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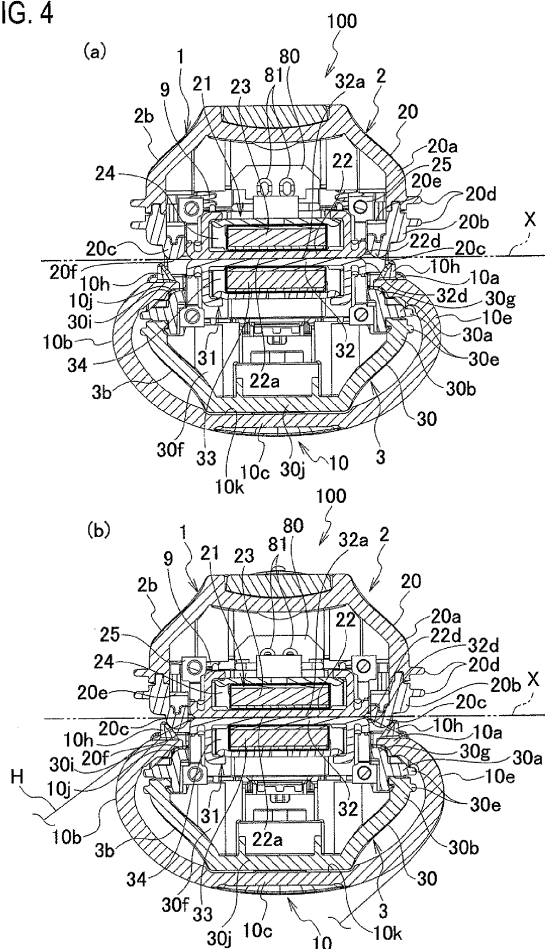
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(54) **Hair iron device**

(57) A hair iron device (100) includes: a hair iron (1) including a first holding portion (2b) having a first hair holding surface (22a) and a second holding portion (3b) having a second hair holding surface (32a) configured to hold hair with the first hair holding surface; and a setting member (10) detachably provided on the second holding portion and configured to style hair. The first holding portion includes a protrusion (20c) configured to guide hair held between the first hair holding surface and the second holding surface toward the second holding portion.

FIG. 4



Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to a hair iron device.

2. DESCRIPTION OF THE RELATED ART

[0002] Japanese Unexamined Patent Application Publication No. 2005-198984 discloses a related hair iron device including: a pair of grips which are openably provided by turnably joining base ends to each other; and heat generators (holding portions) of a flat shape which are provided to be opposed to each other on tip end sides of the respective grips and are provided with curling portions respectively on back sides thereof.

[0003] According to Japanese Unexamined Patent Application Publication No. 2005-198984, the hair is styled with a hair iron device in such a way that the hair iron device is caused to hold the hair between the heat generators (the holding portions) opposed to each other, is turned to press a portion of the hair that is not held between the heat generators against the curling portions, and then is pulled down along the hair.

[0004] Moreover, Japanese Unexamined Patent Application Publication No. 2005-198984 enables a degree of curve in hair curl to be changed by attaching an auxiliary case designed to be detachably attachable to the heat generators (the holding portions) and to have a curved surface with a curvature different from a curvature of the curling portions of the heat generators.

SUMMARY OF THE INVENTION

[0005] In the above-described related art, however, the hair iron device cannot curl the hair only by holding the hair between the heat generators (the holding portions) because the heat generators are formed in the flat shape, and thereby may fail to set the hair into a desired style.

[0006] An object of the present invention is to provide a hair iron device which is capable of more certainly setting the hair into a desired style.

[0007] An aspect of the present invention is a hair iron device comprising: a hair iron including a first holding portion having a first hair holding surface and a second holding portion having a second hair holding surface configured to hold hair with the first hair holding surface; and a setting member detachably provided on the second holding portion and configured to style hair, wherein the first holding portion includes a protrusion configured to guide hair held between the first hair holding surface and the second holding surface toward the second holding portion.

[0008] According to the foregoing aspect, the first hold-

ing portion is provided with the protrusion configured to guide the hair toward the second holding portion when the hair is held between the first hair holding surface and the second hair holding surface. Thus, the hair can be pushed toward the second holding portion by the protrusion. As a result, it is possible to style the hair using the protrusion before styling the hair by pressing the hair against the setting member. Thereby, the hair can be styled more certainly. As described above, according to the invention of claim 1, it is possible to set the hair into a desired style more certainly.

[0009] At least one of the first holding portion and the second holding portion may include a heat generator configured to heat hair held between the first hair holding surface and the second hair holding surface.

[0010] According to the foregoing configuration, the heat generator configured to apply heat to the hair held between the first hair holding surface and the second hair holding surface is provided. Thus, the hair in which the hydrogen bonds between hair fibers are broken by application of heat energy can be pushed toward the second holding portion by used of the protrusion. As a result, it is possible to style the hair more certainly.

[0011] The hair iron device may further comprise a plurality of types of setting members.

[0012] According to the foregoing configuration, the hair iron device includes the multiple types of setting members. Thus, it is possible to perform a variety of hair arrangement by using the single hair iron.

[0013] The hair iron device may further comprise a first setting member having a first curling portion.

[0014] According to the foregoing configuration, the hair iron device includes the setting member provided with the curling portion. Thus, it is possible to set the hair into a curled style by using this setting member.

[0015] The hair iron device may further comprise a second setting member having a second curling portion with a curvature different from a curvature of the first curling portion, in addition to the first setting member.

[0016] According to the foregoing configuration, the hair iron device includes the multiple types of setting members provided with the curling portions having mutually different curvatures. Hence, it is possible to curl the hair at a desired degree of curve by changing the setting member to be attached to the hair iron device.

[0017] The first setting member may have the first curling portion in a side portion of the first setting member.

[0018] According to the foregoing configuration, the curling portion is provided in the side portion of the setting member. Thus, it is possible to reduce the thickness of the setting member, to downsize the setting member in the thickness direction, and eventually to reduce the thickness of the hair iron device.

[0019] The first curling portion of the first setting member attached to the second holding portion with the second hair holding surface facing upward may be located below the second hair holding surface.

[0020] According to the foregoing configuration, when

the second holding portion is disposed with the second hair holding surface facing upward, the curling portion of the setting member which is attached to the second holding portion is located below the second hair holding surface. For this reason, it is possible to make the hair move smoothly from the second hair holding surface toward the curling portion. Moreover, it is possible to suppress excessive bending of the hair in the middle thereof, and to minimize a load to be applied to the hair in the hair curling.

[0021] The setting member attached to the second holding portion with the second hair holding surface facing upward may include first protrusions protruding upward on an upper part of the setting member, and the first protrusions may be provided at an interval in a direction intersecting an extending direction of hair held between the first hair holding surface and the second hair holding surface.

[0022] According to the foregoing configuration, when in a state where the setting member is attached to the second holding portion and the second holding portion is disposed with the second hair holding surface facing upward, the upper part of the setting member is provided with the first protrusions which protrude upward. Moreover, the multiple first protrusions are provided at an interval in the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface. For these reasons, when the hair iron device is pulled down along the hair, it is possible to orient the hair by using the first protrusions. Moreover, it is possible to suppress deviation of the hair held between the first hair holding surface and the second hair holding surface from regions covered with the hair holding surfaces, and to suppress incapability of pressing the hair against the setting member. In this way, the providing of the first protrusions makes it possible to orient the hair by guiding the hair into the spaces between the first protrusions, and thereby to curl the hair more evenly.

[0023] The setting member attached to the second holding portion with the second hair holding surface facing upward may have a flat surface portion located below the second hair holding surface in an upper part of the setting member.

[0024] According to the foregoing configuration, when in a state where the setting member is attached to the second holding portion while the second holding portion is disposed with the second hair holding surface facing upward, the hair iron device includes the setting member which has the flat surface portion on an upper part thereof, and in which the flat surface portion is located below the second hair holding surface. By attaching this setting member to the second holding portion, it is possible to cause the hair to contact the flat surface portion of the setting member, and thereby to set the hair straighter. Moreover, since the flat surface portion is provided in a way to be located below the second hair holding surface, it is possible to achieve a smoother flow of the hair, and to reduce a load to be applied to the hair.

[0025] The flat surface portion may include second protrusions protruding upward, and the second protrusions may be provided at an interval in a direction intersecting an extending direction of hair held between the first hair holding surface and the second hair holding surface.

[0026] According to the foregoing configuration, the second protrusions protruding upward are provided on the flat portion. In addition, the multiple second protrusions are provided at an interval in the direction intersecting the extending direction of the hairs held between the first hair holding surface and the second hair holding surface. For these reasons, it is possible to orient the hair by guiding the hair into the spaces between the second protrusions, and thereby to set the hair straighter.

[0027] The setting member attached to the second holding portion with the second hair holding surface facing upward may have: an upper surface portion parallel to the second hair holding surface in an upper part of the setting member; a side surface portion perpendicular to the second hair holding surface in a side part of the setting member; and a curved surface portion connecting the upper surface portion and the side surface portion. The curved surface portion may include third protrusions protruding upward, and the third protrusions may be provided at an interval in a direction intersecting an extending direction of hair held between the first hair holding surface and the second hair holding surface.

[0028] According to the foregoing configuration, when in a state where the setting member is attached to the second holding portion while the second holding portion is disposed with the second hair holding surface facing upward, the hair iron device includes the setting member provided with: the upper surface portion, which is formed substantially parallel to the second hair holding surface, in the upper part; the side surface portion, which is formed substantially perpendicular to the second hair holding surface, in the side part; and the curved surface portion connecting the upper surface portion and the side surface portion. In the setting member, the third protrusions protruding upward are provided on the curved surface portion; and the multiple third protrusions are provided at an interval in the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface. By attaching this setting member to the second holding portion, it is possible to style base end portions of the hair, and thereby to set the hair with more volume given to the hair as a whole.

[0029] Moreover, it is possible to comb out the hair by providing the third protrusions, and thereby to insert the hair holding surfaces more smoothly into the base end portions of the hair, and to style the hair starting with the locations closer to the base end portions.

[0030] The curved surface portion may have fourth protrusions protruding in a curved manner, and the fourth protrusions may be provided at an interval in the direction intersecting the extending direction of the hair held be-

tween the first hair holding surface and the second hair holding surface.

[0031] According to the foregoing configuration, the fourth protrusions protruding in the curved manner are provided on the curved surface portion. Furthermore, the multiple fourth protrusions are provided at an interval in the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface. For these reasons, it is possible to orient the hair by guiding the hair into the spaces between the fourth protrusions, and thereby to style the hair with more even volume being given to the hair as a whole.

[0032] The hair iron device may further comprise a restricting member configured to restrict relative movement of the first holding portion toward the second holding portion.

[0033] According to the foregoing configuration, the hair iron device includes the restricting members configured to restrict the relative movement of the first holding portion toward the second holding portion. For this reason, it is possible to suppress application of an excessive load to the hair held between the first hair holding surface and the second hair holding surface, and thereby to suppress damage on the hair.

[0034] The hair iron device may further comprise a variable unit configured to change a relative position of the first holding portion to the second holding portion at a time of restriction by the regulating member.

[0035] According to the foregoing configuration, the hair iron device includes the variable unit configured to change the relative position of the first holding portion to the second holding portion at the time of restriction by the regulating members. For this reason, it is possible to change the relative position of the first holding portion to the second holding portion at the time of restriction depending on the hair styling type and the like, and to achieve an optimum condition of the load to be applied to the hair held between the first hair holding surface and the second hair holding surface.

[0036] The setting member and the hair iron may include fitting portions removably fitted to each other.

[0037] According to the foregoing configuration, it is possible to attach and detach the setting member to and from the hair iron easily by providing the setting member and the hair iron with their respective fitting members which are removably fitted to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0038]

Fig. 1 is a perspective view of a hair iron device according to an embodiment of the present invention.

Fig. 2 is a side view of the hair iron device according to the embodiment of the present invention.

Fig. 3 is a cross-sectional view of the hair iron device according to the embodiment of the present inven-

tion.

Fig. 4 illustrates cross-sectional views showing actions of a holding member of the hair iron device according to the embodiment of the present invention, (a) is a cross-sectional view showing a state of causing holding surfaces to abut on each other, and (b) is a cross-sectional view showing a state where the holding member sinks down as the hair iron device is closed more tightly.

Fig. 5 is a perspective view of a first example a setting member according to the embodiment of the present invention.

Fig. 6 is a cross-sectional view of the first example the setting member according to the embodiment of the present invention.

Fig. 7 is a perspective view of a second example a setting member according to the embodiment of the present invention.

Fig. 8 is a cross-sectional view of the second example the setting member according to the embodiment of the present invention.

Fig. 9 is a perspective view of a third example a setting member according to the embodiment of the present invention.

Fig. 10 is a cross-sectional view of the third example the setting member according to the embodiment of the present invention.

Fig. 11 is a perspective view of a fourth example a setting member according to the embodiment of the present invention.

Fig. 12 is a cross-sectional view of the fourth example the setting member according to the embodiment of the present invention.

Fig. 13 is a perspective view of a fifth example a setting member according to the embodiment of the present invention.

Fig. 14 is a cross-sectional view of the fifth example the setting member according to the embodiment of the present invention.

Fig. 15 illustrates views showing a slide member according to the embodiment of the present invention, (a) is a cross-sectional view of a state before sliding, and (b) is a cross-sectional view of a state after sliding.

Fig. 16 is a view showing an interlock between the sliding member and the setting member according to the embodiment of the present invention, which is a plan view of the sliding member and the setting member before their abutment.

Fig. 17 is a view showing the interlock between the sliding member and the setting member according to the embodiment of the present invention, which is a plan view of the insides of the sliding member and the setting member before their abutment.

Fig. 18 is a view showing the interlock between the sliding member and the setting member according to the embodiment of the present invention, which is a plan view of the sliding member and the setting

member which abut on each other.

Fig. 19 is a view showing the interlock between the sliding member and the setting member according to the embodiment of the present invention, which is a plan view of the insides of the sliding member and the setting member which abut on each other.

Fig. 20 is a view showing the interlock between the sliding member and the setting member according to the embodiment of the present invention, which is a plan view of the sliding member and the setting member which are attached together.

Fig. 21 is a view showing the interlock between the sliding member and the setting member according to the embodiment of the present invention, which is a plan view of the insides of the sliding member and the setting member which are attached together.

Fig. 22 is a cross-sectional view schematically showing a state of coating a hair holding surface with a photocatalyst according to the embodiment of the present invention.

Fig. 23 is a cross-sectional view schematically showing a state of containing photocatalyst particles in a hair holding surface according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENT

[0039] An embodiment of the present invention will be described below in detail with reference to the drawings. In the following description, a vertical direction is defined based on a hair iron in a state where a first hair holding surface and a second hair holding surface are caused to abut on each other and the second hair holding surface faces upward. Moreover, the description will be made on the assumption that a holding portion-side of the hair iron is defined as the front while a grip portion-side thereof is defined as the back.

[0040] As shown in Fig. 1 and Fig. 2, a hair iron device 100 according to this embodiment comprises a hair iron 1 and a setting member 10 for styling hair H. The setting member 10 is detachably attached to the hair iron 1.

[0041] In this embodiment, the hair iron 1 includes an upper arm portion 2 and a lower arm portion 3 which are joined so as to be spreadable substantially into a V-shape by use of a turnable joint 4. The hair iron 1 can bring tip ends of the upper arm portion 2 and the lower arm portion 3 close to and away from each other by relatively turning the upper arm portion 2 and the lower arm portion 3 by use of the turnable joint 4. In this embodiment, an upper hair holding surface 22a and a lower hair holding surface 32a to be described later are brought close to and away from each other in response to the relative turn between the upper arm portion 2 and the lower arm portion 3.

[0042] In this embodiment, a tubular portion 3c opened upward is provided at a portion of the lower arm portion 3 in the vicinity of the turnable joint 4, as well as a tubular portion 2c opened downward and insertable into the tubular portion 3c is provided at a portion of the upper lower

arm portion 2 in the vicinity of the turnable joint 4. A coil spring 5 is disposed in a space portion formed between the tubular portion 2c and the tubular portion 3c. The coil spring 5 biases the upper arm portion 2 and the lower arm portion 3 so as for them to spread away from each other. The tubular portion 2c is inserted into the tubular portion 3c so as to avoid displacement between the upper arm portion 2 and the lower arm portion 3 in a width direction when closing the hair iron 1. In this embodiment, the turn of the upper arm portion 2 and the lower arm portion in the spreading direction is restricted by a stopper, which is not illustrated.

[0043] An upper grip portion 2a and a lower grip portion 3a are respectively provided in portions close to the turnable joint 4 (on a back side of the hair iron 1) of the upper arm portion 2 and the lower arm portion 3, as well as an upper holding portion (a first holding portion) 2b and a lower holding portion (a second holding portion) 3b are respectively provided on tip end sides thereof.

[0044] The upper holding portion 2b and the lower holding portion 3b are respectively provided with an upper hair holding surface (a first hair holding surface) 22a and a lower hair holding surface (a second hair holding surface) 32a, which can abut on each other when the upper arm portion 2 and the lower arm portion 3 are turned in a closing manner.

[0045] In this embodiment, the upper holding portion 2b and the lower holding portion 3b are respectively provided with a heater 23 and a heater 33 serving as heat generators as shown in Fig. 3.

