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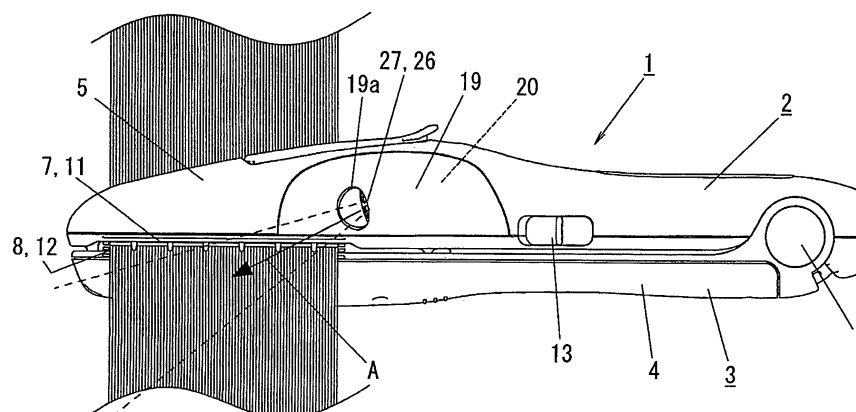
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(54) **Hair iron**

(57) A hair iron (1) includes a main block (2) and a press block (3) hinged with each other at rear ends thereof in which iron plates (11,12) respectively installed at front portions of the main block (2) and the press block (3) are pivotally movable to contact with and separate from each other. The hair iron (1) further includes an electrostatic atomizer (20) for generating charged water particles by applying a voltage to water supplied to a discharge electrode (21) and electrostatically atomizing the

water. The electrostatic atomizer (20) includes dischargers (27) for discharging the charged water particles, the dischargers (27) being disposed on opposite lateral sides of the main block (2). The charged water particles are discharged from the dischargers (27) of the electrostatic atomizer (20) in such a way that they move away from the main block (2) while being directed to intersect with an imaginary plane laterally extending from the sides of a pinch face (7) of the iron plate (11) of the main block (2).

FIG. 1



Description

Field of the Invention

[0001] The present invention relates to a hair iron, which pinches, heats and grooms hair.

Background of the Invention

[0002] Up to now, a hair iron, which pinches, heats and grooms hair, has been equipped with a negative ion generator to provide negative ions to the hair, thereby endowing the hair with care effects such as good moisture-retention capability and a good feeling (see, e.g., Japanese Patent Laid-open Application No. 2004-41759).

[0003] Specifically, in such a hair iron, a main block and a press block, which are arranged vertically, are hinged with each other at the rear ends thereof so that iron plates provided at leading portions of the main and press blocks can be pivoted to contact with and separate from each other. Further, the pinching face of the iron plate of the main block has steam discharge openings which discharge steam generated by a steam generator, or ion discharge openings which discharge negative ions generated by a negative ion generator.

[0004] However, in this hair iron, pinching and heating the hair is concurrent with providing the negative ions. Therefore, the hair iron pinches and heats the hair without supplying sufficient moisture, thereby causing damage to the hair; or the hair iron pinches and heats the hair after endowing the hair with the negative ions, thereby diminishing the effects of the negative ions (hair care effects). Further, because steam, generated by basically evaporating water, is made up of large water particles, it has difficulty in infiltrating into the hair, and thus in reliably creasing the hair.

Summary of the Invention

[0005] It is, therefore, an object of the present invention to provide a hair iron that prevents the hair from being damaged while being pinched and heated and increases the reliability with which hair is creased when the hair is groomed, so that hair care effects are not deteriorated by pinching and heating the hair after grooming the hair and such effects can be applied to all of the hair.

[0006] In accordance with an aspect of the present invention, there is provided a hair iron including a main block and a press block hinged with each other at rear ends thereof in which iron plates respectively installed at front portions of the main block and the press block are pivotally movable to contact with and separate from each other, the hair iron further including: an electrostatic atomizer for generating charged water particles by applying a voltage to water supplied to a discharge electrode and electrostatically atomizing the water, wherein the electrostatic atomizer includes dischargers for discharging the charged water particles, the dischargers being dis-

posed on opposite lateral sides of the main block. The charged water particles are discharged from the dischargers of the electrostatic atomizer in such a way that they move away from the main block while being directed to intersect with an imaginary plane laterally extending from the sides of a pinch face of the iron plate of the main block.

[0007] With such configurations, because the electrostatic atomizer applies a high voltage to the water supplied to the discharge electrode, and causes the electrostatic atomization of the water to generate the charged water particles, and because the dischargers for the charged water particles of the electrostatic atomizer are disposed on the left and right sides of the main block, the charged water particles (i.e. nanometer-sized water particles charged with negative charges) can be supplied to the forward and backward sides of the hair pinched and heated regardless of whether the hair iron is used on the left or right side of a user. In other words, because the charged water particles can penetrate into the hair before the hair is pinched and heated, it is possible to increase the reliability with which the hair is creased when the hair is groomed while suppressing damage to the hair when the hair is pinched and heated. Further, after the hair is pinched and heated, the charged water particles (moisture) can penetrate into the hair, and the charges of the charged water particles can be supplied to the hair. As a result, the hair care effects can be effectively exerted without being deteriorated as in the conventional case. Further, because the discharge directions of the charged water particles from the dischargers of the electrostatic atomizer are directed to move away from the main block, the charged water particles are suppressed from being attached to the main block to prevent the main block from being charged with the charges of the charged water particles; therefore, the charged water particles from the dischargers can be continuously discharged without interruption. Further, because the discharge directions of the charged water particles from the dischargers of the electrostatic atomizer are directed to intersect with the imaginary plane laterally extending from the sides of the pinch face of the iron plate of the main block, the charged water particles can be efficiently attached to all of the hair located at the sides of the pinch faces of the iron plates with the hair pinched between the pinch faces of the iron plates, and thus the increased creasing effects and the hair care effects by the charged water particles can be effectively exerted to all of the hair.

