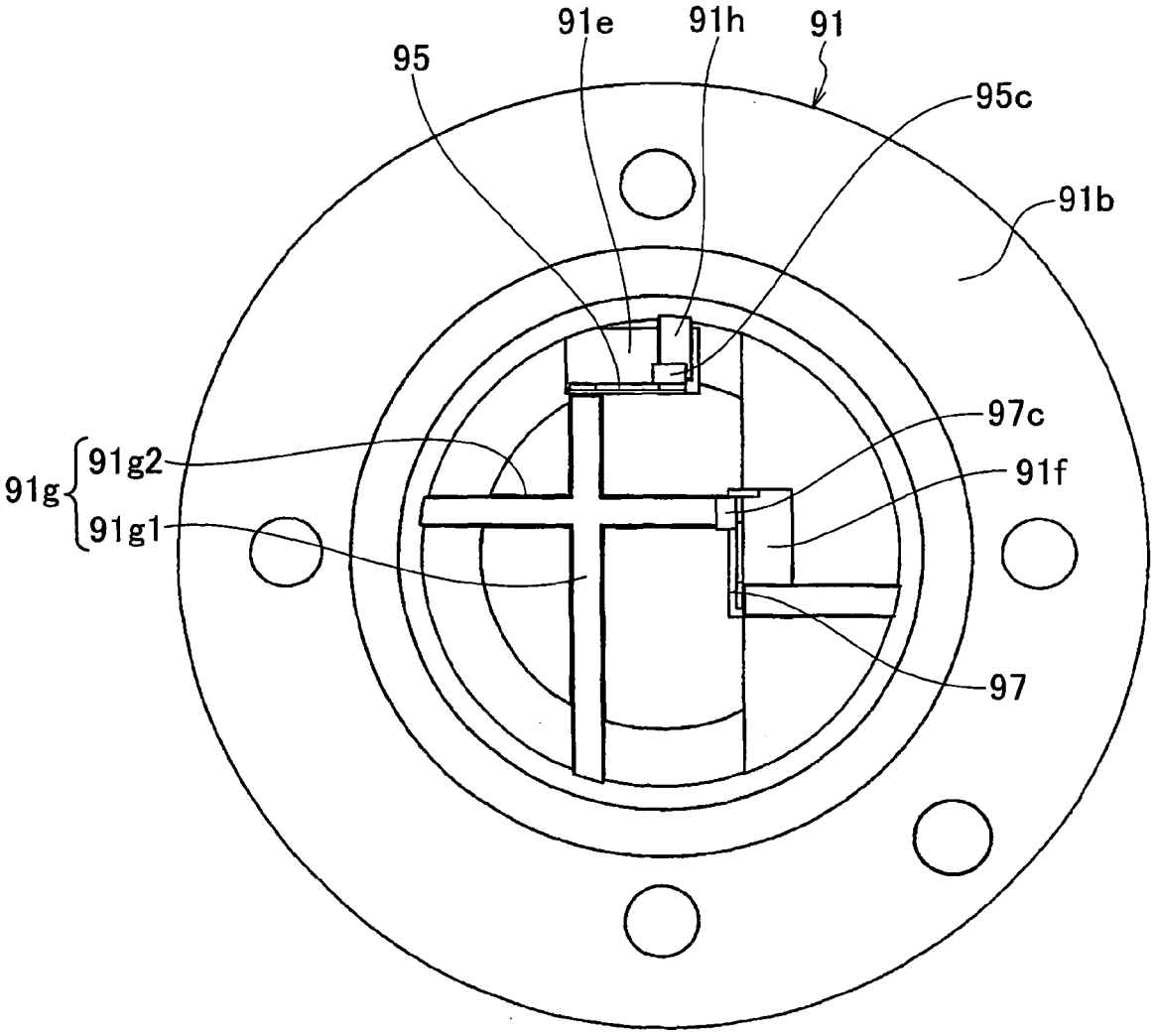


FIG. 16

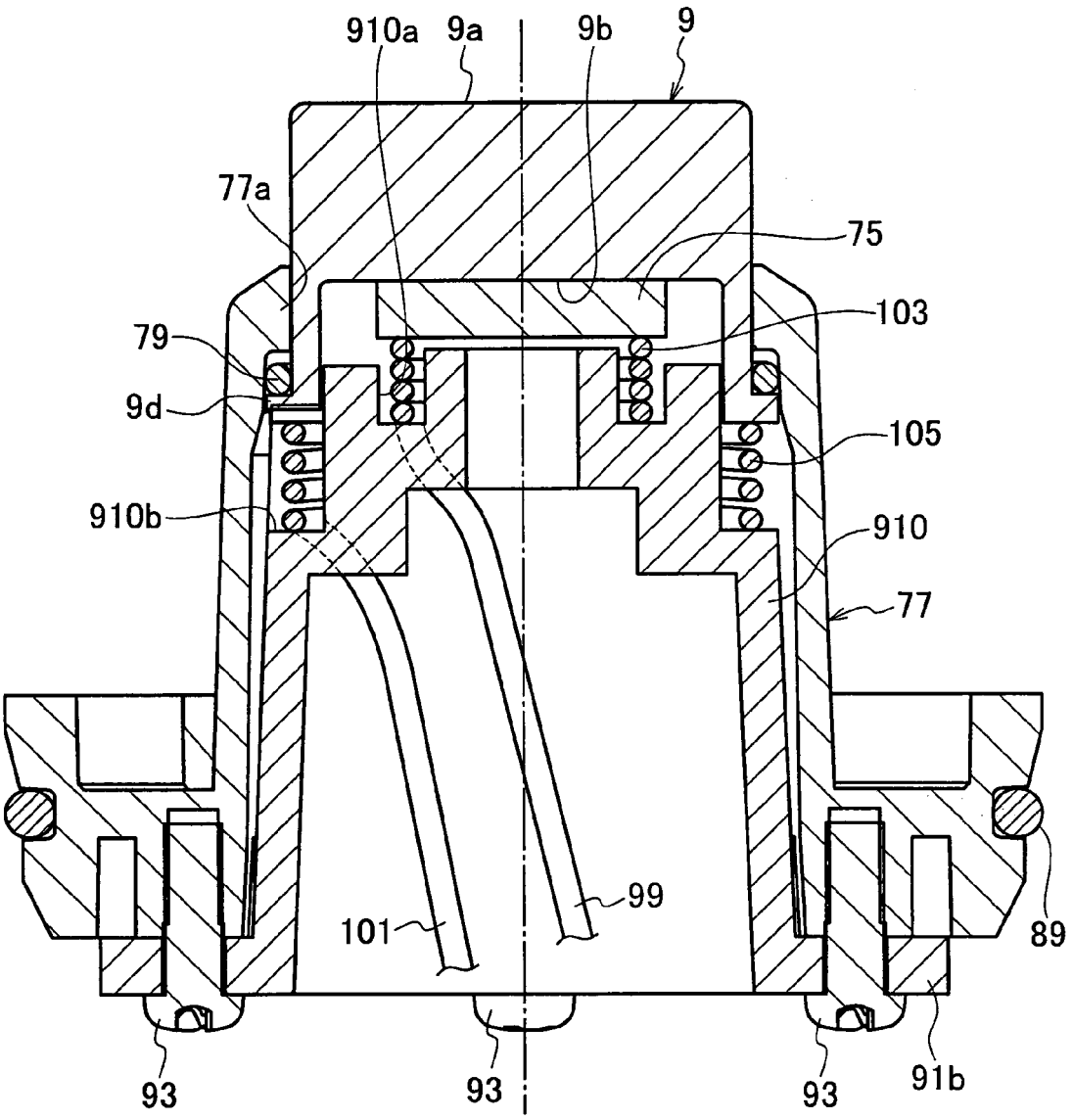
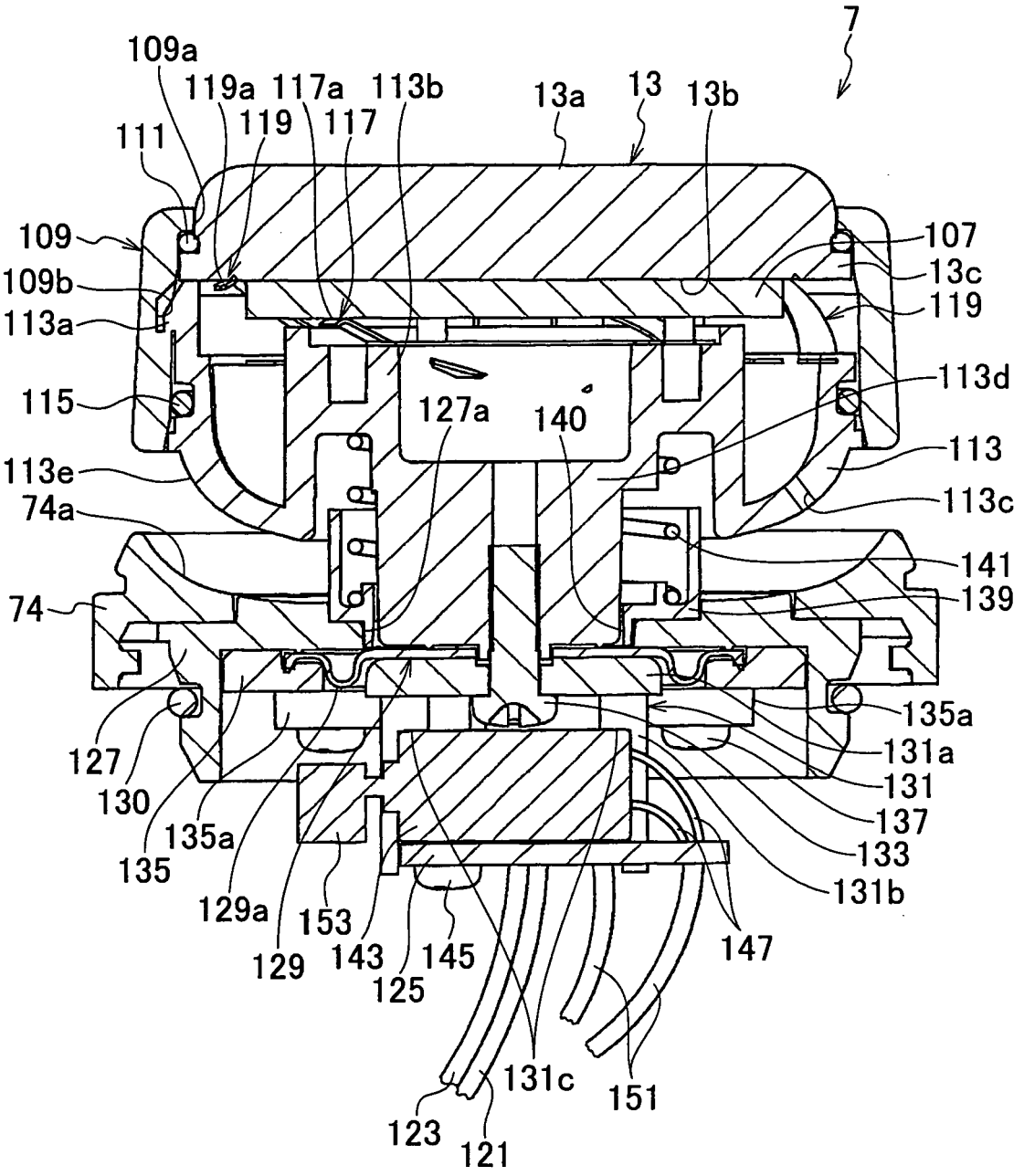


FIG. 17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113d
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127a
140
113
113e