[0046] As shown in Figs. 4 and 6, a curling portion 10e for curling the hair H is provided on an outer surface of the setting member 10.

[0047] The hair H is set into a curled style or a straight style by: holding the hair H between the upper hair holding surface 22a and the lower hair holding surface 32a formed on the tip end sides of the upper arm portion 2 and the lower arm portion 3; and applying heat generated by the heater 23 and the heater 33 to the hair H through the upper hair holding surface 22a and the lower hair holding surface 32a.

[0048] For example, the setting of the hair H into a curled style is carried out as follows. First, the heated upper holding portion 2b and the heated lower holding portion 3b are opposed each other, and the hair H is disposed between the upper holding portion 2b and the lower holding portion 3b so as for the hair to extend in the width direction of the upper holding portion 2b and the lower holding portion 3b. Subsequently, base end sides of the hair H, which are not held between the upper hair holding surface 22a and the lower hair holding surface 32a, are pressed against the curling portion 10e of the setting member 10 while turning the hair iron device 100 with the hair H being held therebetween. Then, the hair iron device 100 is pulled down while sliding the hair iron device 100 along the hair H with the hair H pressed against the curling portion 10e of the setting member 10, thereby setting the hair into the curled style. The setting

of the hair H into the straight style is achieved by pulling the hair iron 100, which holds the hair between the upper hair holding surface 22a and the lower hair holding surface 32a, down toward the hair tips while sliding the hair iron 100 along the hair H without rotation.

[0049] As described above, the hair iron device 100 according to this embodiment is configured to style the hair H by styling the hair H with the heat.

[0050] In this embodiment, the width direction of the upper holding portion (the first holding portion) 2b and the lower holding portion (the second holding portion) 3b corresponds to a direction in which the hair H held between the upper hair holding surface (the first hair holding surface) 22a and the lower hair holding surface (the second hair holding surface) 32a extends while the hair H are being held between the upper hair holding surface (the first hair holding surface) 22a and the lower hair holding surface (the second hair holding surface) 32a. A longitudinal direction of the upper holding portion (the first holding portion) 2b and the lower holding portion (the second holding portion) 3b corresponds to a direction orthogonal to the extending direction of the hair H.

[0051] The upper arm portion 2 and the lower arm portion 3 described above include a case 20 and a case 30 constituting outer walls. The case 20 and the case 30 are each formed by joining multiple separated parts together. Hollows are formed inside the case 20 and the case 30, and various electric components are housed in these hollows.

[0052] In this embodiment, as shown in Fig. 4, the case 20 having the hollow inside is formed by: engaging a protrusion provided on an upper end of a lower case 20b opened upward with a groove portion provided on a lower end of an upper case 20a opened downward; and then integrating the upper case 20a and the lower case 20b together by welding or using an adhesive, screws, or the like.

[0053] As shown in Fig. 4, the case 30 having the hollow inside is formed by: engaging a protrusion provided on a lower end side portion of an upper case 30a opened downward with a groove portion provided on an upper end side portion of a lower case 30b opened upward; and then integrating the upper case 30a and the lower case 30b by welding or using an adhesive, screws, or the like.

[0054] Protruded beams 20d and protruded beams 30e extending in the longitudinal direction of the case 20 and the case 30 are provided on both side portions in the width direction of the case 20 and the case 30.

[0055] The protruded beams 20d and the protruded beams 30e are provided on the case 20 and the case 30 close to the upper holding portion 2b and the lower holding portion 3b such that: their front ends protrude forward from the front shorter sides of the upper and lower hair holding surfaces 22a, 32a; and their back ends protrude backward from the rear shorter sides of the upper and lower hair holding surfaces 22a, 32a in a side view.

[0056] By providing the case 20 and the case 30 with

the protruded beams 20d and the protruded beams 30e extending in the longitudinal direction as described above, it is possible to reduce contact areas of the case 20 and the case 30 with the scalp and the skin of a user or the like when using the hair iron device 100. Because surface areas of the case 20 and the case 30 are increased by providing the protruded beams 20d and the protruded beams 30e extending in the longitudinal direction, it is possible to radiate heat more efficiently. In other words, the protruded beams 20d and the protruded beams 30e also function as radiators.

[0057] In this embodiment, the upper holding portion (the first holding portion) 2b and the lower holding portion (the second holding portion) 3b are formed by causing the case (a holding portion main body) 20 and the case (a holding portion main body) 30 to support a hair holding member 21 provided with the upper hair holding surface 22a and a hair holding member 31 provided with the lower hair holding surface 32a.

[0058] To put it concretely, the hair holding member 21 and the hair holding member 31 include a plate portion 22 and a plate portion 32 each having a substantially platy shape. The upper hair holding surface 22a and the lower hair holding surface 32a each having a substantially flat shape are formed on surfaces of the plate portion 22 and the plate portion 32. In this embodiment, each of the upper hair holding surface 22a and the lower hair holding surface 32a is formed into a substantially rectangular shape which is elongated in the longitudinal direction of the case 20 in a plan view as shown in Fig. 1.

[0059] In each of the plate portion 22 and the plate portion 32, both ends in the width direction (the same direction as the width direction of the first holding portion and the second holding portion) are bent toward an inner side of the case 20 or the case 30. Moreover, as shown in Fig. 4, curved surfaces 22d and curved surfaces 32d protruding obliquely outward in a cross-sectional view in the width direction are respectively formed on both ends in the width direction of the upper hair holding surface 22a and the lower hair holding surface 32a.

[0060] A housing portion 24 and a housing portion 34 for housing the heater 23 and the heater 33 are formed inside the case 20 and the case 30 of the plate portion 22 and the plate portion 32. The heater 23 and the heater 33 housed in the housing portion 24 and the housing portion 34 are caused to abut on rear surfaces of the plate portion 22 and the plate portion 32, respectively.

[0061] The plate portion 22 and the plate portion 32 are preferably made of a material having high electric conductivity such as copper or aluminum so as to transfer heat to the hair H effectively.

[0062] In this embodiment, PTC heaters (positive temperature coefficient heaters) are used as the heater 23 and the heater 33. Accordingly, it is possible to achieve continuous temperature control. Although this embodiment is shown as an example in which the PTC heaters are used as the heater 23 and the heater 33, the invention is not limited only to this configuration. Nichrome-wire

heaters or other heating means may be used instead. The heater (the heat generator) may be provided on only one out of the upper holding portion (the first holding portion) 2b and the lower holding portion (the second holding portion) 3b.

[0063] A control circuit 6 configured to control temperatures and the like of the heater 23 and the heater 33 is housed in the case 20. The heater 23 and the heater 33 are connected to the control circuit 6 by use of lead wires 8. In this embodiment, the temperatures of the upper hair holding surface 22a and the lower hair holding surface 32a can be set stepwise. As shown in Fig. 4, the hollow inside the case 20 is defined by use of a packing 80 provided with through holes 81 for inserting the lead wires 8 between the control circuit 6 and the plate portion 22. A waterproof effect of the control circuit 6 is enhanced by providing the packing 80. A power supply cord 72 is drawn out of a back end 1a of the hair iron 1.

[0064] An operating switch 7 is provided to a portion of the case 20 close to the upper grip portion 2a. It is possible to turn power of the heater 23 and the heater 33 on and off by operating the operating switch 7. Once the power is supplied to the heater 23 and the heater 33 by operating this switch 7, the heater 23 and the heater 33 generate the heat, and the heat is transferred from the heater 23 and the heater 33 to the plate portion 22 and the plate portion 32. Thereby, the plate portion 22 and the plate portion 32 are heated.

[0065] In this embodiment, a thermistor 73 is attached to the heater 23 as shown in Fig. 3. The temperatures of the heater 23 and the heater 33 are controlled by use of a resistance value of the thermistor 73 which varies with change in temperature of the heater 23. Reference numeral 74 denotes a fuse. The fuse 74 is provided in order to cut off power to the heater 23 and the heater 33 if the temperature of any of the upper hair holding surface 22a and the lower hair holding surface 32a exceeds a predetermined temperature due to a failure of the control circuit 6 and the like.

[0066] Two temperature control switches 70a and 70b are provided in a portion of the case 20 close to the upper grip portion 2a. By operating the two temperature control switches 70a and 70b, it is possible to change set temperatures of the upper hair holding surface 22a and the lower hair holding surface 32a. This embodiment exemplifies a configuration to switch the set temperature into five steps. Five lighting units 71 lit by LED lamps, which are not illustrated, are provided on the case 20 so that a current set temperature can be recognized by lighting any of the lighting units 71 corresponding to the respective steps, for example.

[0067] In this embodiment, the upper holding portion 2b is provided with protrusions 20c that protrude downward, which are configured to guide the hair H toward the lower holding portion 3b when holding the hair H between the upper hair holding surface 22a and the lower hair holding surface 32a.

[0068] The protrusions 20c are provided on both sides

in the width direction of the upper holding portion 2b in a way to extend in the longitudinal direction of the upper holding portion 2b. In this embodiment, as shown in Fig. 1, the protrusions 20c are provided extending on outsides in the width direction in the vicinities of longer edges of the upper hair holding surface 22a in a way to have substantially the same length as the longer edges of the upper hair holding surface 22a.

[0069] Each of the protrusions 20c is formed substantially in a semicircular shape in a cross-sectional view in the width direction such that a peak 20f of the protrusion 20c protrudes downward.

[0070] The protrusions 20c are preferably made of a heat resistant resin or a metal material (which has a high electric conductivity such as copper or aluminum).

[0071] In this embodiment, as shown in Fig. 4, the hair holding member 21 is supported reciprocally relative to the case (holding portion main body) 20 in a vertical direction (a direction normal to the first hair holding surface).

[0072] To be more specific, the hair holding member 21 is rendered vertically movable relative to the case 20 by supporting four corners of the hair holding member 21 with four float springs 9 disposed inside the case 20.

The hair holding member 21 is prevented from coming off the case 20 by engaging stopper members 25 provided on the hair holding portion 21 with stopper portions 20e provided on the lower case 20b. In other words, in this embodiment, the hair holding member 21 is supported vertically movably on the case 20 by use of biasing forces of the float springs 9.

[0073] As described above, by supporting the hair holding member 21 vertically movably relative to the case 20, the hair H is pressed downward by the protrusions 20c when the case moves downward relative to the case 30 as shown in Fig. 4(b).

[0074] When the stopper members 25 are engaged with the stopper portions 20e, it is preferable that a backlash of the hair holding member 21 should be able to be suppressed by biasing the hair holding member 21 downward with the float springs 9. In this embodiment, the four corners of the hair holding member 21 are supported by the float springs 9. However, the locations and the number of the float springs to be provided can be appropriately set up. A movable range in the vertical direction of the hair holding member 21 is preferably set in a range of about 0 to 3 mm. An amount of movement equal to or above 3 mm leads to an increase in a load to be applied to the hair held therebetween or in friction which occurs when pulling the hair iron device 100 downward. Accordingly, there is a risk of complicating the smooth movement of the hair iron device 100 along the hair H.

[0075] In this embodiment, as shown in Fig. 4, the hair holding member 31 is placed on a mount portion 30f which is made of a rib or the like and provided on the lower case 30b. The case 30 is caused to support the hair holding member 31 by holding the hair holding member 31 between the mount portion 30f and a flange 30g

formed on the upper case 30a. The hair holding member 31 is supported by the case 30 in a way to exposes the lower hair supporting surface 32a inclusive of the curved surfaces 32d, i.e., in a way to cause the lower hair holding surface 32a including the curved surfaces 32 to protrude upward from the flange 30g.

[0076] In this embodiment, when the hair H is held between the upper hair holding surface 22a and the lower hair holding surface 32a while disposing the lower holding portion 3b with the lower hair holding surface facing upward, the lower hair holding surface 32a can be located above the peaks 20f of the protrusions 20c.

[0077] To be more specific, the hair holding member 21 is rendered reciprocable relative to the case in the vertical direction, and the hair holding member 31 is supported by the case 30 in a way that the lower hair holding surface 32a protrudes upward from the flange 30g. Thereby, the hair holding member 21 is pressed upward by the lower hair holding surface 32a, when the hair iron 1 is closed. Then, the case 20 is moved downward relative to the hair holding member 21 by pressure using the lower hair holding surface 32a as shown in Fig. 4(b), so that the peaks 20f of the protrusions 20c can be located below an imaginary plane (corresponding to the lower hair holding surface 32a) X.

[0078] As shown in Fig. 6, the setting member 10 includes: a bottom wall 10c; side walls 10b projectingly provided upward from both ends in the width direction of the bottom wall 10c; and a rib 10a extending substantially horizontally and inward from upper ends of both of the side walls 10b. Moreover, an aperture is formed on an upper part thereof. A front end wall 10d is formed at a front end of the bottom wall 10c, and the rib 10a extending substantially horizontally and backward from an upper end of this front end wall 10d is also provided to this front end wall 10d. Accordingly, the setting member 10 is open in its rear and upward. The setting member 10 is attached to the lower holding portion 3b by: inserting this setting member 10 from the front of the lower holding portion 3b; and sliding the setting member 10 toward the back side.

[0079] A fitting recessed portion 10f is provided at a back portion of the bottom wall 10c. When this fitting recessed portion 10f is fitted to a fitting protrusion 61 on an attachment button 60 to be described later, the setting member 10 is attached to the lower holding portion 3b, and the setting member 10 is prevented from coming off the lower holding portion 3b.

[0080] The attachment button 60 is provided with a spring receiving cylinder 62 that protrudes into the case 30, and a coil spring 63 is interposed between this spring receiving cylinder 62 and a spring receiver 30h provided inside the case 30. This attachment button 60 is fitted to the case 30 while biased toward the outside of the case by the coil spring 63.

[0081] The fitting between the fitting recessed portion 10f and the fitting protrusion 61 is released by pressing the attachment button 60 inward against the biasing force of the coil spring 63 while fitting the fitting recessed por-

tion 10f to the fitting protrusion 61. Hence, it is possible to detach the setting member 10.

[0082] Specifically, the fitting recessed portion 10f provided in the setting member 10 and the fitting protrusion 61 provided on the hair iron 1 correspond to fitting portions to be detachably fitted to each other.

[0083] In this embodiment, a recessed curved surface 10j is formed in an inner lower part in the width direction of the rib 10a, and this recessed curved surface 10j is slidably engageable with a projecting curved surface 30i formed on an upper end of the upper case 30a. The bottom wall 10c includes a groove portion 10k configured to guide a lower end portion 30j of the lower case 30b. Notches 10i are formed in back parts of the rib 10a. When the setting member 10 is attached to the lower holding portion 3b, a fitting plate portion 30d having a narrow width (see Fig. 8), which is formed on a top wall 30c of the case 30, is fitted to the notches 10i.

[0084] A back end surface 10g functions as a pressing surface configured to press and slide a sliding member 50 to be described later when sliding and attaching the setting member 10 to the lower holding portion 3b.

[0085] The curling portions 10e which are curved at a predetermined curvature are formed on the side walls 10b of the setting member 10.

[0086] Each of the curling portions 10e is formed in a way to be located below the lower hair holding surface 32a when disposing the lower holding portion 3b with the lower hair holding surface 32a facing upward while attaching the setting member 10 to the lower holding portion 3b (in the state as shown in Fig. 4).

[0087] When disposed as shown in Fig. 4, first protrusions 10h protruding upward are provided on an upper surface of the rib 10a located on the upper part of the setting member 10. The first protrusions 10h are provided on both ends in the width direction of the setting member 10. In each end therein, the first protrusions 10h are respectively provided in two positions

[0088] (multiple positions) at an interval in the longitudinal direction of the setting member 10.

[0089] Accordingly, it is possible to curl the hair H by: using this setting member 10; and pressing the hair H against the curling portions 10e.

[0090] In this embodiment, the hair iron device 100 includes multiple types of setting members. Specifically, the hair iron device 100 includes setting members 11 to 14 in addition to the setting member 10 so that the hair iron device 100 can make various hairstyles available by styling the hair while changing these five types of setting members 10 to 14 depending on a style into which the hair is intended to be set.

[0091] As shown in Figs. 7 and 8, the setting member 11 includes: a bottom wall 11c; side walls 11b provided protruding upward from both ends in the width direction of the bottom wall 11c; and a rib 11a extending inward and substantially horizontally from upper ends of the two side walls 11b. Moreover, an aperture is formed in an upper part thereof. A front end wall 11d is formed in a

front end of the bottom wall 11c, and the rib 11a extending backward and substantially horizontally is also provided at the upper end of this front end wall 11d. The setting member 11 is attached to the lower holding portion 3b by: inserting the setting member 11 from the front of the lower holding portion 3b; and sliding the setting member 11 toward the back side.

[0092] A fitting recessed portion 11f is provided in a back portion of the bottom wall 11c. The setting member 11 is attached to the lower holding portion 3b by fitting this fitting recessed portion 11f to the fitting protrusion 61 on the attachment button 60, thereby preventing the setting member 11 from coming off the lower holding portion 3b.

[0093] In this embodiment, a recessed curved surface 11j is formed in an inner lower part in the width direction of the rib 11a, and this recessed curved surface 11j is slidably engageable with the projecting curved surface 30i formed on the upper end of the upper case 30a. The bottom wall 11c includes a groove portion 11k configured to guide the lower end portion 30j of the lower case 30b. Notches 11i are formed in back parts of the rib 11a. When the setting member 11 is attached to the lower holding portion 3b, the fitting plate portion 30d having the narrow width (see Fig. 20), which is formed on the top wall 30c of the case 30, is fitted to the notches 11i.