[0008] Further, preferably, the left and right dischargers are fixed to a fixing base for fixing the electrostatic atomizer to the main block. In a case where separate fixing bases for the respective dischargers are fixed to the main block, the positional precision of each discharger also depends on the precision with which the corresponding separate fixing base is fixed to the main block. In contrast, in accordance with the case where the left and right dischargers are fixed to the fixing base for fixing the electrostatic atomizer to the main block as described

above, it is not necessary to consider the precision with which the separate fixing bases are fixed to the main block. Accordingly, it is possible to obtain a high positional precision of each discharger and uniform attachment efficiency of the charged water particles to the hair between the respective dischargers.

[0009] Further, preferably, the fixing base includes rail-shaped sockets extending in the respective discharge directions of the charged water particles, and the dischargers are slid into and fixed in the sockets. In this way, each atomizer unit can be fixed to the fixing base while being guided in the corresponding discharge direction of the charged water particles by the socket, thereby making it possible to obtain a high precision of the discharge directions of the charged water particles.

[0010] In accordance with the present invention, the hair is prevented from being damaged while being pinched and heated and the reliability with which the hair is creased when the hair is groomed is increased, so that it is possible to obtain hair care effects after grooming the hair without being deteriorated by pinching and heating the hair, and effectively apply such effects to all of the hair.

Brief Description of the Drawings

[0011]

FIG. 1 is a schematic side view of a hair iron in accordance with an embodiment of the present invention, wherein the hair iron is being used;

FIG. 2 is a plan sectional view of the hair iron with a part thereof cut way;

FIG. 3 is a perspective view of the hair iron;

FIG. 4 is an exploded perspective view of the hair iron;

FIG. 5 is a cross sectional view of the hair iron;

FIGS. 6A to 6C are views for explaining the state in which the hair iron is used, wherein FIG. 6A is a perspective view illustrating the state in which the hair iron is used for the hair of a user, FIG. 6B is an enlarged perspective view of the hair iron, and FIG. 6C is an enlarged perspective view of the hair iron illustrating the state in which the pinched and heated hair is straightened using the hair iron;

FIGS. 7A and 7B illustrate an electrostatic atomizer mounted in the hair iron, wherein FIG. 7A is a plan view illustrating the state in which a water tank is removed from the electrostatic atomizer, and FIG. 7B is a cross sectional view of an atomizer unit; and

FIGS. 9A and 9B are views explaining how the atomizer units are attached to a fixing base, wherein FIG. 9A is a plan view, and FIG. 9B is a side view.

Detailed Description of the Embodiments

[0012] Hereinafter, an embodiment of the present invention will be described with reference to the accompanying drawings.

[0013] As in FIGS. 1 to 5, a hair iron 1 of this embodiment includes a grip 4, which is grasped by the hand of a user and which corresponds to a half part (i.e. a rear half part) of the hair iron in a longitudinal direction, and a groomer 5, which pinches, heats and groom the hair of a user and which corresponds to the other half part (i.e. a front half part) in the longitudinal direction. A housing of the hair iron 1 is made up of a main block 2 and a press block 3, which are horizontally bisected in the form of a semi-block. The main block 2 and the press block 3, arranged one over the other, are pivotally connected by a hinge 6 provided to the grip 4 so that the groomer 5 can be pivotally opened and closed. Further, the hinge 6 is equipped therein with a spring 6a (see FIG. 5) biasing the groomer 5 in an opening direction, so that the main block 2 and the press block 3 are slightly opened in a normal state.

[0014] In the groomer 5 that is freely opened and closed, opposite faces of the main block 2 and the press block 3 serve as pinch faces 7 and 8, which are pivotally movable to contact and separate from each other and pinch and heat the hair. The pinch faces 7 and 8 are provided with flat iron plates 11 and 12, which have heaters 9 and 10, respectively. The main block 2 is equipped therein with an electrostatic atomizer 20, and is provided with a manipulation switch 13 for controlling the operations of the heaters 9 and 10 of the iron plates 11 and 12 and the electrostatic atomizer 20. The electrostatic atomizer 20 is disposed between the grip 4 and the groomer 5 in the main block 2 so as not to interfere with the hand grasping the grip 4. The manipulation switch 13 is disposed at the grip 4 so that a user can easily manipulate it by the hand grasping the grip 4. Specifically, the heaters 9 and 10 are arranged along inner surfaces of the iron plates 11 and 12, and are positioned and fixed by press springs 14 and 15, respectively. Further, the heaters 9 and 10 is provided with temperature fuses 16, as safety units, positioned and fixed by fuse fixing plates 16a. And, the heater 9 of the main block is provided with a temperature sensor 17 fixed by a sensor fixing plate 17a. In addition, the grip 4 of the main block 2 is equipped therein with a controller 18 connected to the manipulation switch 13, and the heaters 9 and 10 are connected in series to the controller 18 through leads.