113c
74a
141
74
139
135a
127
131a
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135a
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129a
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131b
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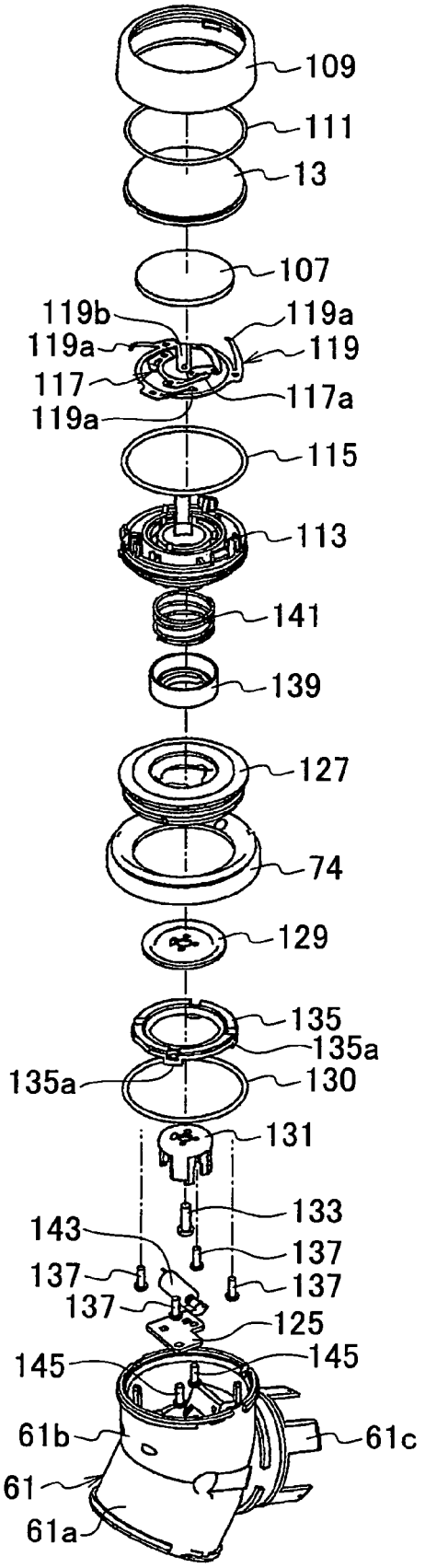