[0094] A back end surface 11g functions as the pressing surface configured to press and slide the sliding member 50 to be described later when sliding and attaching the setting member 11 to the lower holding portion 3b.

[0095] Curling portions 11e which are curved at a curvature smaller than the curvature of the curling portions 10e of the setting member 10 (the curvature different from the curvature of the curling portions 10e) are formed on the side walls 11b of the setting member 11.

[0096] Each of the curling members 11e is formed in a way to be located below the lower hair holding surface 32a when the lower holding portion 3b is disposed with the lower hair holding surface 32a facing upward while the setting member 11 is attached to the lower holding portion 3b (in the state as shown in Fig. 4).

[0097] When the setting member 11 is attached to the lower holding portion 3b and is disposed as shown in Fig. 4, first protrusions 11h protruding upward are provided on an upper surface of the rib 11a located in the upper part of the setting member 11. The first protrusions 11h are provided in the two ends in the width direction of the setting member 11. Two (multiple) first protrusions 11h are provided at an interval in the longitudinal direction of the setting member 11.

[0098] By using the setting member 11 and pressing the hair H against the curling portions 11e, it is possible to curl the hair H at a degree of curve which is different from that at which the hair H is curled when using the setting member 10.

[0099] As shown in Fig. 10, the setting member 12 includes: a bottom wall 12c; side walls 12b projectingly provided upward from both ends in the width direction of

the bottom wall 12c; and a rib 12a extending substantially horizontally and inward from upper ends of both of the side walls 12b. Moreover, an aperture is formed on an upper part thereof. A front end wall 12d is formed at a front end of the bottom wall 12c, and the rib 12a extending substantially horizontally and backward from an upper end of this front end wall 12d is also provided to this front end wall 10d. The setting member 12 is attached to the lower holding portion 3b by: inserting this setting member 12 from the front of the lower holding portion 3b; and sliding the setting member 12 toward the back side.

[0100] A fitting recessed portion 12f is provided at a back portion of the bottom wall 12c. When this fitting recessed portion 12f is fitted to a fitting protrusion 61 on an attachment button 60, the setting member 12 is attached to the lower holding portion 3b, and the setting member 12 is prevented from coming off the lower holding portion 3b.

[0101] In this embodiment, a recessed curved surface 12j is formed in an inner lower part in the width direction of the rib 12a, and this recessed curved surface 12j is slidably engageable with a projecting curved surface 30i formed on an upper end of the upper case 30a. Notches 12i are formed in back parts of the rib 12a. When the setting member 12 is attached to the lower holding portion 3b, a fitting plate portion 30d having a narrow width (see Fig. 20), which is formed on a top wall 30c of the case 30, is fitted to the notches 12i.

[0102] A back end surface 12g functions as a pressing surface configured to press and slide a sliding member 50 to be described later when sliding and attaching the setting member 12 to the lower holding portion 3b.

[0103] Curling portions 12e which are curved at a curvature smaller than the curvatures of the curling portions 10e and 11e of the setting members 10 and 11 (the curvature different from the curvatures of the curling portions 10e and 11e) are formed on the side walls 12b of the setting member 12.

[0104] Each of the curling portions 12e is formed in a way to be located below the lower hair holding surface 32a when disposing the lower holding portion 3b with the lower hair holding surface 32a facing upward while attaching the setting member 12 to the lower holding portion 3b (in the state as shown in Fig. 4).

[0105] When disposed as shown in Fig. 4 after attachment of the setting member 12 to the lower holding portion 3b, first protrusions 12h protruding upward are provided on an upper surface of the rib 12a located on the upper part of the setting member 12. The first protrusions 12h are provided on both ends in the width direction of the setting member 12. In each end therein, the first protrusions 12h are respectively provided in two positions (multiple positions) at an interval in the longitudinal direction of the setting member 12.

[0106] By using the setting member 12 and pressing the hair H against the curling portions 12e, it is possible to curl the hair H at a degree of curve which is different from those at which the hair is curled when using the

setting member 10 and the setting member 11.

[0107] As shown in Figs. 11 and 12, the setting member 13 includes: a bottom wall 13c; side walls 13b provided protruding upward from both ends in the width direction of the bottom wall 13c; and a rib 13a extending inward and substantially horizontally from upper ends of the two side walls 13b. Moreover, an aperture is formed in an upper part thereof. A front end wall 13d is formed in a front end of the bottom wall 13c, and the rib 13a extending backward and substantially horizontally is also provided in an upper end of this front end wall 13d. The setting member 13 is attached to the lower holding portion 3b by: inserting the setting member 13 from the front of the lower holding portion 3b; and sliding the setting member 13 toward the back side.

[0108] A fitting recessed portion 13f is provided in a back portion of the bottom wall 13c. The setting member 13 is attached to the lower holding portion 3b by fitting the fitting recessed portion 13f to the fitting protrusion 61 on the attachment button 60, thereby preventing the setting member 13 from coming off the lower holding portion 3b.

[0109] In this embodiment, a recessed curved surface 13k is formed in an inner lower part in the width direction of the rib 13a, and the recessed curved surface 13k is slidably engageable with the projecting curved surface 30i formed on the upper end of the upper case 30a. Notches 13i are formed in back parts of the rib 13a. When the setting member 13 is attached to the lower holding portion 3b, the fitting plate portion 30d having the narrow width (see Fig. 20), which is formed on the top wall 30c of the case 30, is fitted to the notches 13i.

[0110] A back end surface 13g is provided with notches 13j. Hence, the back end surface 13g is configured not to slide a sliding member 50 to be described later even when the setting member 13 is slid and attached to the lower holding portion 3b.

[0111] A flat surface portion 131 is formed on an upper surface of the rib 13a which is located in an upper part of the setting member 13 when the lower holding portion 3b is disposed with the lower hair holding surface 32a facing upward while the setting member 13 is attached to the lower holding portion 3b (the state shown in Fig. 4).

[0112] In this embodiment, the flat surface portion 131 is formed in a way to be located below the lower hair holding surface 32a when the setting portion 13 is attached to the lower holding portion 3b and disposed as shown in Fig. 4. The setting member 13 is formed in a way that: the thickness of the rib 13a is thicker than the thicknesses of those in the above-described setting members 10, 11, and 12; and hence, a step formed between the flat surface portion 131 and the lower hair holding surface 32a is not too large.

[0113] Second protrusions 13h protruding upward are provided on the flat surface portion 131. The second protrusions 13h are provided on both ends in the width direction of the setting member 13. Here, eight (multiple) second protrusions 13h are provided on each side at in-

tervals in the longitudinal direction of the setting member 13.

[0114] It is possible to straighten the hair H by: using the setting member 13; and pressing the hair H against the flat surface portion 131. In particular, the hair H, in which hydrogen bonds between the hair fibers are broken by heating, can be pressed against the flat surface portion 131 by using the setting member 13. Hence, it is possible to set the hair H into a straighter style than by using no setting member.

[0115] As shown in Figs. 13 and 14, the setting member 14 includes: a bottom wall 14c; side walls 14b provided protruding upward from both ends in the width direction of the bottom wall 14c; and a rib 14a extending inward and substantially horizontally from upper ends of the two side walls 14b. Moreover, an aperture is formed in an upper part thereof. A front end wall 14d is formed in a front end of the bottom wall 14c, and the rib 14a extending backward and substantially horizontally is also provided in an upper end of this front end wall 14d. The setting member 14 is attached to the lower holding portion 3b by: inserting the setting member 14 from the front of the lower holding portion 3b; and sliding the setting member 14 toward the back side.

[0116] A fitting recessed portion 14f is provided in a back portion of the bottom wall 14c. The setting member 14 is attached to the lower holding portion 3b by fitting the fitting recessed portion 14f to the fitting protrusion 61 on the attachment button 60, thereby preventing the setting member 14 from coming off the lower holding portion 3b.

[0117] In this embodiment, a recessed curved surface 14j is formed in an inner lower part in the width direction of the rib 14a, and the recessed curved surface 14j is slidably engageable with the projecting curved surface 30i formed in the upper end of the upper case 30a. Notches 14i are formed in back parts of the rib 14a. When the setting member 14 is attached to the lower holding portion 3b, the fitting plate portion 30d having the narrow width (see Fig. 20), which is formed on the top wall 30c of the case 30, is fitted to the notches 14i.

[0118] A back end surface 14g functions as the pressing surface configured to press and slide the sliding member 50 to be described later when sliding and attaching the setting member 14 to the lower holding portion 3b.

[0119] When the setting member 14 is attached to the lower holding portion 3b disposed with the lower hair holding surface 32a facing upward (the state shown in Fig. 4), the setting member 14 includes: an upper surface portion 14m formed, in the upper portion thereof, substantially parallel to the lower hair holding surface 32a; side surface portions 14e formed, in the respective side parts, to be substantially perpendicular to the lower hair holding surface 32a; and curved surface portions 14k connecting the upper surface portion 14m and the side surface portions 14e. By forming the setting member 14 in the shape in which the upper surface portion 14m and the side surface portions 14e are connected by the

curved surface portions 14k in this way, it is possible to suppress excessive bending of the hair H to be pressed against the setting member 14, and thereby to reduce the load to be applied to the hair H as much as possible.

[0120] Like the setting member 13, the setting member 14 is formed in a way that: the thickness of the rig 14a is thicker than the thicknesses of those in the above-described setting members 10, 11, and 12; and hence, a step formed between the upper surface portion 14m and the lower hair holding surface 32a is not too large.

[0121] Third protrusions 14h protruding upward are provided on the curved surface portion 14k. The third protrusions 14h are provided on both ends in the width direction of the setting member 14. Seven (multiple) third protrusions 14h are provided on each side at intervals in the longitudinal direction of the setting member 14.

[0122] The third protrusions 14h are those for combing out the hair H, and are formed in a way that: the outer surface of each third protrusion 14h in the width direction is flush with the corresponding side surface portion 14e; and a tip end (an upper part in Fig. 14) of the third protrusion 14h is shaped like a comb tooth. In this embodiment, the forming of the third protrusions 14h in the above-described shape makes it easy for the third protrusions 14h to be inserted to the base end portions of the hair H.

[0123] The curved surface portion 14k is provided with fourth protrusions 14i protruding in a curved manner. The fourth protrusions 14i are provided in both ends in the width direction of the setting member 14. Twelve (multiple) fourth protrusions 14i are provided on each side at intervals in the longitudinal direction of the setting member 14. In this embodiment, two fourth protrusions 14i are provided in each of the spaces between the mutually adjacent third protrusions 14h. The fourth protrusions 14i are those for orienting the hair H when pulling the hair iron device 100 down along the hair H, and are caused to protrude substantially along the curved shape of the curved surface portions 14k when viewed cross-sectionally in the width direction. In this embodiment, the forming of the fourth protrusions 14i in the above-described shape inhibits the fourth protrusions 14i from obstructing the hair styling when the hair H is curled with the curved surface portion 14k.

[0124] The use of the setting member 14 makes it possible to style the base end portions of the hair H, and thereby to set the hair H with more volume being given to the hair as a whole.

[0125] To be specific, the setting member 14 is firstly inserted to the base end portions of the hair while moving the setting member 14 along the scalp of a user, thereby holding the base end portions of the hair H between the upper hair holding surface 22a and the lower hair holding surface 32a. At this time, by coming out the hair H with the third protrusions 14h, it is possible to hold the base end portions of the hair H between the upper hair holding surface 22a and the lower hair holding surface 32a easily. Next, the base end portions of the hair H are pressed

against the curved surface portion 14k while holding the hair H. Then, the hair iron device 100 is slid along the hair H and pulled down toward hair tips, thereby reforming the base ends of the hair H and styling the hair H with volume being given to the hair as a whole.

[0126] As described above, it is possible to perform a variety of hair arrangement by preparing various types of setting members and appropriately changing these setting members.

[0127] The hair iron device 100 can also be used without attaching any of the setting members thereto. In this case, the hair H is set into a straight style. Nevertheless, it is also possible to style the hair H by using the upper and lower holding portions.

[0128] The hair iron device 100 according to this embodiment includes restricting members configured to restrict the relative movement of the upper holding portion 2b toward the lower holding portion 3b.

[0129] Specifically, a stopper protrusion 40 protruding downward is provided in a lower part of the case 20, which is close to the upper grip portion 2a, while a stopper groove portion 41 is provided in the top wall 30c of the case 30. Hence, the turn of the upper arm portion 2 and the lower arm portion 3 in the closing direction is restricted by causing a tip end of the stopper protrusion 40 to abut on a bottom surface of the stopper groove portion 41.

[0130] In this embodiment, the hair iron device 100 includes a variable unit configured to change an angle defined between the upper arm portion 2 and the lower arm portion 3 (a relative position of the upper holding portion 2b to the lower holding portion 3b) when restricting the turn of the upper arm portion 2 and the lower arm portion 3 in the closing direction (placing the restriction using the restricting members).

[0131] To be more specific, as shown in Fig. 15, the sliding member 50 is provided inside the case 30 in a way to be slidable in the longitudinal direction of the case 30, so that a groove depth of the stopper groove portion 41 can be changed by sliding the sliding member 50.

[0132] In this embodiment, the top wall 30c is provided with a through-hole 30k, while an upper surface 50a of the sliding member 50 is provided with a groove portion 51 having a bottom surface 50b. By sliding the sliding member 50, it is possible to switch between a state of causing the upper surface 50a to occlude a lower opening of the through-hole 30k as shown in Fig. 15(a) and a state of causing the through-hole 30k to communicate with the groove 51 as shown in Fig. 15(b).

[0133] As described above, in this embodiment, the depth of the stopper groove portion 41 is rendered variable by: forming the shallow groove with the through hole 30k and the upper surface 50a; and forming the deep groove with the through-hole 30k and the groove portion 51.

[0134] In this embodiment, the depth of the stopper groove portion 41 is rendered variable in conjunction with attachment and detachment of the setting members 10, 11, 12 and 14 to and from the lower holding portion 3b.

To be more specific, as shown in Fig. 17, Fig. 19, and Fig. 21, a sliding plate 52 configured to be pressed by the setting members 10, 11, 12 and 14 and to slide backward is integrally provided in the sliding member 50 with a connecting arm 53 interposed in between. Moreover, when attaching the setting members 10, 11, 12 and 14 to the lower holding portion 3b, the back end surfaces 10g, 11g, 12g and 14g of the setting members 10, 11, 12 and 14 abuts on a front end surface 52a of the sliding plate 52 halfway in the course of the attachment, whereby the sliding plate 52 is pressed backward in response to the backward slide of the setting members 10, 11, 12 and 14 and the sliding member 50 slides backward as a consequence. Then, in the state where the setting members 10, 11, 12 and 14 are attached to the lower holding portion 3b, the sliding member 50 slides to a position shown in Fig. 15(b). Thus, the through-hole 30k is made to communicate with the groove portion 51.

[0135] The sliding member 50 is biased forward by a biasing member, which is not illustrated. Accordingly, when the setting members 10, 11, 12 and 14 are detached from the lower holding portion 3b, the sliding member 50 moves forward and establishes the state shown in Fig. 15(a) (the state where the shallow groove is formed by the through-hole 30k and the upper surface 50a).

[0136] As described above, in this embodiment, the depth of the stopper groove portion 41 is increased when setting the hair H into the curled style by use of the setting members 10, 11, 12 and 14. Meanwhile, the depth of the stopper groove portion 41 is decreased when setting the hair H into the straight style by use of the setting member 13 or when styling the hair H without using the setting members. Hence, it is possible to establish an amount of the hair H to be held, a pressure to be applied to the hair, and so forth more suitably depending on the intended use.

[0137] To be more specific, when increasing the depth of the stopper groove portion 41, the upper hair holding portion 22a and the lower hair holding portion surface 32a are set up so as to be turnable to establish the state shown in Fig. 4(b) so that the hair held therebetween can be pressed against the curved surface 32b by use of the protrusions 20c. Meanwhile, when decreasing the depth of the stopper groove portion 41, the upper hair holding portion 22a and the lower hair holding portion surface 32a are set up so as for their turn in the closing direction to be restricted as in the state shown in Fig. 4(a) so that the hair H placed on the flat surface portion 131 of the setting member 13 is pressed by the protrusions 20c at appropriate pressure. Note that the depth of the groove can be appropriately set without limitation to the foregoing.

[0138] It is also possible to impart a photocatalytic function to the hair holding surfaces 22a, 32a. For example, it is possible to impart the photocatalytic function to the hair holding surfaces 22a, 32a by applying and thus coating coating members 22b and 32b, which contain

photocatalytic particles, onto the surfaces of the plate portion 22 and the plate portion 32 as shown in Fig. 22, or by causing the photocatalytic particles 22c and 32c to be contained in the plate portion 22 and the plate portion 32 as shown in Fig. 23.

[0139] When doing so, it is possible to impart a sterilizing function, a deodorizing function, and the like to the hair holding surfaces 22a, 32a.

[0140] Although various publicly-known materials including silver can be used as the material for causing the hair holding surfaces 22a, 32a to exert the photocatalytic function, it is preferable to use titanium dioxide in particular. By using titanium dioxide, it is possible to impart a hydrophilic property to the hair holding surfaces 22a, 32a, and to provide the hair with smooth and moist textures.

[0141] Now, an operation when using the hair iron device 100 to which the setting member 10 is attached will be described.