[0015] As shown in FIGS. 7A and 7B, the electrostatic atomizer 20 comprises an acicular discharge electrode 21 that applies a voltage to supplied water, an annular counter electrode 22 that is located opposite to the discharge electrode 21, a high-voltage applier that applies a high voltage between the discharge electrode 21 and the counter electrode 22, a tank 23 that stores water (see FIG. 4), and a supply pipe 24 that supplies water W stored in the tank 23 to the discharge electrode 21. In this em-

bodiment, the high-voltage applier includes a high-voltage generator circuit provided to the controller 18 so as to apply ground voltage to the counter electrode 22 and simultaneously apply negative high voltage to the discharge electrode 21. Further, the discharge electrode 21 and the counter electrode 22, between which the high voltage is applied by the high-voltage applier, are integrated by a cover body 25 in order to prevent an electric shock, thereby forming an atomizer unit 26. As described below, this atomizer unit 26 is a part where charged water particles are generated and discharged, and functions as a discharger 27 of the charged water particles. The electrostatic atomizer 20 is formed by attaching one tank 23 and two atomizer units 26 to a fixing base 28. By assembling the fixing base 28 to the main block 2, the electrostatic atomizer 20 is disposed in the main block 2.

[0016] The mechanism of generating the charged water particles of a nanometer size by using the electrostatic atomizer 20 (called an electrostatic atomizing phenomenon) is as follows. The water supplied to the leading end of the discharge electrode 21 is charged by the voltage applied between the discharge electrode 21 and the counter electrode 22, and a Coulomb force acts on the charged liquid. Thus, the level of the water supplied to the leading end of the discharge electrode 21 locally swells in the shape of a needle having a pointed leading end (called a "Taylor cone"). Electric charges are concentrated on the leading end of the Taylor cone, and thus become densified. Due to the repulsive force of the densified charges, the liquid is repeatedly segmented and scattered (called Rayleigh scattering) and is thus electrostatically atomized. As a result, nanometer-sized charged water particles having a radical (negative ion mists) are generated. The charged water particles thus generated are scattered substantially along the lines of electric force from the leading end of the discharge electrode 21 to the counter electrode 22.

[0017] The main block 2 is provided with lateral protrusions 19 protruding outwardly on left and right sides thereof. The atomizer units 26 of the electrostatic atomizer 20 are respectively provided in the lateral protrusions 19. Further, the left-right direction refers to the direction perpendicular to the longitudinal direction of the hair iron 1 in the plane of the pinch faces 7 and 8 matched with each other. At this time, discharge directions A of the charged water particles from the atomizer units 26 as the dischargers 27 are directed to move away from the main block as illustrated in FIG. 2, and are also directed to intersect with an imaginary plane laterally extending from the sides of the pinch face 7 of the iron plate 11 of the main block 2, as illustrated in FIG. 1. In other words, the discharge directions A of the charged water particles are directed forward and slightly outward when viewed from the top of the hair iron 1 (i.e., when viewed in the vertical direction (see FIG. 2)), and forward and slightly downward when viewed from the side of the hair iron 1 (i.e., when viewed in the horizontal direction (see FIG. 1)). Further, more specifically, while the charged water par-

ticles are discharged from the discharger 27 within a radial angular range from the leading end of the discharge electrode 21, the discharge direction of the charged water particles refers to the central direction in the radial angular range. Further, the atomizer units 26 are respectively disposed so as to be directed to face the discharge openings 19a formed by drilling the ends (front ends) of the lateral protrusions 19 on the side of the groomer 5. The charged water particles are discharged from the atomizers 26 out of the air iron 1 through the discharge openings 19a.

[0018] As shown in FIGS. 6A to 6C, the hair iron 1 is used to groom the hair in such a way of inserting the hair of the user between the heated iron plates 11 and 12 of the main and press blocks 2 and 3, which are in an opened state, from a direction (the left-right direction) perpendicular to the longitudinal direction of the hair iron 1, pivoting the main and press blocks 2 and 3 in a closing direction to make the pinch faces 7 and 8 of the iron plates 11 and 12 closer to each other to heat and pinch the hair inserted therebetween, and moving the hair iron 1 toward the leading end of the hair while pinching the hair.

[0019] In the hair iron 1 of this embodiment, as described above, the dischargers 27 of the electrostatic atomizer 20 are disposed on the left and right sides (of the main block 2) of the hair iron 1, so that the charged water particles (i.e. nanometer-sized water particles charged with negative electricity) can be supplied to the forward and backward sides of the hair pinched and heated. In other words, because the charged water particles can penetrate into the hair before the hair is pinched and heated, it is possible to increase the reliability of creasing the hair when the hair is groomed while suppressing damaged on the hair pinched and heated. Further, after the hair is pinched and heated, the charged water particles (moisture) can penetrate into the hair, and the charges of the charged water particles can be supplied to the hair. Accordingly, after the hair is groomed, the hair care effects can be effectively realized without being deteriorated as in a conventional case. Moreover, since the dischargers 27 of the electrostatic atomizer 20 are disposed on the left and right sides of the hair iron 1, the hair can be consistently endowed with the creasing effect or the care effect by the charged water particles, even when the hair iron 1 is used with the left and right sides thereof reversed, i.e., when the hair on the side of the left hand is groomed by the hair iron 1 grasped by the right hand and when the hair on the side of the right hand is groomed by the hair iron 1 grasped by the left hand.