147
125
131c
151
123
121

FIG. 18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61c
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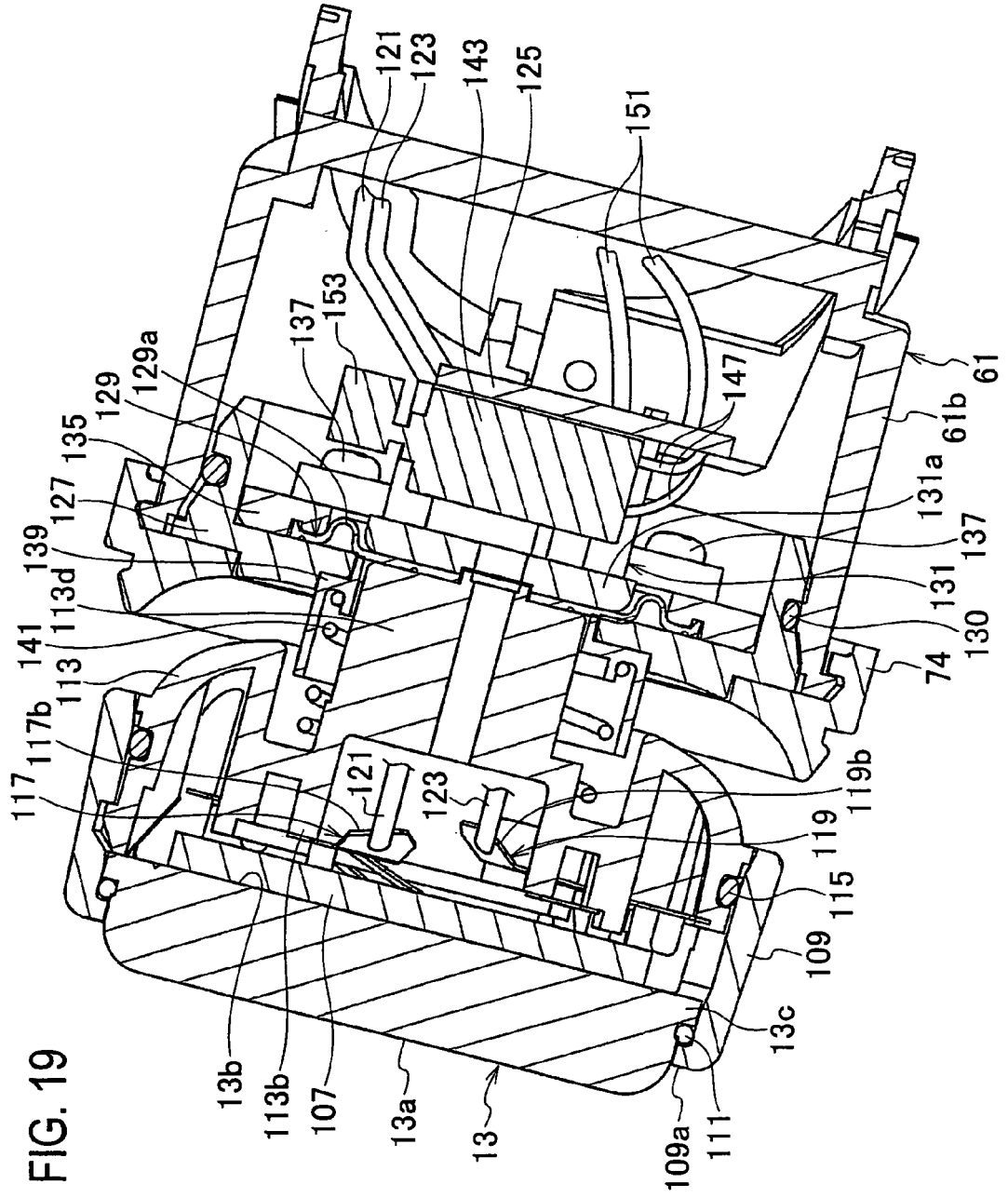
61a

FIG. 19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109a