[0142] First, the setting member 10 is attached and the depth of the stopper groove portion 41 is increased, so that the upper arm portion 2 and the lower arm portion 3 can be turned until establishing the state shown in Fig. 4(b). Then, the upper hair holding surface 22a and the lower hair holding surface 32a are heated up to predetermined temperatures, respectively.

[0143] Then, the hair H is disposed between the upper holding portion 2b and the lower holding portion 3b opposed to each other in a way to extend in the width direction of the upper holding portion 2b and the lower holding portion 3b, and then the hair H is held between the upper hair holding surface 22a and the lower hair holding surface 32a. At this time, the case 20 is moved relative to the case 30, whereby the hair H is pressed downward by the protrusions 20c and pushed to the heated curved surface 32d. By pushing the hair H to the heated curved surface 32d in this way, it is possible to set the hair H, in which hydrogen bonds between hair fibers are broken, into the curled style. Hence, it is possible to set the hair H into the curled style easily. Moreover, the curl holding power of the hair H can be enhanced because it is possible to subject the hair fibers to hydrogen bonding with the hair H being curled.

[0144] Next, by making a half turn of the hair iron device 100 with the hair H being held in between, the base end sides of the hair H not held between the upper hair holding surface 22a and the lower hair holding surface 32a are pressed against the curling portions 10e of the setting member 10. Then, the hair iron device 100 is pulled down toward the hair tips while sliding along the hair H with the hair H being pressed against the curling portions 10e of the setting member 10, thereby setting the hair H into the curled style.

[0145] As described above, in this embodiment, the upper holding portion (the first holding portion) 2b is provided with the protrusions 20c configured to guide the hair H toward the lower holding portion (the second holding portion) 3b when holding the hair H between the upper hair holding surface (the first hair holding surface) 22a

and the lower hair holding surface (the second hair holding surface) 32a. Hence, it is possible to push the hair H toward the lower holding portion (the second holding portion) 3b by use of the protrusions 20c. As a consequence, before the hair H is styled by pressing the hair H against the setting member 10, the hair H can be styled by the protrusions 20. Accordingly, it is possible to style the hair H more certainly. As described above, according to the present invention, it is possible to set the hair H into desired styles more certainly.

[0146] When styling the hair H, it is preferable to maintain the hair H in a desired style by: breaking the hydrogen bonds between the hair fibers by applying heat energy to the hair H; then setting the hair H into the desired style (for example, the curled style) under such a state; and subjecting the hair fibers again to the hydrogen bonding by removing the heat energy with the hair H being set in the styled state.

[0147] However, according to the above-described related art entails the likelihood that: the hair once held between the heat generators and heated is cooled down before the hair abuts on the curling portion, and hence, the hair fibers are bonded again by hydrogen bonding when the hair is pressed against the curling portion. In this way, it is difficult to style the hair into the desired style if the hair having the hydrogen-bonded hair fibers is pressed against the curling portion.

[0148] On the other hand, in this embodiment, by providing the heaters (the heat generators) 23 and 33 configured to apply heat to the hair H held between the upper hair holding surface (the first hair holding surface) 22a and the lower hair holding surface (the second hair holding surface) 32a, it is possible to push the hair H, in which the hydrogen bonds between the hair fibers are broken by the application of heat energy, toward the lower holding portion (the second holding portion) 3b by use of the protrusions 20c. Hence, it is possible to style the hair H more certainly.

[0149] According to this embodiment, since the hair iron device 100 includes the multiple types of setting members 10 to 14, the single hair iron 1 can offer a variety of hair arrangements.

[0150] According to this embodiment, since the hair iron device 100 includes the setting members 10, 11, and 12 provided with the curling portions 10e, 11e, and 12e, it is possible to set the hair H into the curled style by using the setting members 10, 11, and 12.

[0151] According to this embodiment, since the hair iron device 100 includes the setting members 10, 11, and 12 provided with the curling portions 10e, 11e, and 12e having the mutually different curvatures, it is possible to curl the hair H at a desired degree of curve by changing the setting members to be attached to the hair iron device 100.

[0152] According to this embodiment, the curling portions 10e, 11e and 12e are provided on the side walls (side portions) 10b, 11b and 12b of the setting members 10, 11 and 12. Hence, it is possible to reduce a thickness

of the setting members, to reduce the size in the thickness direction of the setting members, and eventually to reduce the thickness of the hair iron device 100.

[0153] The setting member is provided only on the lower holding portion (the second holding portion) 3b. Accordingly, it is easier to replace the setting member, to reduce the number of components, thereby to simplify the configuration thereof. Moreover, since the hair H can be styled only by making a half turn of the hair iron device 100, it is possible to improve the usability of the hair iron device 100.

[0154] According to this embodiment, the curling portions 10e, 11e and 12e of the setting members 10, 11 and 12 in the state of being attached to the lower holding portion (the second holding portion) 3b is located below the lower hair holding surface (the second hair holding surface) 32a when the lower holding portion (the second holding portion) 3b is disposed with the lower hair holding surface (the second hair holding surface) 32 facing upward. Hence, it is possible to advance the hair H smoothly from the lower hair holding surface (the second hair holding surface) 32a to the curling portions 10e, 11e and 12e of the setting member 10, 11 and 12 via the protrusions 20c. Moreover, it is possible to suppress the excessive bending of the hair H halfway in the advancement, and to minimize the load to be applied to the hair H when curling.

[0155] According to this embodiment, the first protrusions 10h, 11h and 12h protruding upward are provided on the upper parts of the setting members 10, 11 and 12 in the state where: the setting members 10, 11 and 12 are attached to the lower holding portion (the second holding portion) 3b; and the lower holding portion (the second holding portion) 3b is disposed with the lower hair holding surface (the second hair holding surface) 32 facing upward. In addition, the multiple first protrusions 10h, 11h and 12h are provided at the interval in the longitudinal direction of the setting members 10, 11 and 12 (in the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface). For this reason, when the hair iron device 100 is pulled down along the hair H, it is possible to orient the hair H by using the first protrusions 10h, 11h and 12h. Moreover, it is possible to suppress deviation of the hair H held between the upper hair holding surface (the first hair holding surface) 22a and the lower hair holding surface (the second hair holding surface) 32a from regions covered by the hair holding surfaces 22a, 32a, and to suppress incapability of pressing the hair H against the setting members 10, 11 and 12. In this way, by providing the first protrusions 10h, 11h and 12h, it is possible to orient the hair H by causing the hair H to enter the spaces between the first protrusions 10h, 11h and 12h, and thereby to curl the hair H more evenly.

[0156] According to this embodiment, when in the state where the setting member 13 is attached to the lower holding portion (second holding partition) 3b while the lower holding portion (second holding portion) 3b is dis-

posed with the lower hair holding surface (second hair holding surface) 32b facing upward, the hair iron device 100 includes the setting member 13 which is provided with the flat surface portion 131 on the rib (the upper part) 13a, and in which the flat portion 131 is located below the lower hair holding surface (the second hair holding surface) 32a. By attaching this setting member 13 to the lower holding portion (the second holding portion) 3b, the hair H held between the upper hair holding surface (first hair holding surface) 22a and the lower hair holding surface (second hair holding surface) 32a can be brought into contact with the flat surface portion 131 of the setting member 13. Thereby, the hair H can be set straighter than when the setting member 13 is detached. Since the flat surface portion 131 is provided in a way to be located below the lower hair holding surface (second hair holding surface) 32a, it is possible to achieve a smoother flow of the hair H, and to reduce a load to be applied to the hair H.

[0157] According to this embodiment, the second protrusions 13h protruding upward are formed on the flat surface portion 131. Moreover, the multiple second protrusions 13h are provided at intervals in the longitudinal direction of the setting member 13 (the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface). For these reasons, it is possible to orient the hair by guiding the hair H into the spaces between the second protrusions 13h, and thereby to set the hair H straighter.

[0158] According to this embodiment, when in the state where the setting member 14 is attached to the lower holding portion (second holding portion) 3b while the lower holding portion (second holding portion) 3b is disposed with the lower hair holding surface (second hair holding surface) 32a, the hair iron device 100 includes the setting member 14 provided with: the upper surface portion 14m, which is formed substantially parallel to the lower hair holding surface (second hair holding surface) 32a, in an upper part thereof; the side surface portions 14e, which are formed substantially perpendicular to the lower hair holding surface (second hair holding surface) 32a, in sidewalls (side parts) thereof; and the curved surface portion 14k connecting the upper surface portion 14m and the side surface portions 14e. Moreover, in the setting member 14, the third protrusions 14h protruding upward are provided on the curved surface portion 14k, and the multiple third protrusions 14h are provided at intervals in the longitudinal direction of the setting member 14 (the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface). By attaching this setting member 14 to the lower holding portion (the second holding portion) 3b, it is possible to style the base end portions of the hair H, and thereby to set the hair H with volume being given to the hair H as a whole.

[0159] Since it is possible to comb out the hair H by providing the third protrusions 14h, the hair holding surfaces 22a and 32a can be inserted more smoothly into

the base end portions of the hair H, thereby styling the hair H starting from the locations closer to the base ends.

[0160] According to this embodiment, the fourth protrusions 14i protruding in the curved manner are provided on the curved surface portion 14k, and the multiple fourth protrusions 14i are provided at the intervals in the longitudinal direction of the setting member 14 (the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface). For this reason, it is possible to orient the hair H by guiding the hair H into the spaces between the fourth protrusions 14i, and thereby to set the hair H with more even volume being given to the hair H as a whole.

[0161] According to this embodiment, the hair iron device 100 includes the restricting members (the stopper protrusion 40 and the stopper groove portion 41) configured to restrict the relative movement of the upper holding portion (the first holding portion) 2b toward the lower holding portion (the second holding portion) 3b. For this reason, it is possible to suppress the application of an excessive load to the hair H held between the upper hair holding surface (the first hair holding surface) 22a and the lower hair holding surface (the second hair holding surface) 32a, and thereby to suppress damage on the hair H.

[0162] According to this embodiment, the hair iron device 100 includes the variable unit configured to change the relative position of the upper holding portion (the first holding portion) 2b to the lower holding portion (the second holding position) 3b at the time of the restriction by the restricting members (the stopper protrusion 40 and the stopper groove portion 41). For this reason, it is possible to change the relative position of the upper holding portion (the first holding portion) 2b to the lower holding portion (the second holding position) 3b at the time of the restriction depending on the hair styling type (the curled style, the straight style, and the like), and to achieve an optimum state of the load to be applied to the hair H held between the upper hair holding surface (the first hair holding surface) 22a and the lower hair holding surface (the second hair holding surface) 32a.

[0163] By providing the hair iron device 100 with the variable unit as described above, it is possible to use the hair iron device 100 in the optimum state irrespective of the hair styling type (the curled style, the straight style, and the like).

[0164] According to the present invention, it is possible to attach and detach the setting members 10 to 14 to and from the hair iron 1 easily by providing the setting members 10 to 14 and the hair iron 1 with the fitting members (the fitting recessed portion 10f, 11f, 12f, 13f and 14f and the fitting protrusion 61) which are releaseably engageable with each other.

[0165] In this embodiment, the setting members 10 to 14 are provided on the lower holding portion (the second holding portion) 3b where the hair holding surface does not move. Moreover, the setting members 10 to 14 are

also provided with the protrusions 10h, 11h, 12h, 13h and 141 for orienting the hair H. It is possible to further enhance the effect of orientation of the hair by providing the protrusions 10h, 11h, 12h, 13h and 141 for orienting the hair H on the fixed side (on the side where the hair holding surface does not move) which has higher adhesion and is capable of exerting a stronger orientation effect as compared to the holding portion where the hair holding surface is movable.

[0166] The embodiment of the present invention has been described above. However, it is to be noted that: the present invention is not limited only to this embodiment; and various modifications can be made.

[0167] For example, the present invention is also applicable to a hair iron device provided with an ion generator such as a mist generator or a metal particulate generator.

[0168] Although the embodiment is configured to render the depth of the stopper groove portion variable in conjunction with the attachment and detachment of the setting member to and from the holding portion, the depth of the stopper groove portion may be changed independently of the attachment and detachment of the setting member.

[0169] The embodiment has exemplified the configuration to attach the setting member to the holding portion while sliding the setting member. However, the invention is not limited only to this configuration. The setting member may be attached to the holding member by fitting a back surface of the holding member into an aperture of the setting member, for example.

[0170] It is also possible to set the types and numbers of setting members as appropriate.

[0171] It is also possible to alter specifications (the shape, the size, the layout, and the like) of the hair holding surfaces, the setting member, the grip portions, and other details as appropriate.

Claims

1. A hair iron device comprising:

a hair iron including a first holding portion having a first hair holding surface and a second holding portion having a second hair holding surface configured to hold hair with the first hair holding surface; and
a setting member detachably provided on the second holding portion and configured to style hair,
wherein the first holding portion includes a protrusion configured to guide hair held between the first hair holding surface and the second holding surface toward the second holding portion.

2. The hair iron device according to claim 1, wherein

at least one of the first holding portion and the second holding portion includes a heat generator configured to heat hair held between the first hair holding surface and the second hair holding surface.

3. The hair iron device according to claim 1, further comprising a plurality of types of setting members.

4. The hair iron device according to any one of claims 1 to 3, further comprising a first setting member having a first curling portion.

5. The hair iron device according to claim 4, further comprising a second setting member having a second curling portion with a curvature different from a curvature of the first curling portion, in addition to the first setting member.

6. The hair iron device according to claim 4, wherein the first setting member has the first curling portion in a side portion of the first setting member.

7. The hair iron device according to claim 4, wherein the first curling portion of the first setting member attached to the second holding portion with the second hair holding surface facing upward is located below the second hair holding surface.

8. The hair iron device according to claim 1 or 2, wherein the setting member attached to the second holding portion with the second hair holding surface facing upward includes first protrusions protruding upward on an upper part of the setting member, and the first protrusions are provided at an interval in a direction intersecting an extending direction of hair held between the first hair holding surface and the second hair holding surface.

9. The hair iron device according to claim 1 or 2, wherein the setting member attached to the second holding portion with the second hair holding surface facing upward has a flat surface portion located below the second hair holding surface in an upper part of the setting member.

10. The hair iron device according to claim 9, wherein the flat surface portion includes second protrusions protruding upward, and the second protrusions are provided at an interval in a direction intersecting an extending direction of hair held between the first hair holding surface and the second hair holding surface.

11. The hair iron device according to claim 1 or 2, wherein, the setting member attached to the second holding portion with the second hair holding surface facing

upward has:

an upper surface portion parallel to the second hair holding surface in an upper part of the setting member; 5
 a side surface portion perpendicular to the second hair holding surface in a side part of the setting member; and
 a curved surface portion connecting the upper surface portion and the side surface portion, 10

the curved surface portion includes third protrusions protruding upward, and
 the third protrusions are provided at an interval in a direction intersecting an extending direction of hair held between the first hair holding surface and the second hair holding surface. 15

12. The hair iron device according to claim 11, wherein the curved surface portion has fourth protrusions protruding in a curved manner, and
 the fourth protrusions are provided at an interval in the direction intersecting the extending direction of the hair held between the first hair holding surface and the second hair holding surface. 20 25

13. The hair iron device according to any one of claims 1 to 3, further comprising a restricting member configured to restrict relative movement of the first holding portion toward the second holding portion. 30

14. The hair iron device according to claim 13, further comprising a variable unit configured to change a relative position of the first holding portion to the second holding portion at a time of restriction by the regulating member. 35

15. The hair iron device according to claim 1 or 2, wherein the setting member and the hair iron include fitting portions removably fitted to each other. 40