[0020] Further, because the charged water particles generated by the electrostatic atomizer 20 are charged with the negative charges and have an invisible nanometer size, the penetration capacity thereof into the hair is excellent, and the reliability with which the hair is creased when the hair is groomed, as well as the hair care effects, is also excellent, compared to conventional steam heated and evaporated (the steam consists of large water particles having a visible size greater than a nanometer size).

The hair care effects include the negative ion function which provide a moist feeling to the hair as well as a function of having the hair strong and soft by making the hair weakly acid and thus tightening the cuticle (epidermis) of the hair. Further, the charged water particles are moisture and negative ions having negative charges, and the electrostatic atomizer 20 generating the charged water particles functions as both a steam generator and a negative ion generator. For this reason, the configuration of the hair iron 1 is simplified.

[0021] In the hair iron 1 of this embodiment, as described above, the discharge directions A of the charged water particles from the dischargers 27 of the electrostatic atomizer 20 are directed to move away from the main block 2. With this configuration, the charged water particles are suppressed from being attached to the main block 2 to prevent the main block 2 from being charged with the charges of the charged water particles, so that the charged water particles from the dischargers 27 can be continuously discharged without interruption. Further, in this embodiment, the atomizer units 26 (dischargers 27) are mounted in the lateral protrusions 19 and the charged water particles are discharged outside through the discharge openings 19a of the lateral protrusions 19, which increase the effect of preventing the charged water particles from being attached to the main block 2. As described above, the discharge directions A of the charged water particles discharged from the dischargers 27 of the electrostatic atomizer 20 are directed to intersect with the imaginary plane laterally extending from the sides of the pinch face 7 of the iron plate 11 of the main block 2. In this way, the charged water particles can be efficiently attached to all of the hair located on the sides of the pinch faces 7 and 8 of the iron plates 11 and 12 with the hair pinched between the pinch faces 7 and 8 of the iron plates 11 and 12.

[0022] In this manner, in the hair iron 1 of this embodiment, the hair iron 1 itself is prevented from being charged with the charged water particles, thereby ensuring continuous discharge of the charged water particles, and the charged water particles are attached to the hair before and after it is pinched and heated. Thus, the increased creasing effects and the hair care effects by the charged water particles can be effectively applied to all of the hair.

[0023] As described above, in order to effectively apply the increase creasing effects and the hair care effects by the charged water particles on all of the hair, the setup of the discharge directions A of the charged water particles from the dischargers 27 of the electrostatic atomizer 20 is important. The hair iron 1 of this embodiment has a high positional precision of the dischargers 27 (i.e. a high directional precision of the charged water particles discharged therefrom) in mounting the electrostatic atomizer 20 in the main block 2, which will be described below with reference to FIGS. 8, 9A and 9B.

[0024] The fixing base 28 of the electrostatic atomizer 20 has the shape of a plate, and is positioned and fixed

in the main block 2 by a hooking structure (not shown). Specifically, the fixing base 28 is positioned and fixed in such a manner that a flat surface thereof is substantially parallel to the pinch face 7 of the iron plate 11 to define the bottom surface of a tank holder 29, recessed from the top surface of the main block 2. The fixing base 28 is provided with a water introduction part 31 in the middle between the left and right ends thereof, and attachment bases 32 at the left and right ends thereof.

[0025] The water introduction part 31 of the fixing base 28 is a joint part which watertightly connects a water outlet 23a of the tank 23 to supply the water stored in the tank 23 to the pair of supply pipes 24. The tank 23 is detachably mounted on the fixing base 28 so as to enable the user to properly supply the water (see FIG. 4). The tank 23 is received in the tank holder 29 while being attached to the fixing base 28 (see FIG. 5). Further, an upper opening of the tank holder 29 is adapted to be opened and closed by an openable cover 30.

[0026] The atomizer units 26 are attached to the respective attachment bases 32 of the fixing base 28. In a case where separate fixing bases for the respective dischargers 27 are fixed to the main block 2, the positional precision of each discharger 27 also depends on the precision with which the corresponding separate fixing base is fixed to the main block 2. In contrast, in accordance with the case where the left and right dischargers 27 are fixed to the fixing base 28 for fixing the electrostatic atomizer 20 to the main block 2 as described above, it is not necessary to consider the precision with which the separate fixing bases are fixed to the main block 2. Accordingly, it is possible to obtain a high positional precision of each discharger 27 and uniform attachment efficiency of the charged water particles to the hair between the respective dischargers 27.