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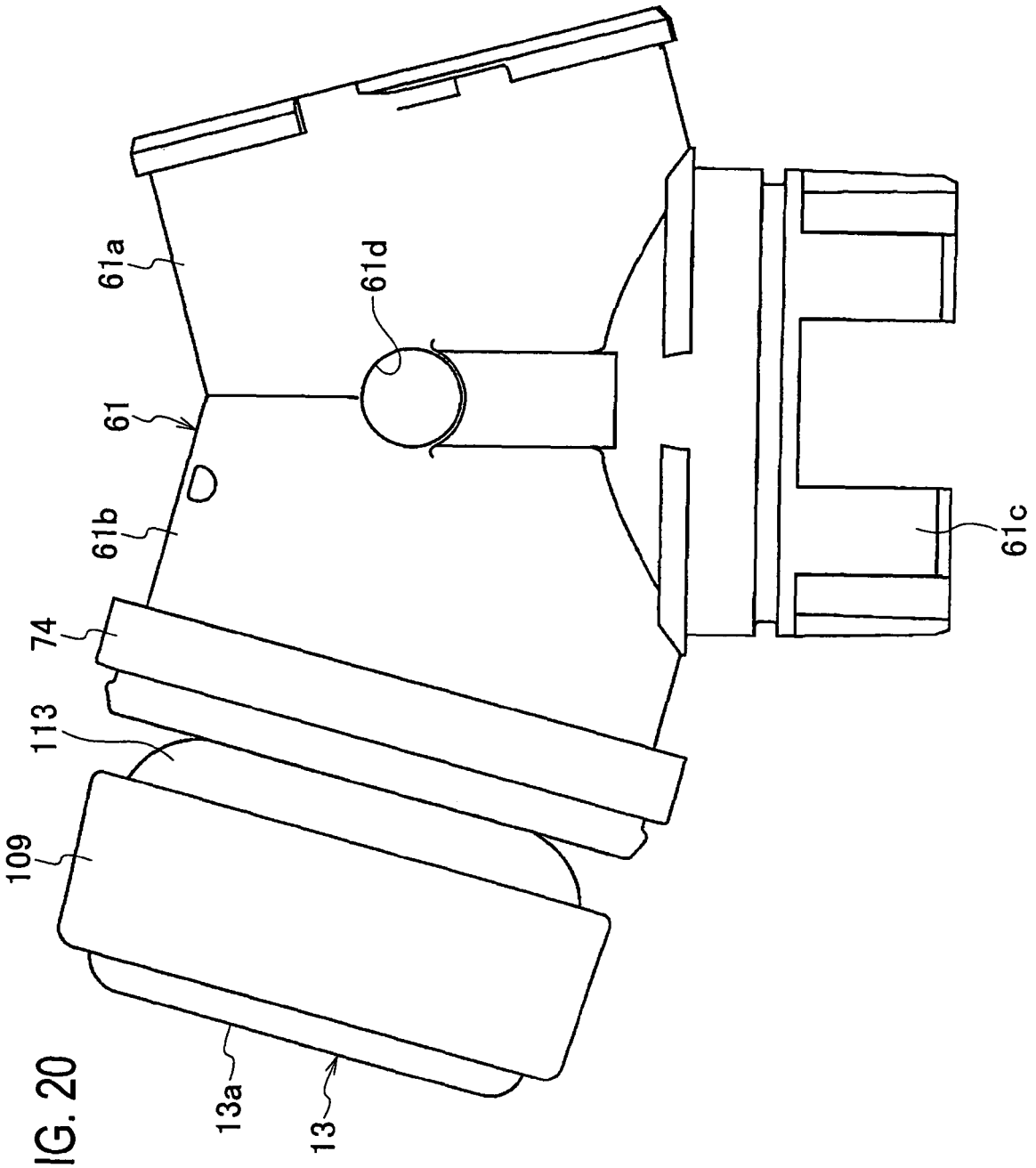

FIG. 20

FIG. 21

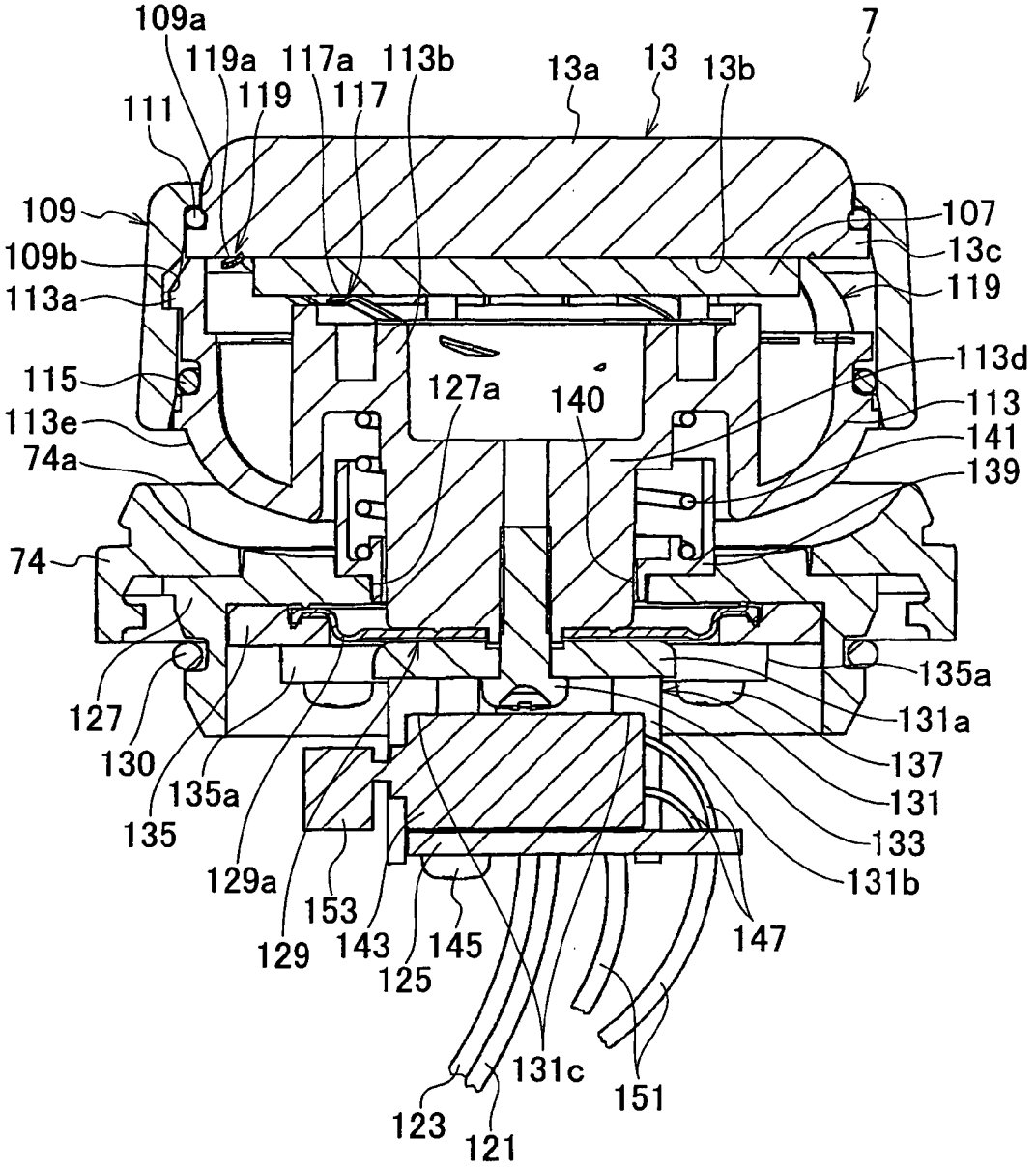
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FIG. 22

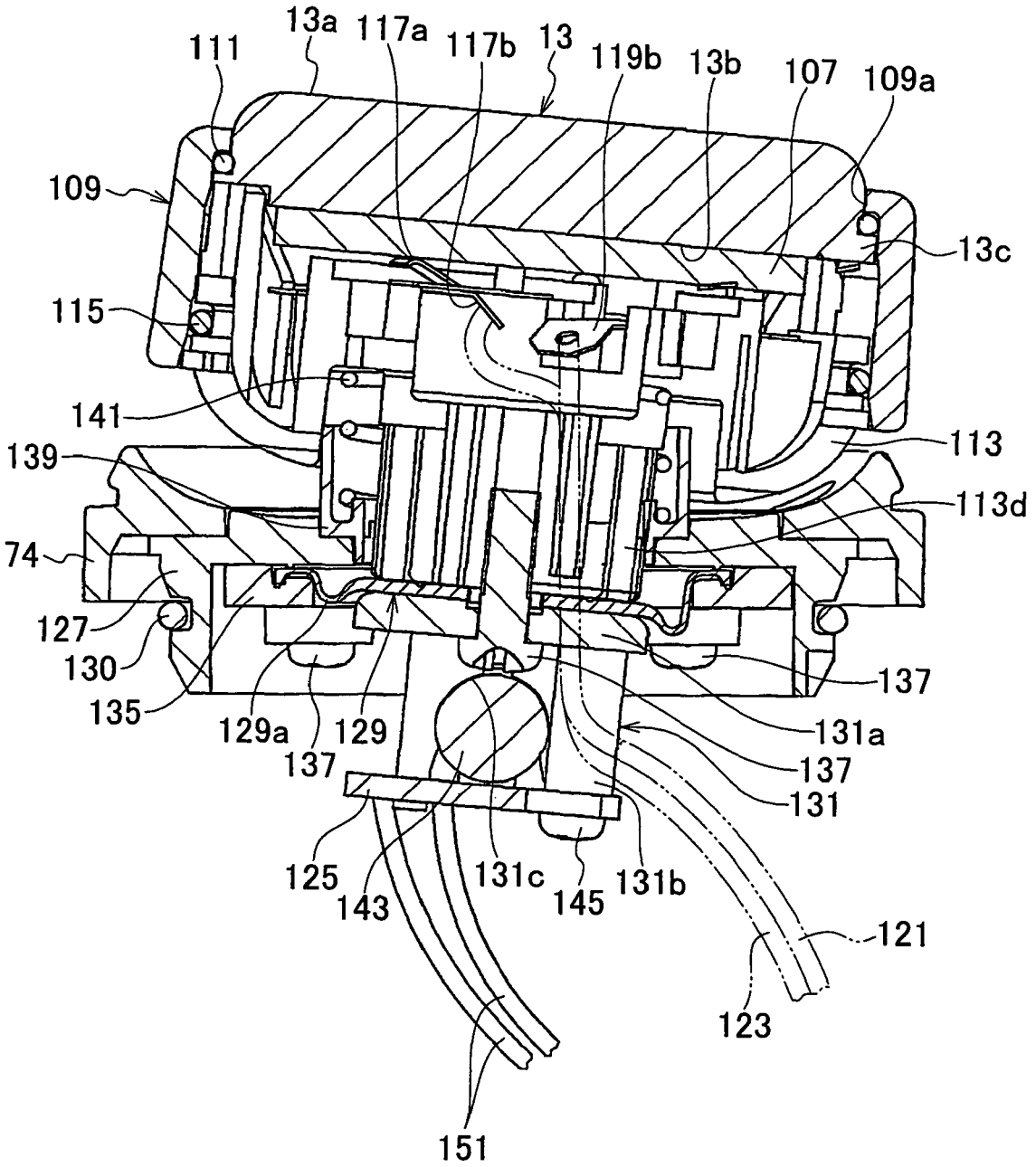