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FIG. 1

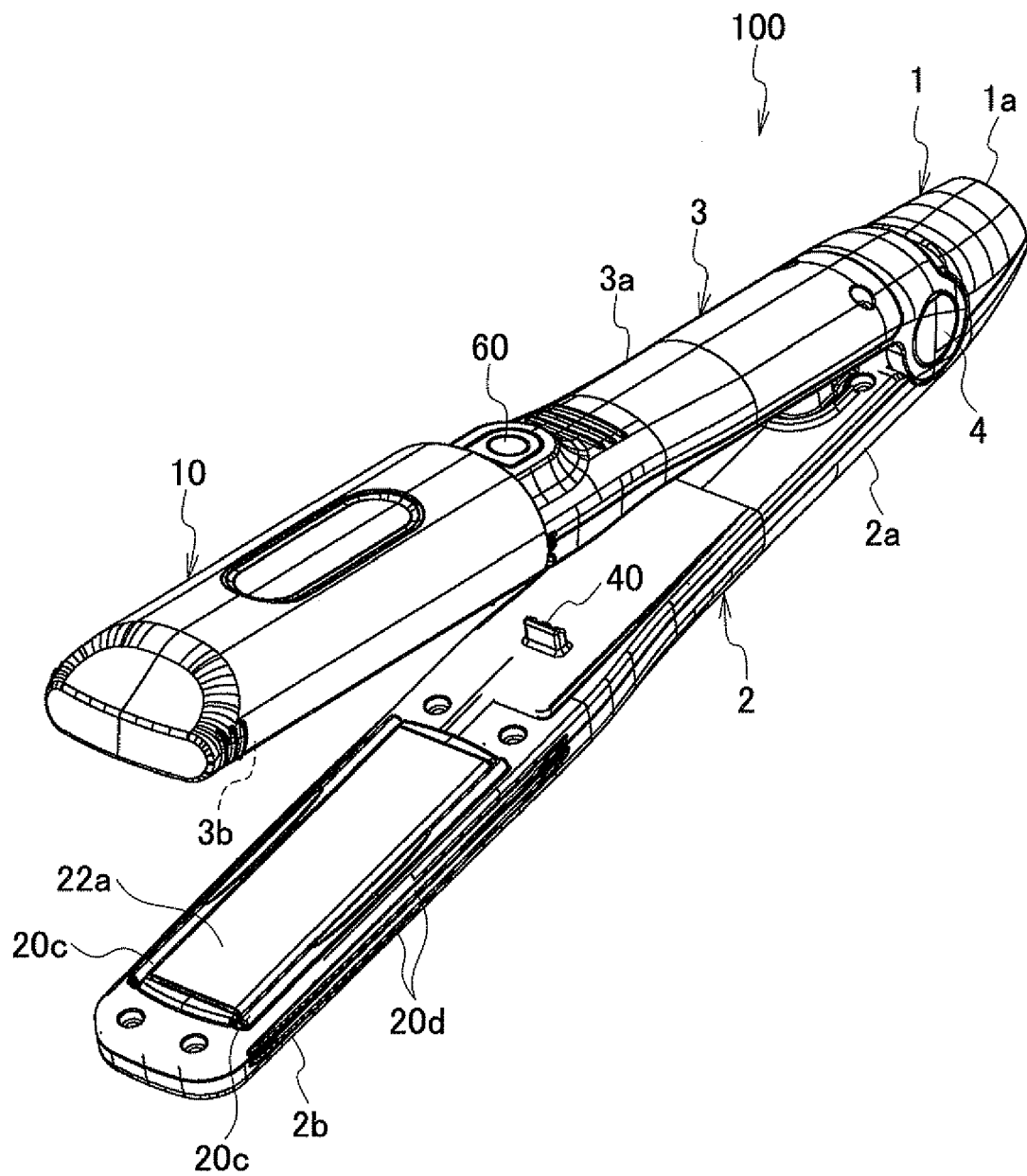


FIG. 2

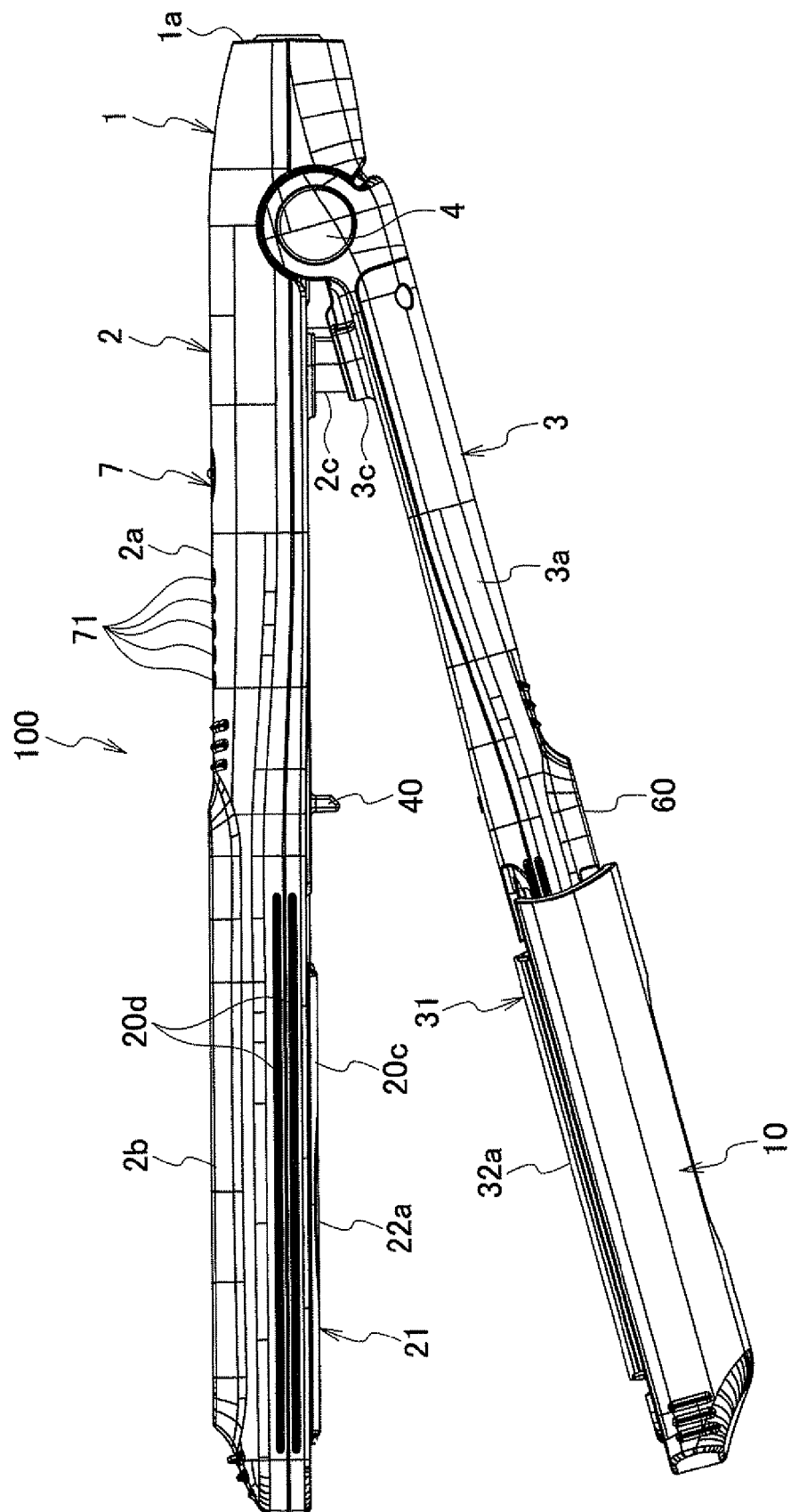


FIG. 3

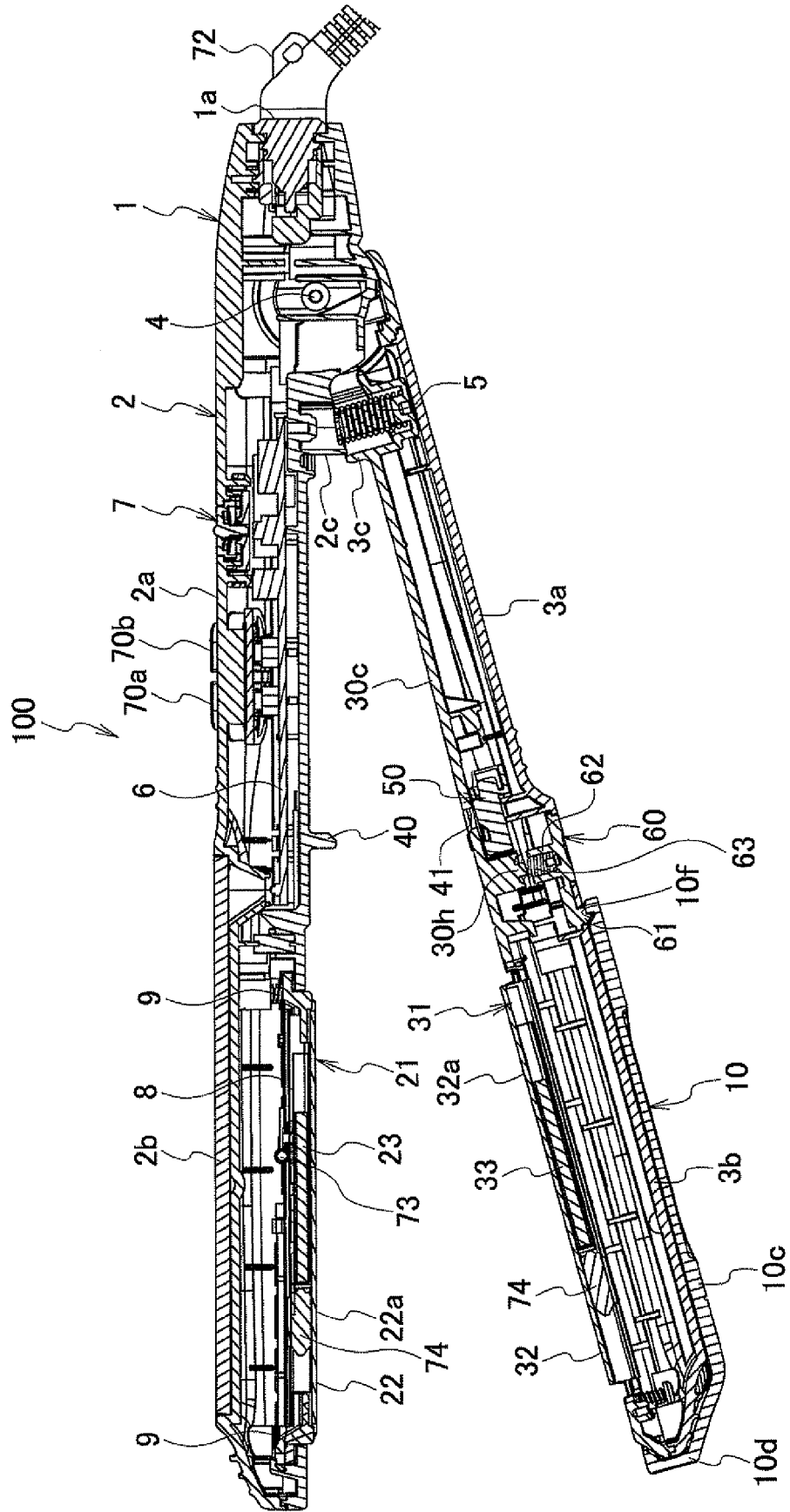


FIG. 4

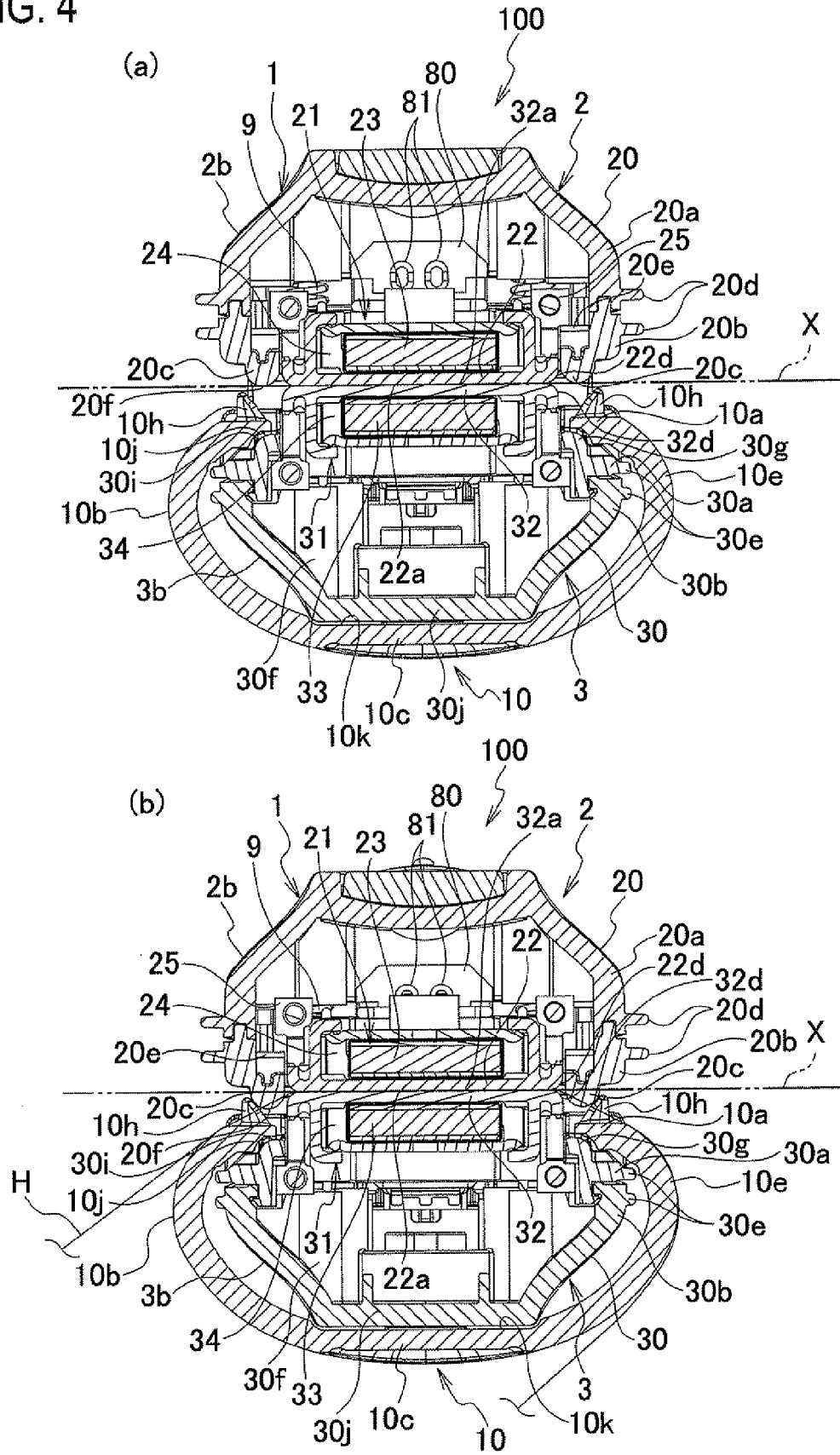


FIG. 5

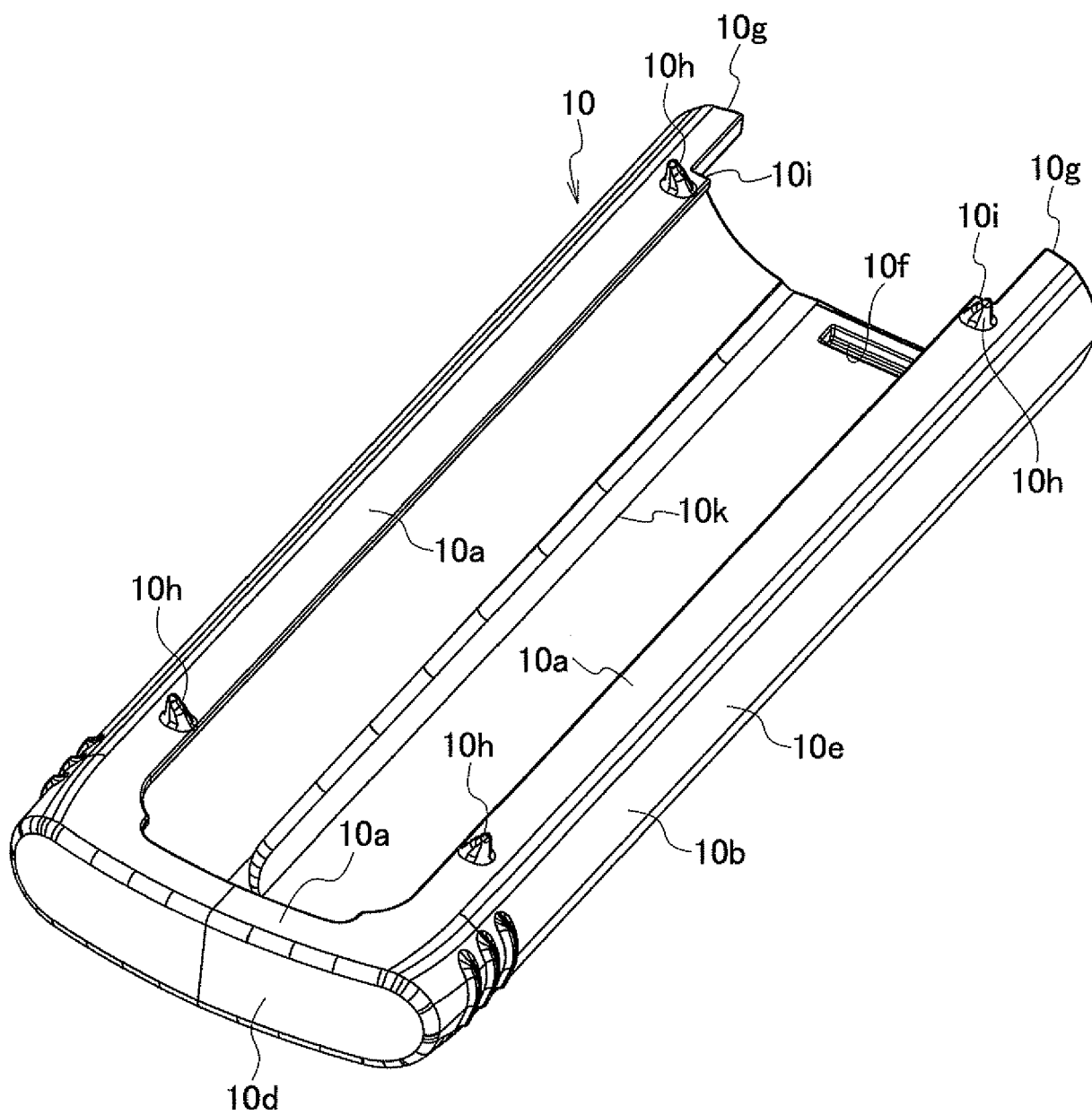


FIG. 6

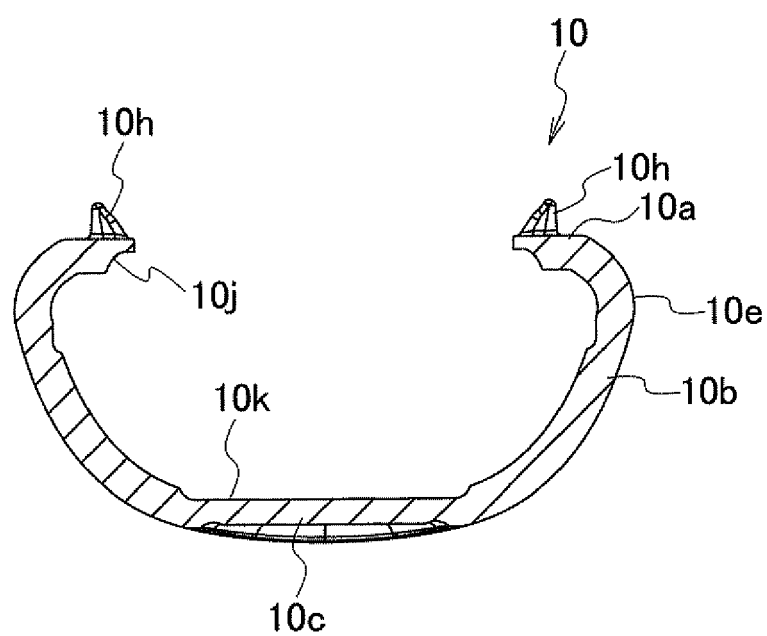


FIG. 7

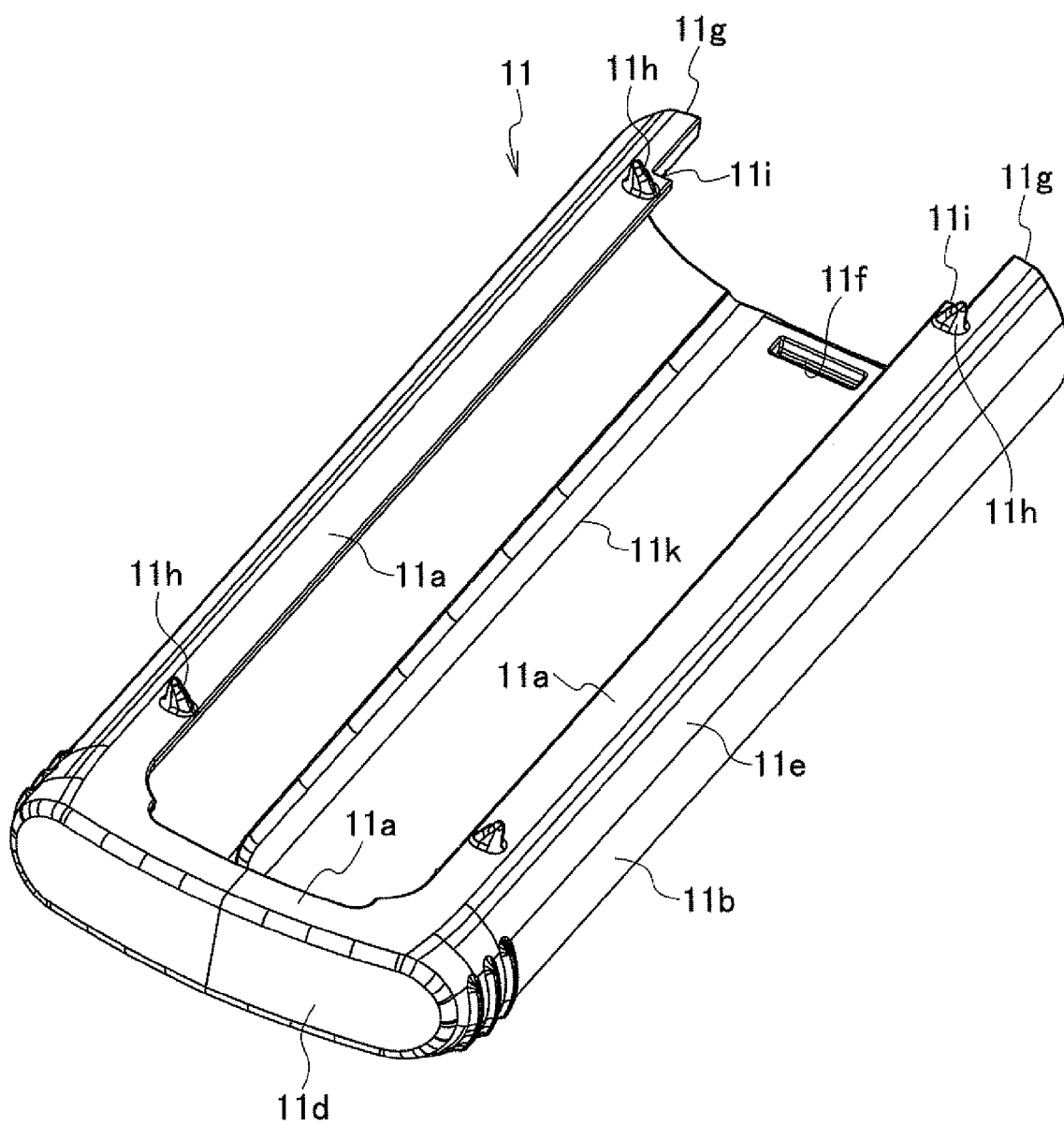


FIG. 8

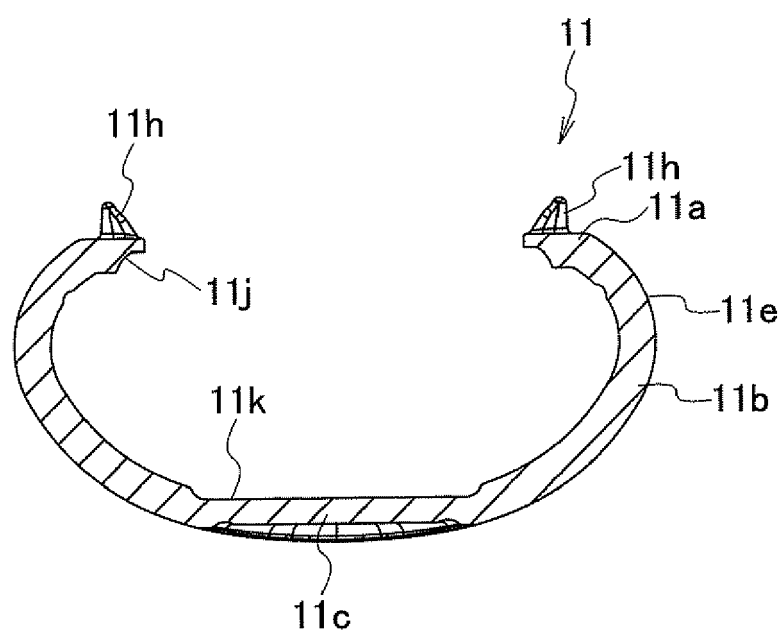


FIG. 9

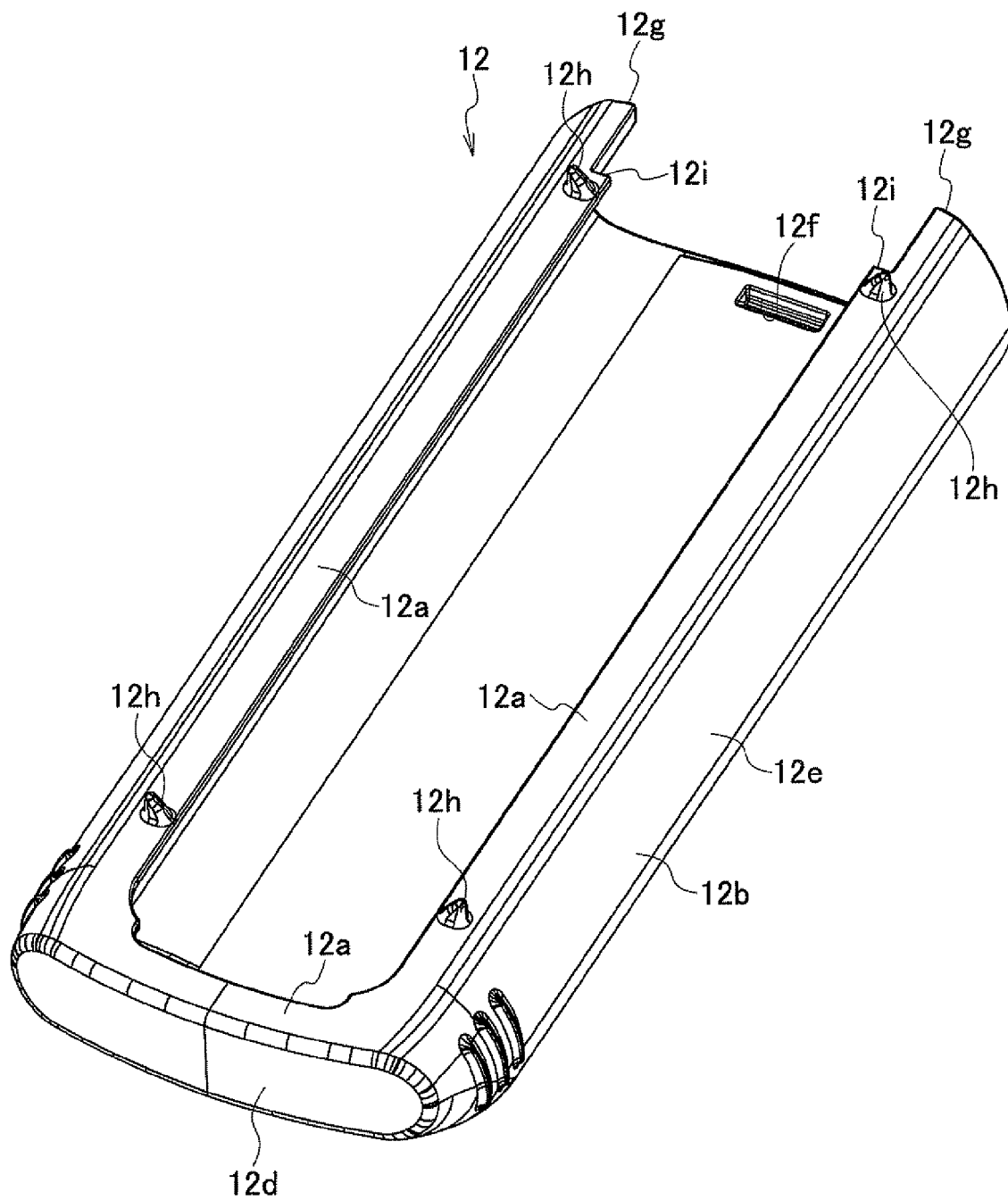


FIG. 10

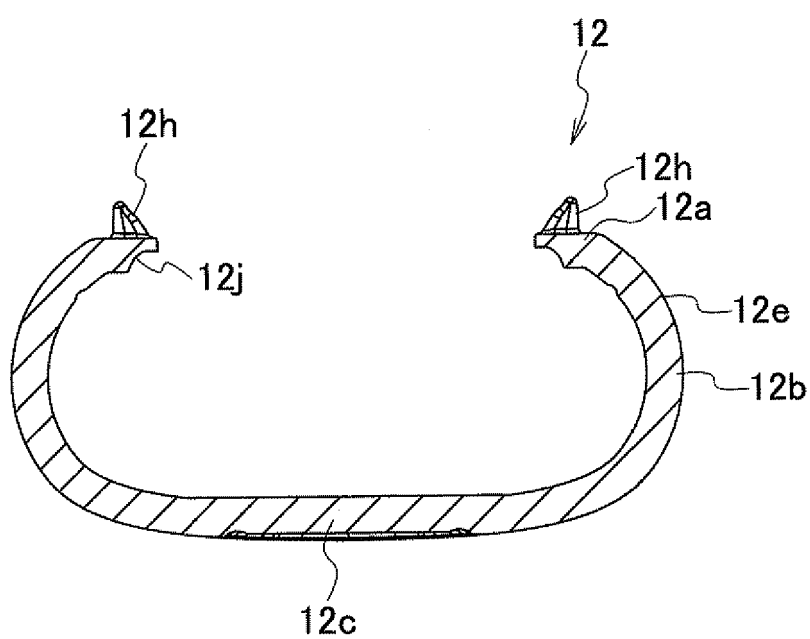