[0027] The attachment bases 32 of the fixing base 28 are each provided with a rail-shaped socket 33 extending in the discharge direction A of the charged water particles. Further, the cover body 25 of each atomizer unit 26 is provided, on a side surface thereof, with an insertion rib 35 elongated in the discharge direction A of the charged water particles. The insertion rib 35 is slidably inserted into the socket 33 in the discharge direction A of the charged water particles. In the state in which the insertion rib 35 is inserted into the socket 33, a hooking nose 34 formed on the socket 33 is hooked in a hooking recess 36 formed in the insertion rib 35, so that the insertion rib 35 is coupled to the socket 33. In this embodiment, the socket 33 is of a "C"-shaped recess having a lip when viewed from the insertion side, while the insertion rib 35 has a T-shape, in which flange segments 35a protrude in opposite directions of a web segment 35b when viewed from the insertion side. In the state in which the insertion rib 35 is inserted into the socket 33, lip segments 33a of the socket 33 are hooked on the flange segments 35a of the insertion rib 35 such that the insertion rib 35 is prevented from escaping from the socket 33 to other sides than the insertion side. The atomizer

units 26 are attached to the attachment bases 32 by sliding the insertion rib 35 into the socket 33 and by hooking the hooking nose 34 on the hooking recess 36. In this manner, each atomizer unit 26 can be fixed to the fixing base 28 while being guided in the discharge direction A of the charged water particles by the socket 33, so that the atomizer unit 26 is fixed to the fixing base 28, particularly, with a high precision of the discharge direction A of the charged water particles, which ensures that the increased creasing effects and the hair care effects by the charged water particles can be effectively applied to all of the hair.

[0028] Further, in the embodiment, the dischargers 27 are disposed between the grip 4 and the groomer 5. For example, however, each discharger may be disposed at the lateral portion of the iron plate 11 of the groomer 5, or at the front portion of the groomer 5 which is located further forward than the iron plate 11. In either the former or latter case, the charged water particles can be attached to the forward and backward sides of the hair pinched and heated. Particularly in the latter case, as in the embodiment, the discharger 27 is disposed at a position offset from the iron plate 11 in the longitudinal direction of the hair iron 1; therefore, in comparison with the former case in which the discharger 27 is disposed at the same position as the iron plate 11 in the longitudinal direction of the hair iron 1, the charged water particles from the discharger 27 is easily attached to all of the hair because there is a distance between the pinched and heated hair and the discharger 27.

[0029] While the invention has been shown and described with respect to the embodiments, it will be understood by those skilled in the art that various changes and modification may be made without departing from the scope of the invention as defined in the following claims.

Claims

1. A hair iron including a main block and a press block hinged with each other at rear ends thereof in which iron plates respectively installed at front portions of the main block and the press block are pivotally movable to contact with and separate from each other, the hair iron comprising:

an electrostatic atomizer for generating charged water particles by applying a voltage to water supplied to a discharge electrode and electrostatically atomizing the water, wherein the electrostatic atomizer includes dischargers for discharging the charged water particles, the dischargers being disposed on opposite lateral sides of the main block.

2. The hair iron as set forth in claim 1, wherein the charged water particles are discharged from the dis-

chargers of the electrostatic atomizer in such a way that they move away from the main block while being directed to intersect with an imaginary plane laterally extending from the sides of a pinch face of the iron plate of the main block.

3. The hair iron as set forth in claim 1 or 2, wherein the dischargers are fixed to a fixing base for fixing the electrostatic atomizer to the main block.

4. The hair iron as set forth in claim 3, wherein the fixing base includes rail-shaped sockets extending in the respective discharge directions of the charged water particles, and the dischargers are slid into and fixed in the sockets.