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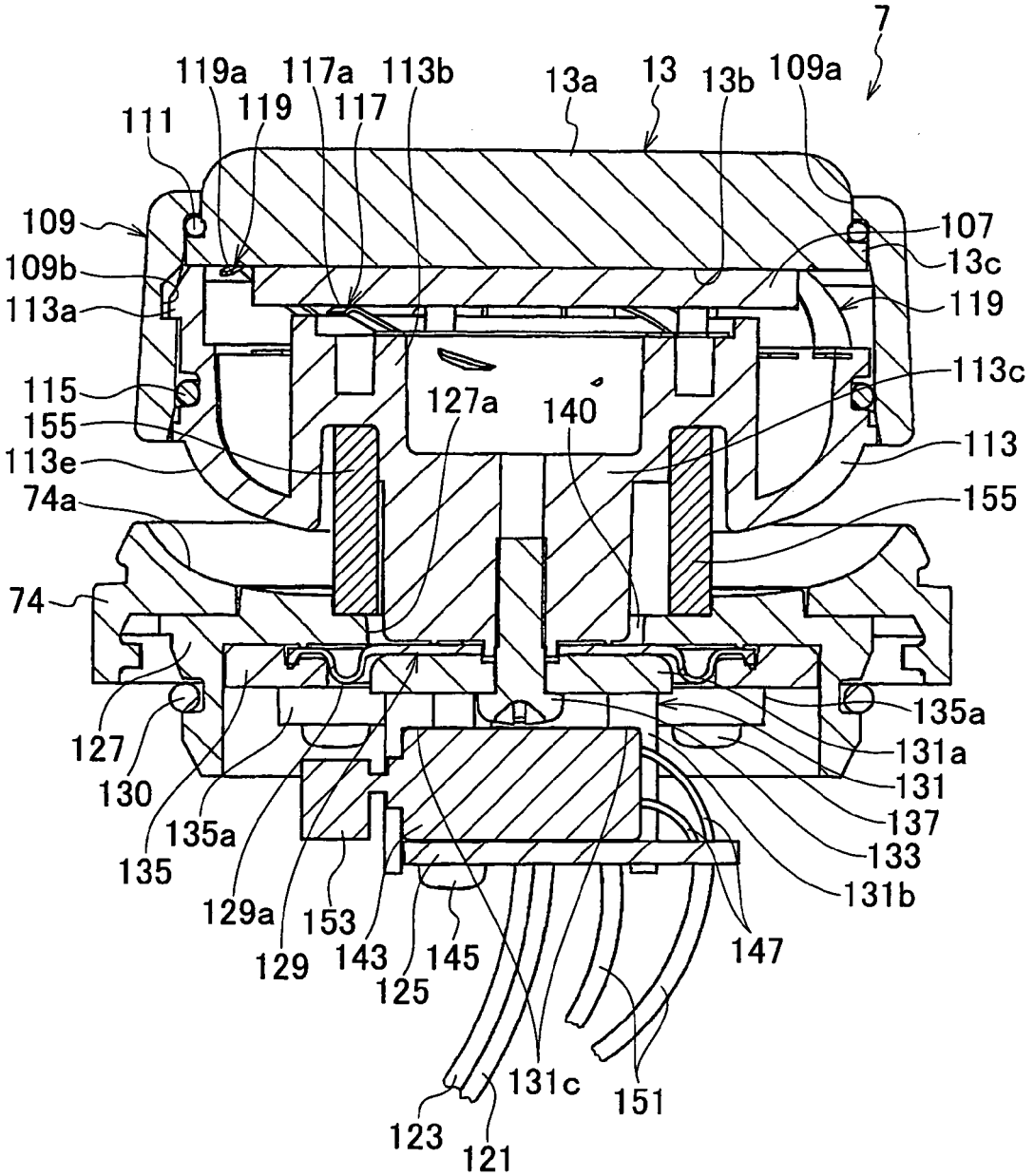
FIG. 23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EUROPEAN SEARCH REPORT

Application Number
EP 08 01 6300

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	WO 2004/087034 A (GEN PROJECT S R L [IT]; NALDONI MORENO [IT]) 14 October 2004 (2004-10-14) * page 14, line 3 - page 15, line 12; figures 4,9-12 *	1-6	INV. A61H7/00 A61H23/02
X	JP 09 206130 A (DAN REN) 12 August 1997 (1997-08-12) * abstract; figures *	1-6	
X	JP 10 263038 A (MATSUSHITA ELECTRIC WORKS LTD) 6 October 1998 (1998-10-06) * paragraph [0022]; figure 10 *	1-6	
X	DE 203 13 648 U1 (KRAUTH PETER GMBH [DE]) 11 December 2003 (2003-12-11) * paragraphs [0008], [0010], [0015], [0022]; figure 1 *	1,3-6	
			TECHNICAL FIELDS SEARCHED (IPC) A61H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 December 2008	Fischer, Elmar

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L : document cited for other reasons

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12-12-2008

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