FIG. 11

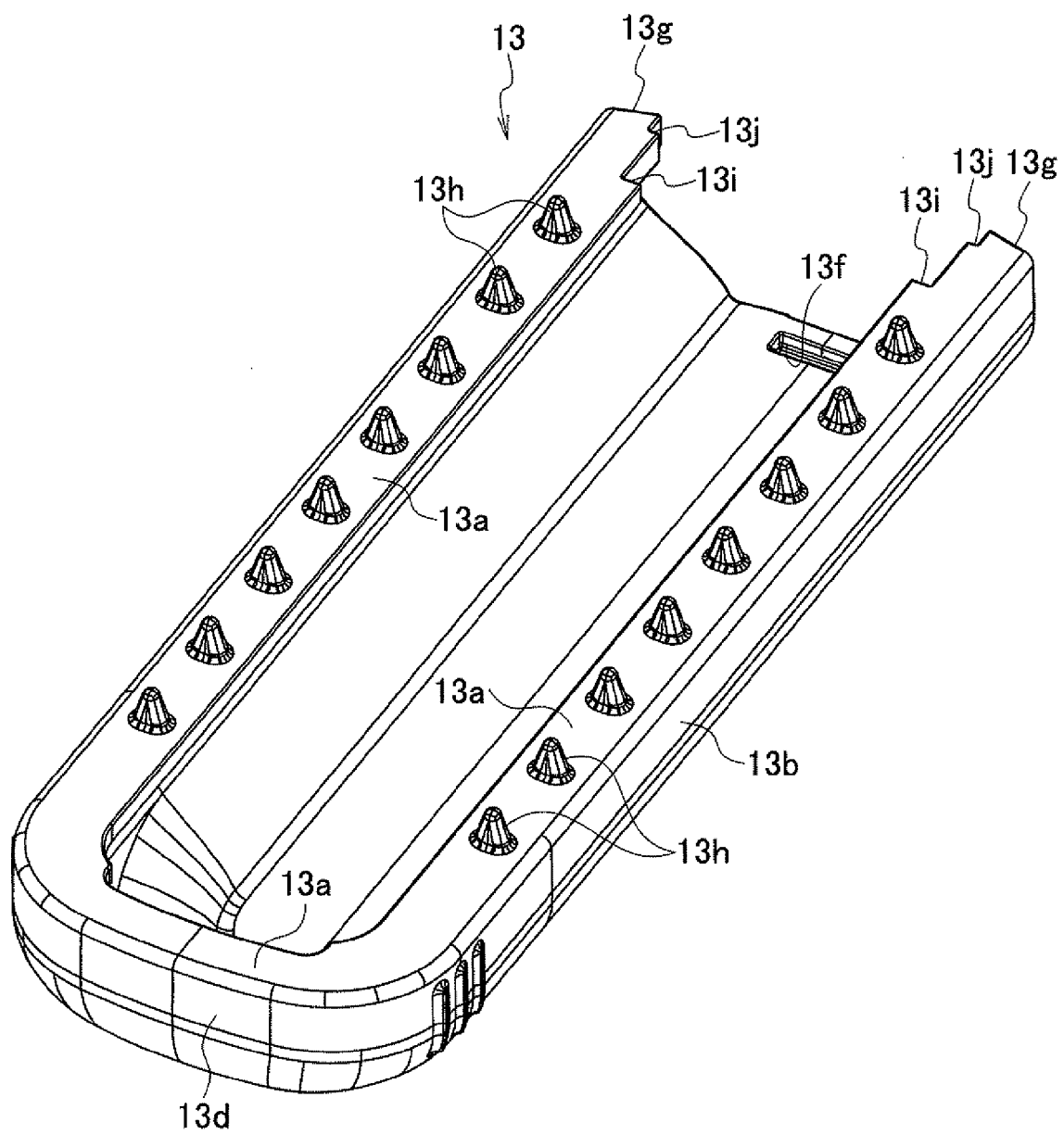


FIG. 12

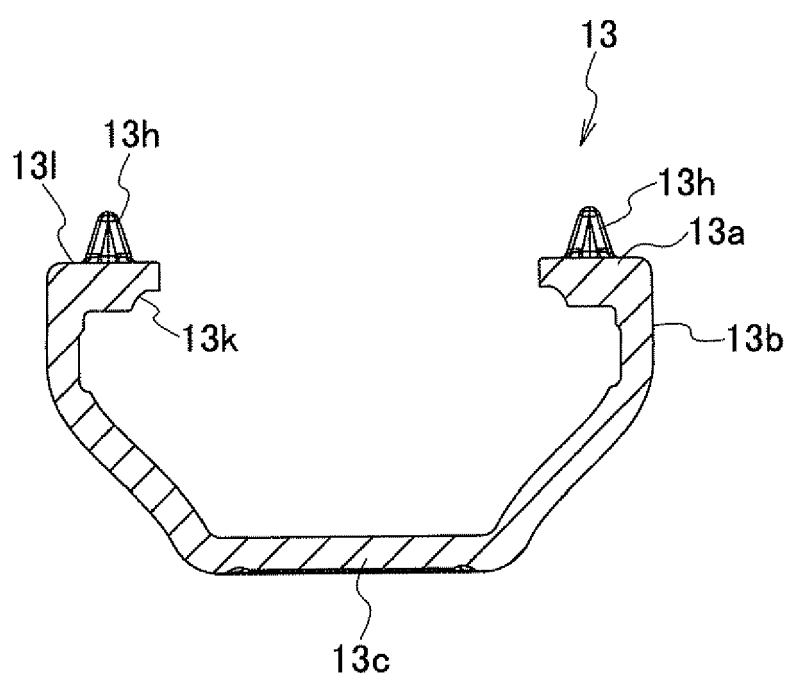


FIG. 13

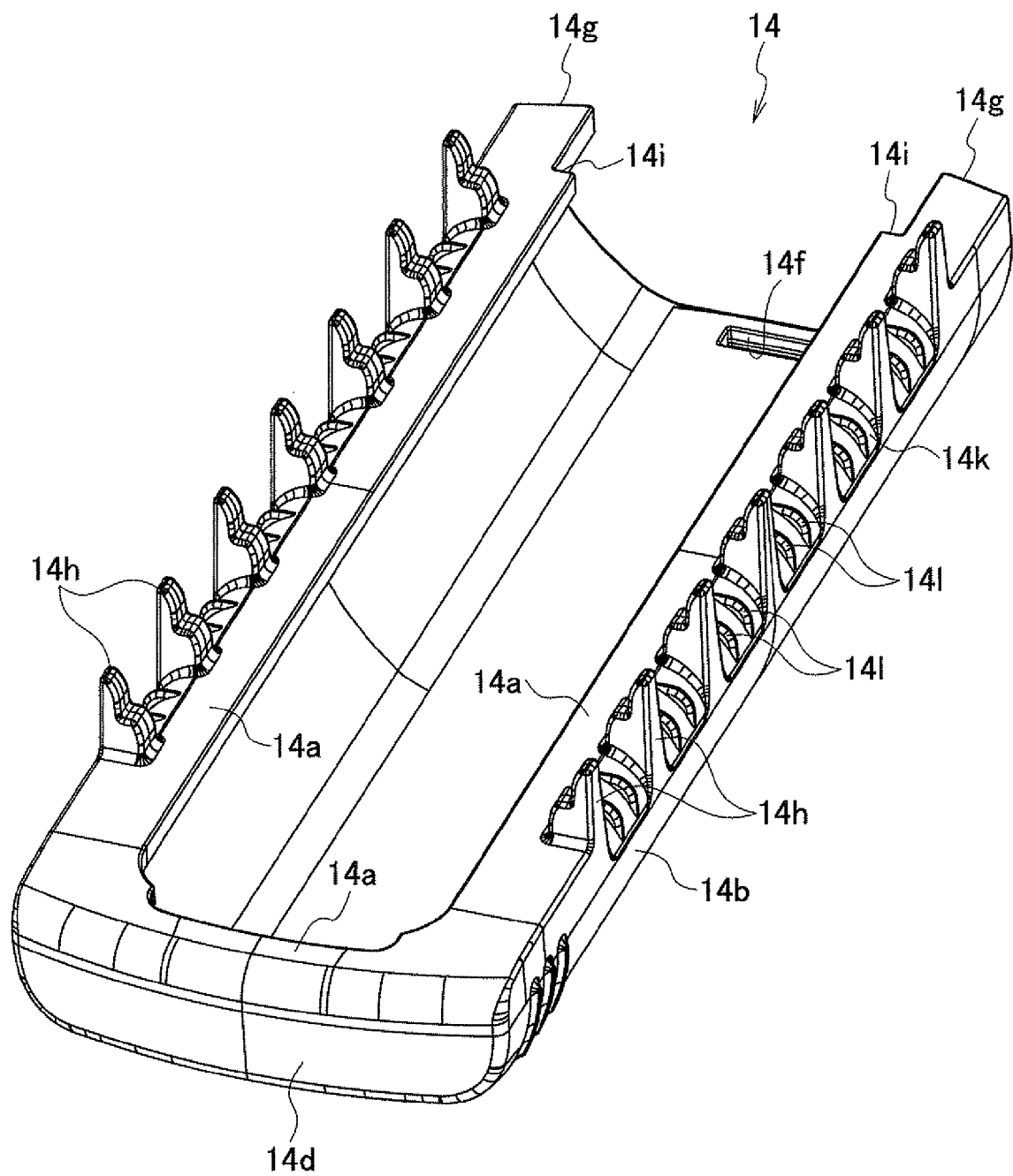


FIG. 14

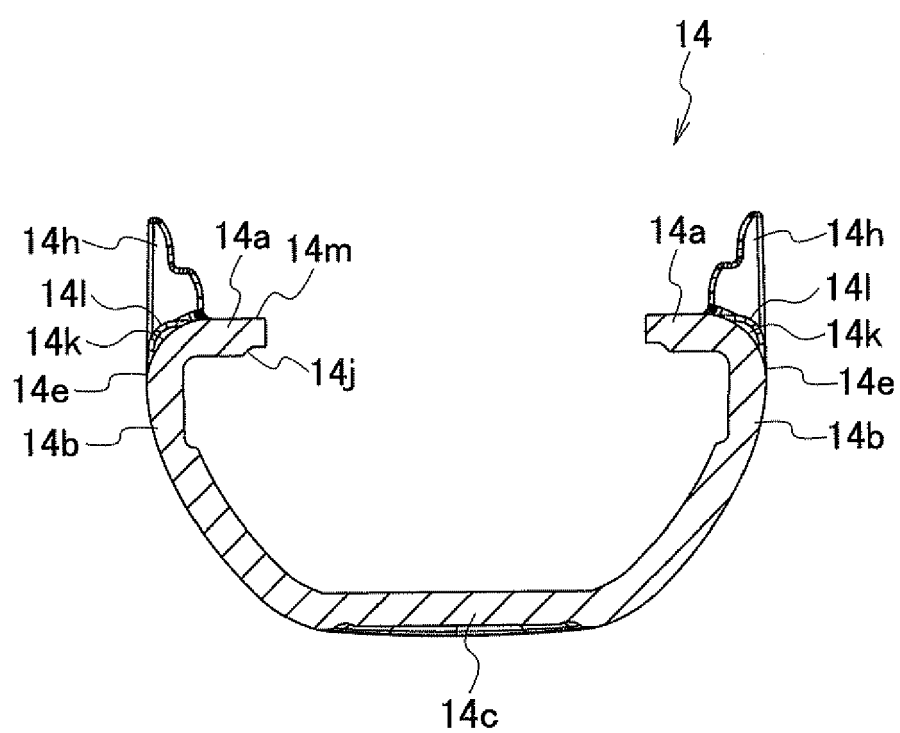


FIG. 15

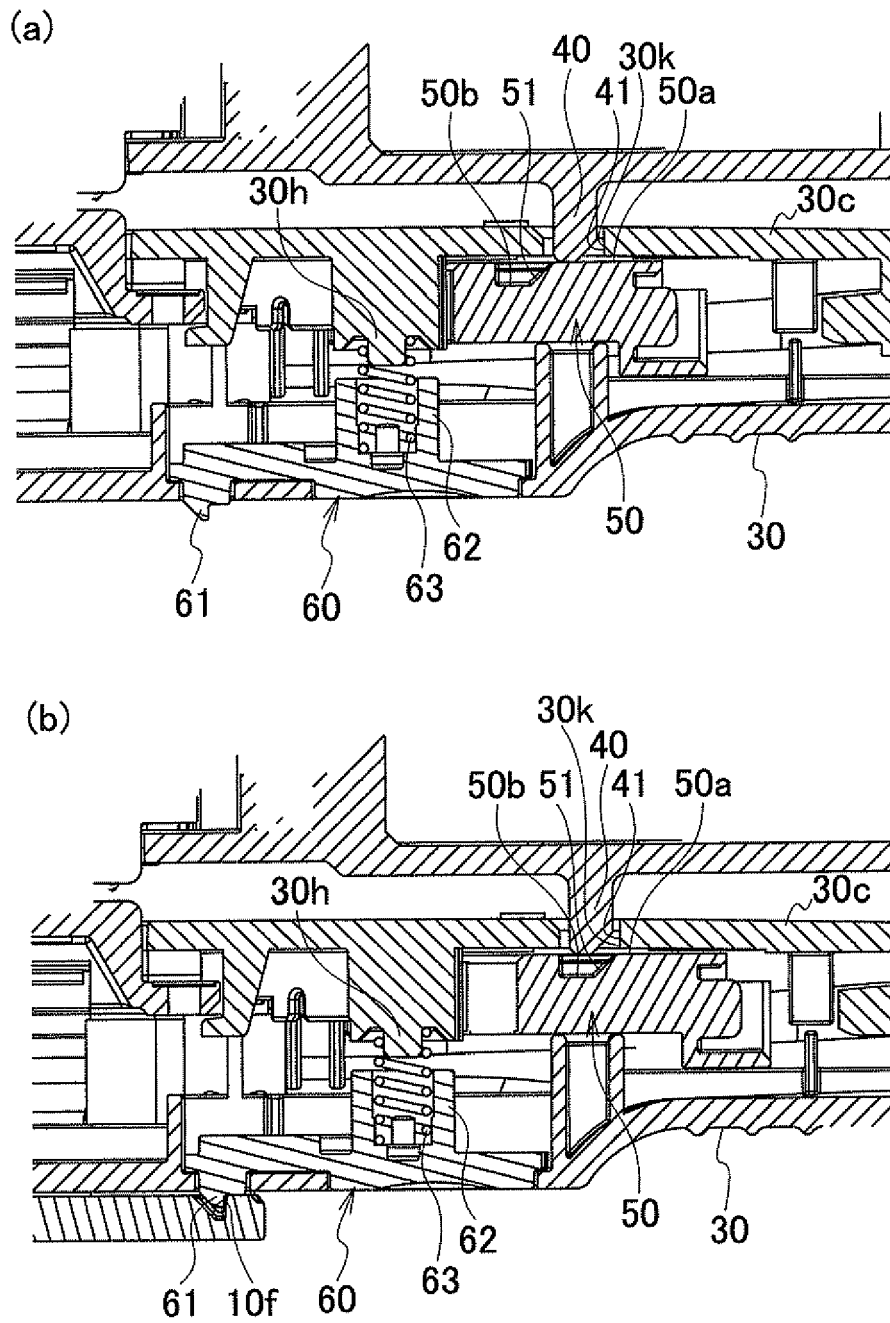


FIG. 16

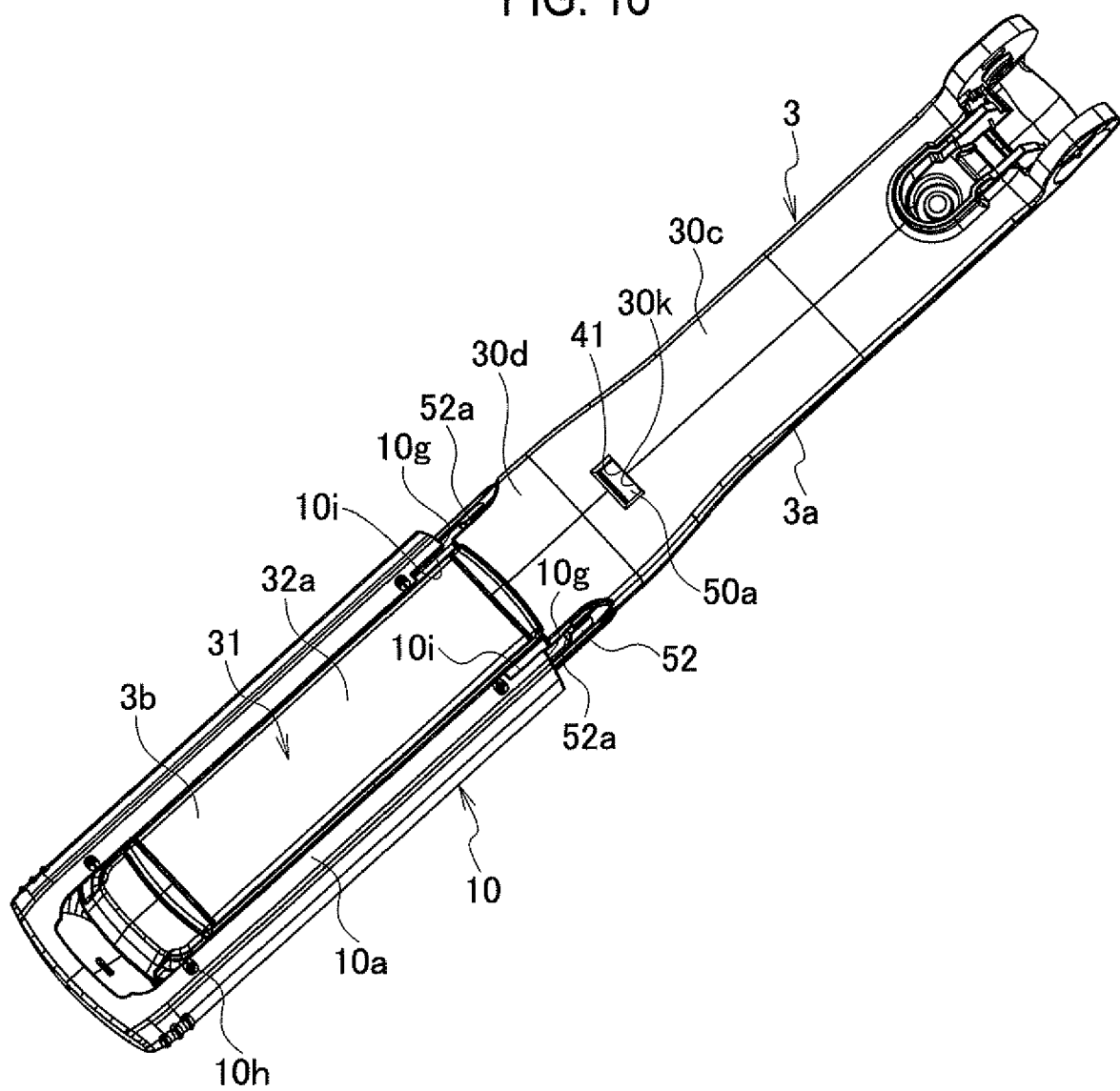


FIG. 17

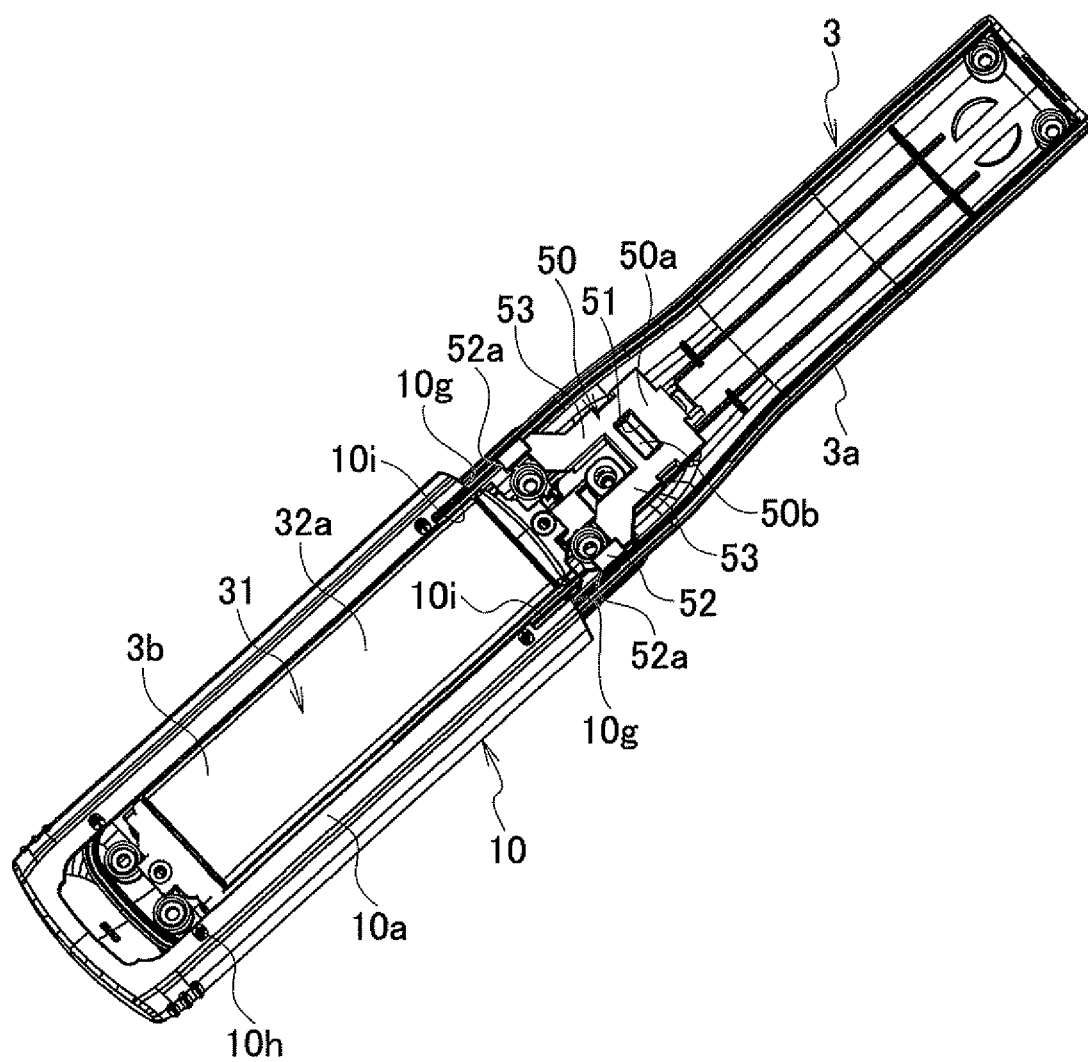


FIG. 18

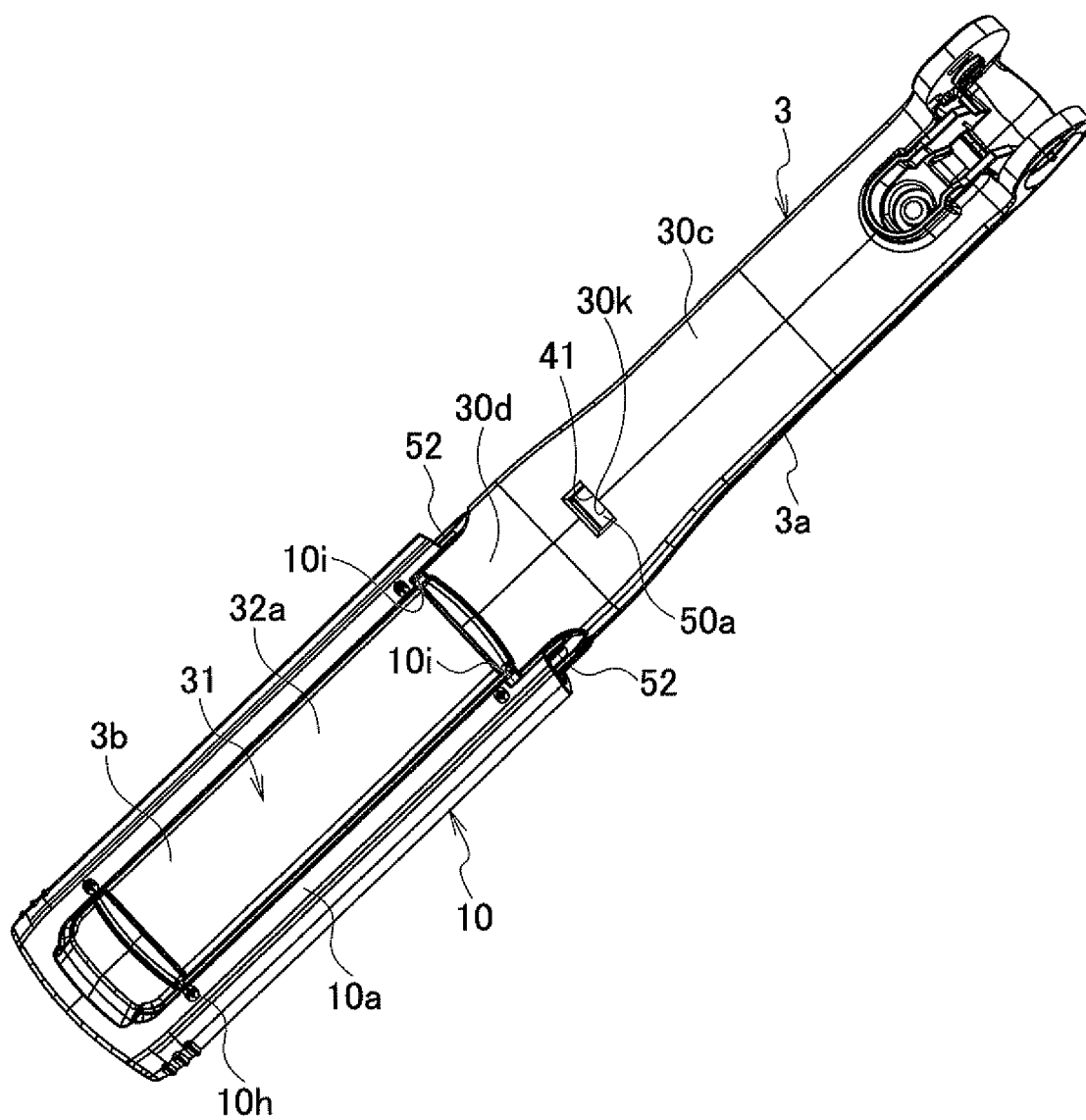


FIG. 19

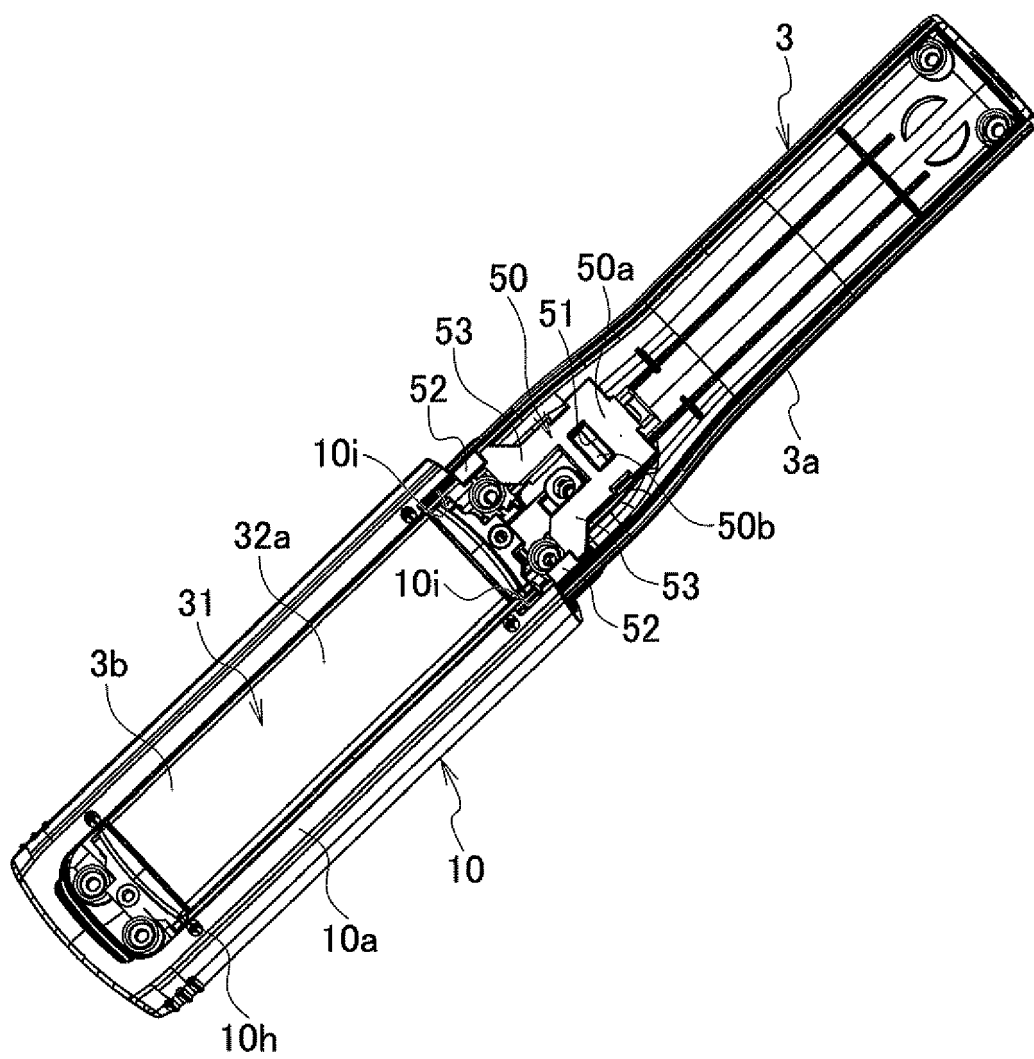


FIG. 20

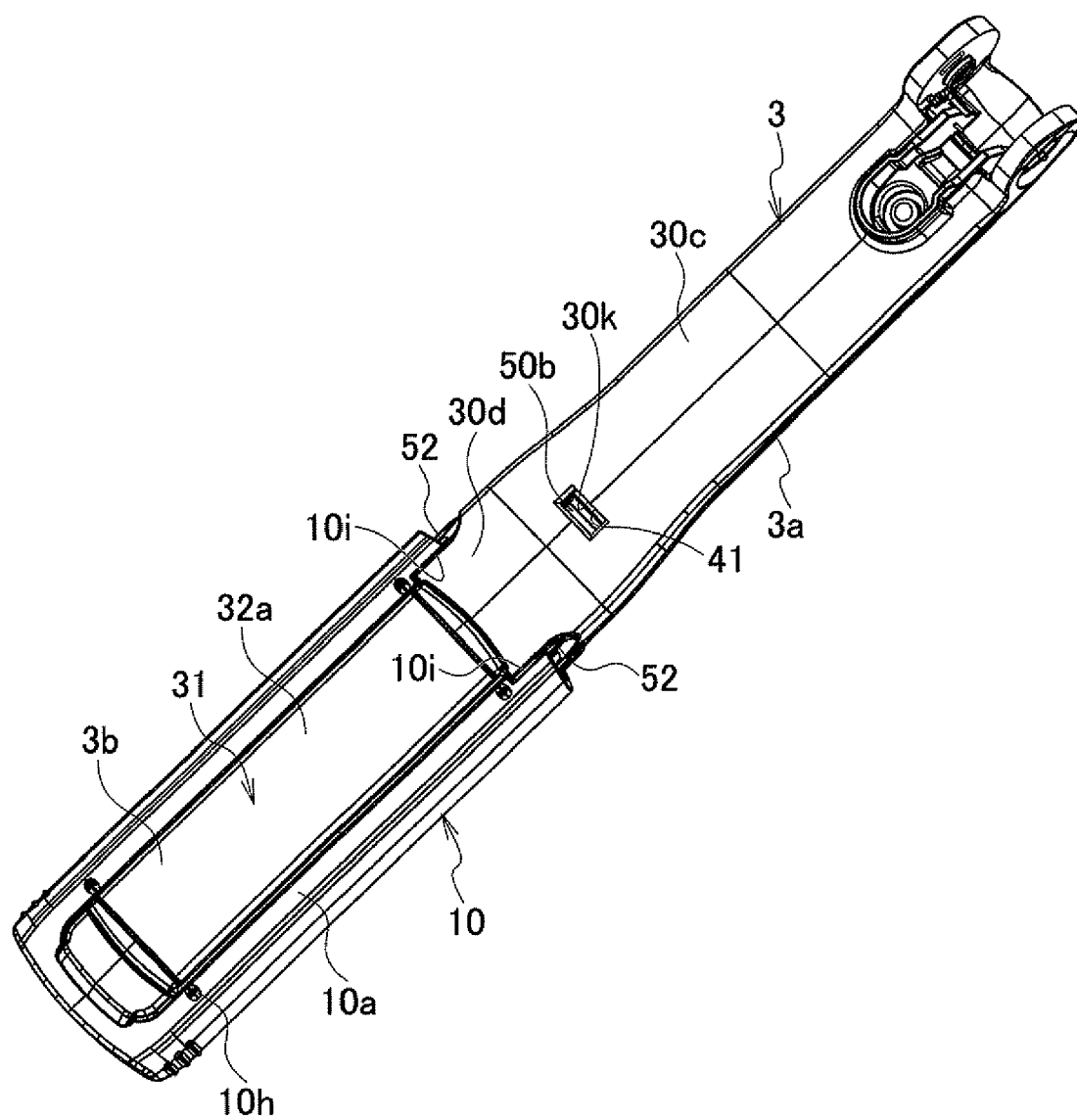


FIG. 21