FIG. 1

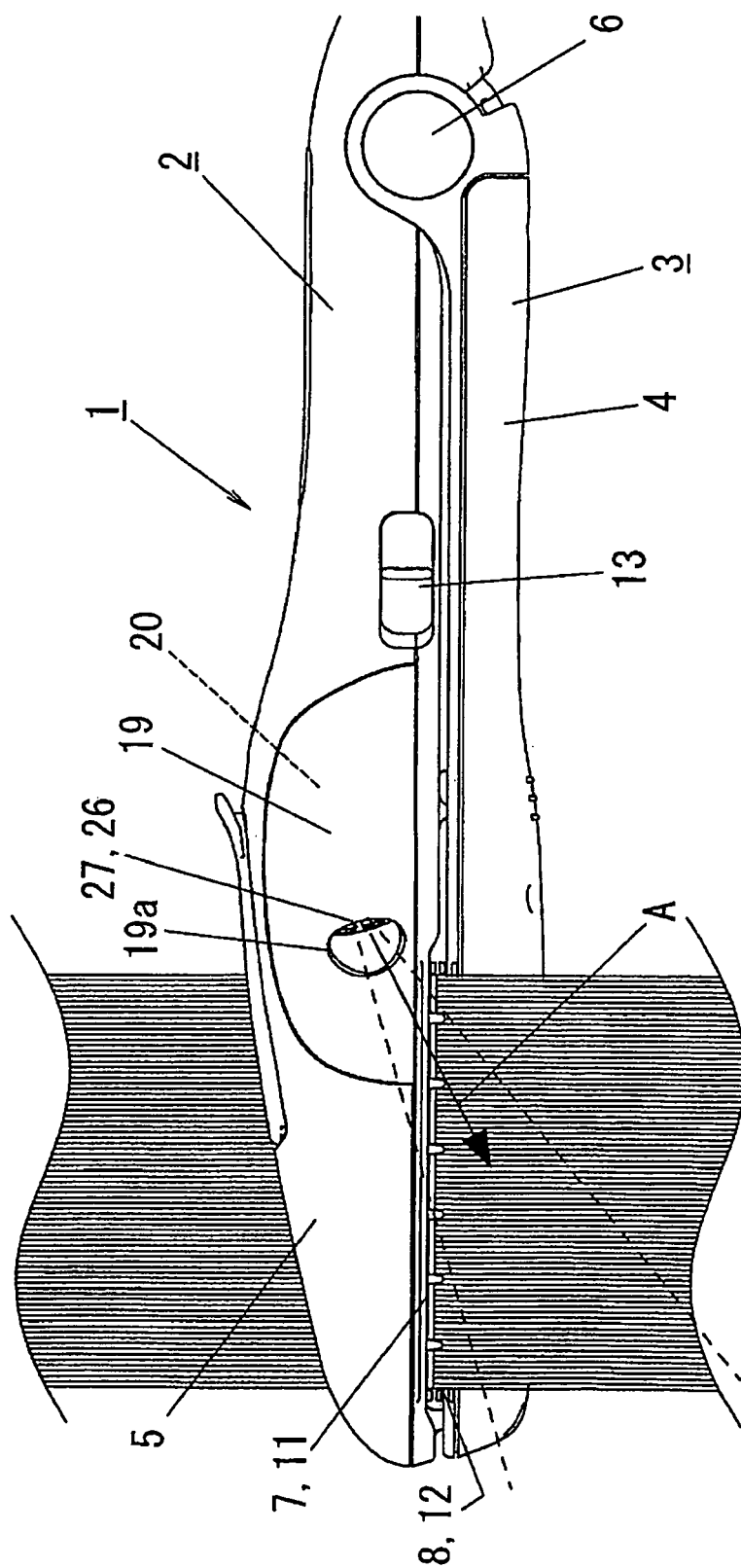


FIG.2

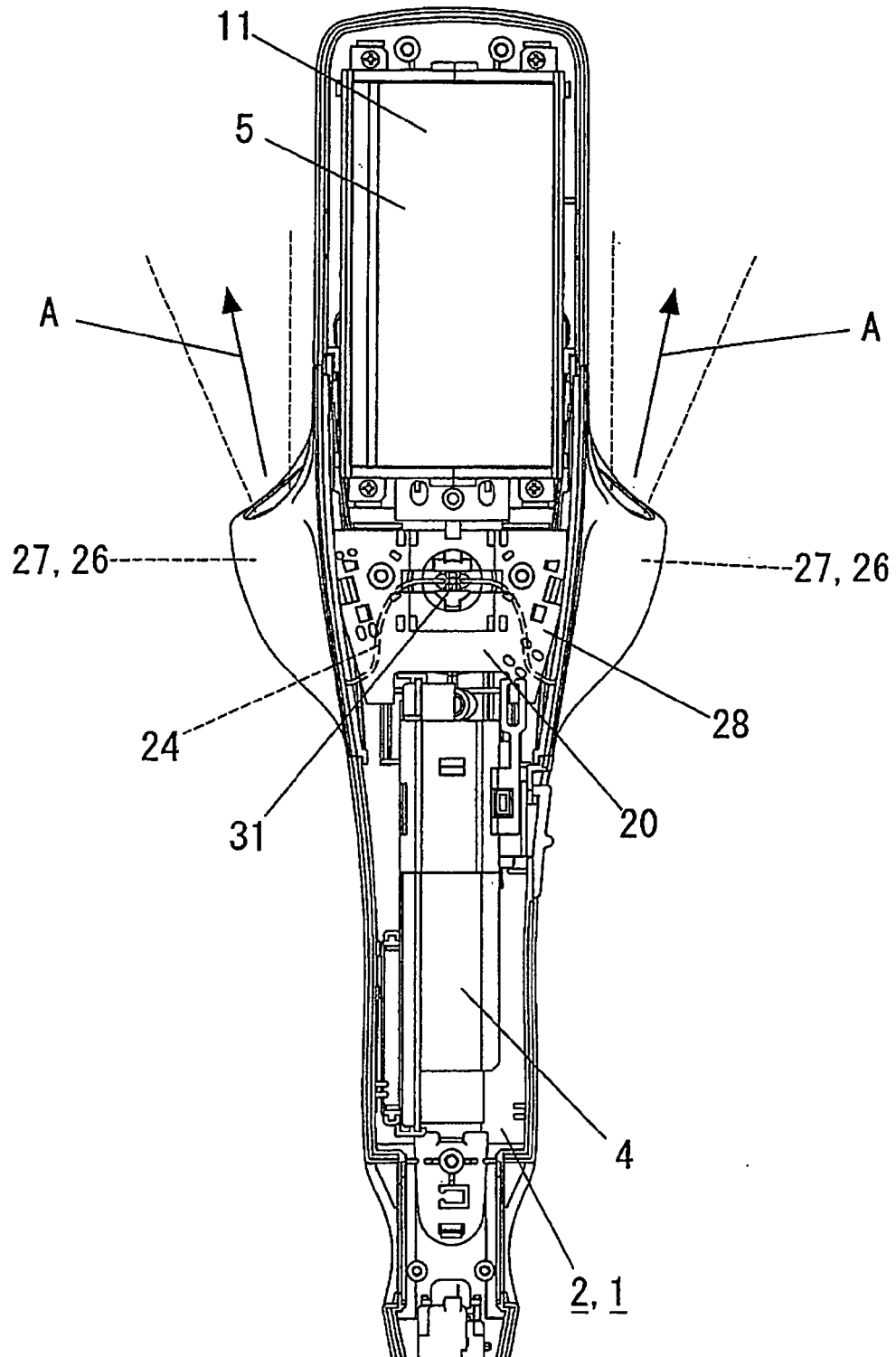


FIG.3

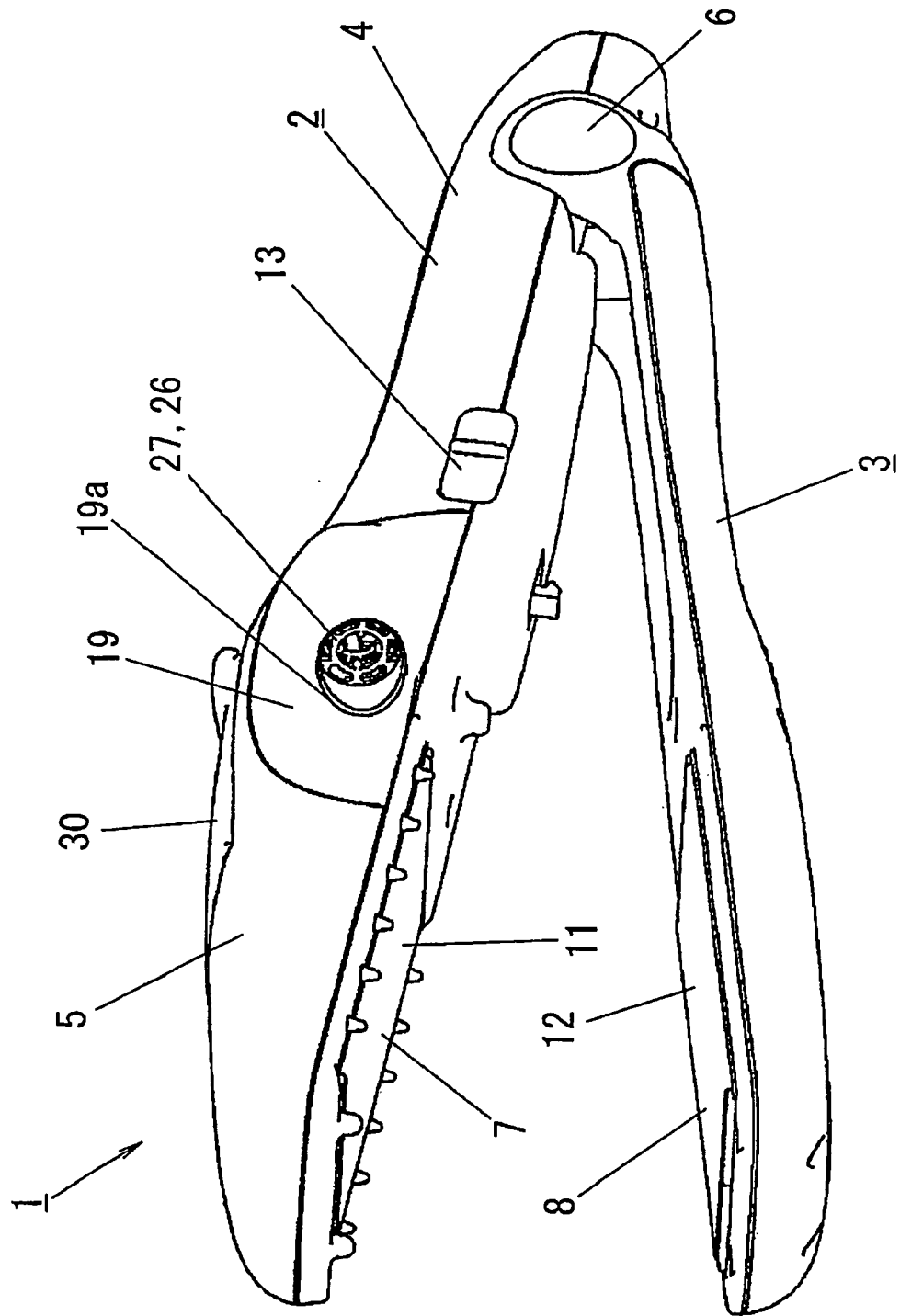


FIG. 4