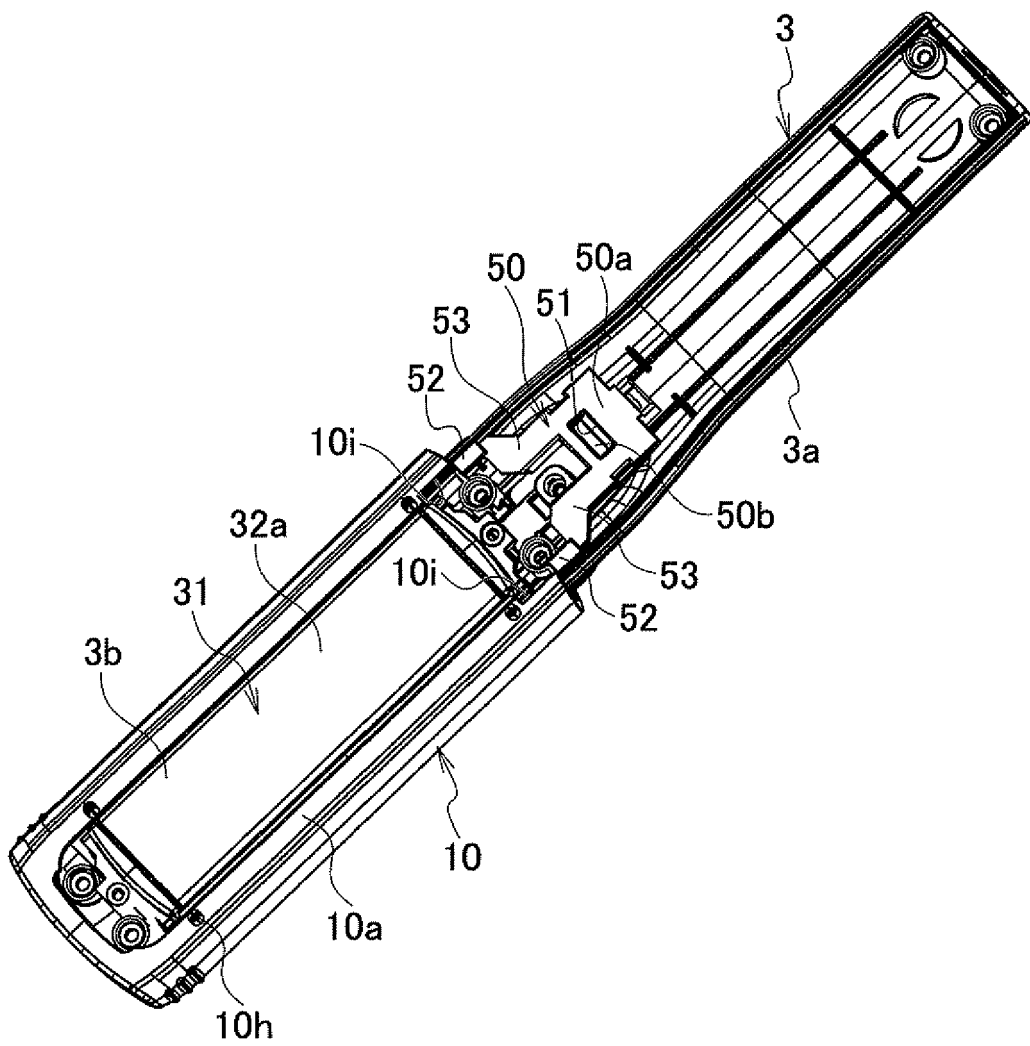


FIG. 22

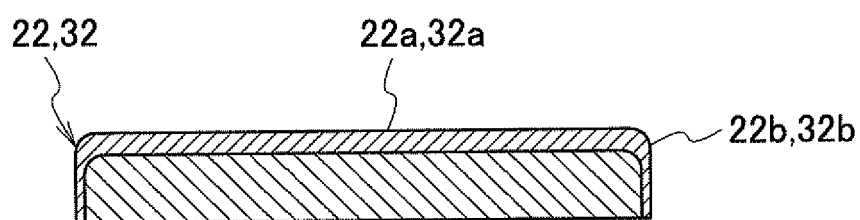
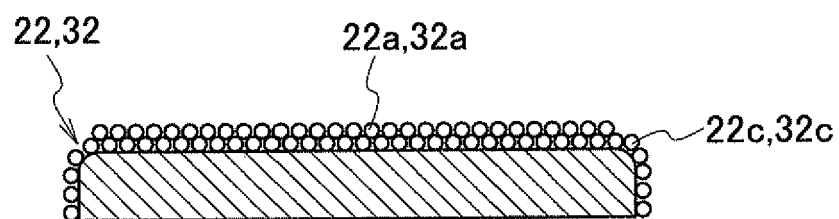


FIG. 23





EUROPEAN SEARCH REPORT

Application Number
EP 10 18 9917

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,P	EP 2 208 433 A1 (SEB SA [FR]) 21 July 2010 (2010-07-21) * paragraphs [0037] - [0044]; figures 1,2 *	1-3,8, 13,14	INV. A45D1/04 A45D1/08
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X	EP 0 273 538 A2 (TOYOSAKU TAKIMAE) 6 July 1988 (1988-07-06) * column 1, lines 1-3; figures 1,2 * * column 2, line 29 - column 3, line 38 *	1,2	
A,P	EP 2 165 620 A1 (FUTEK INC [JP]) 24 March 2010 (2010-03-24) * paragraphs [0007] - [0010], [0 27] - [0051]; figures 1-6 *	1-5,15	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 March 2011	Examiner Escudero, Raquel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 18 9917

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The members are as contained in the European Patent Office EDP file on
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11-03-2011

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