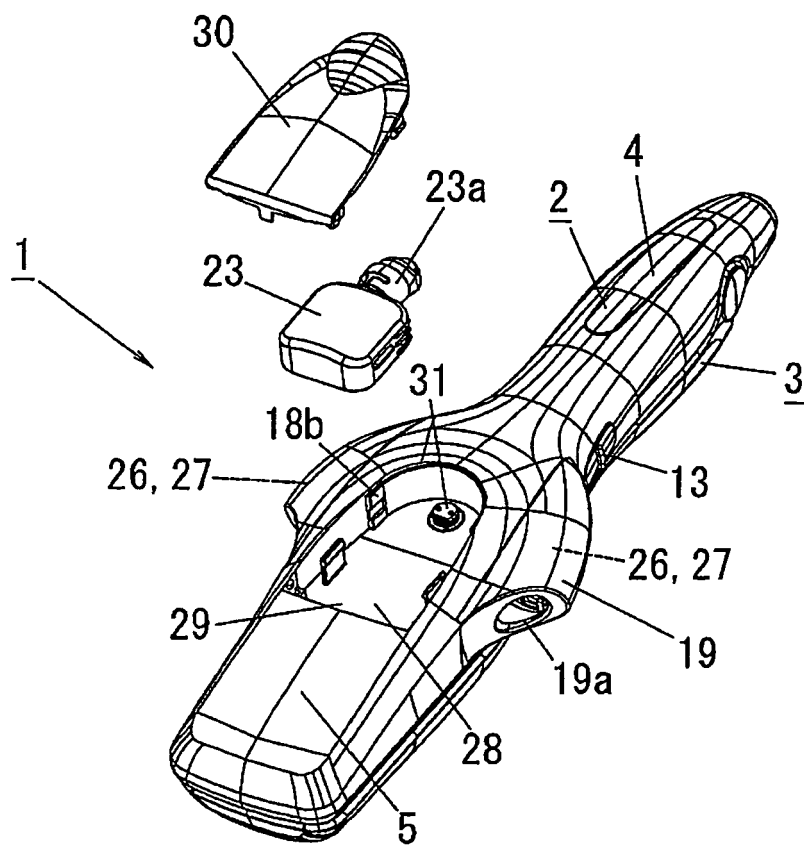


FIG. 5

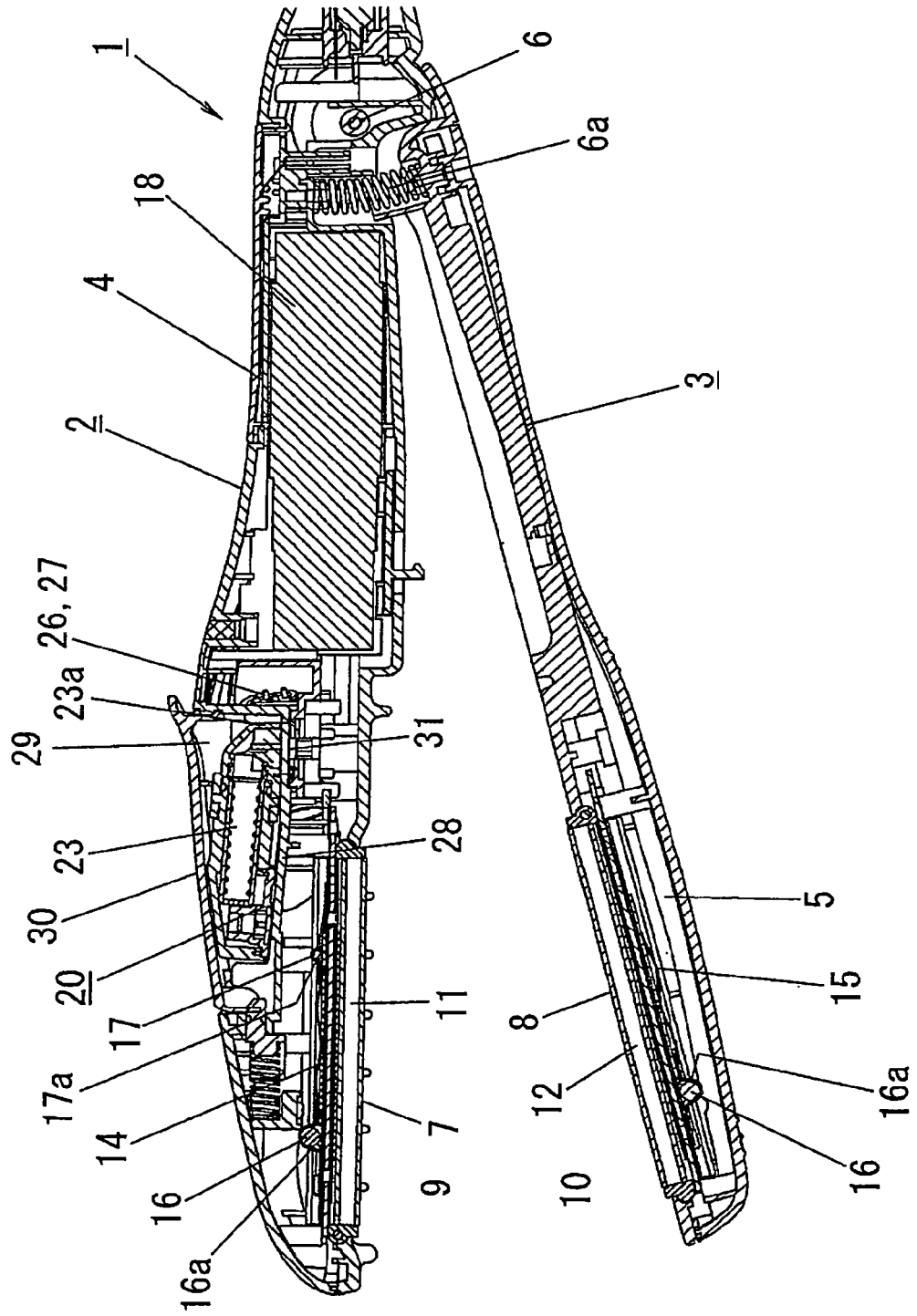


FIG. 6A

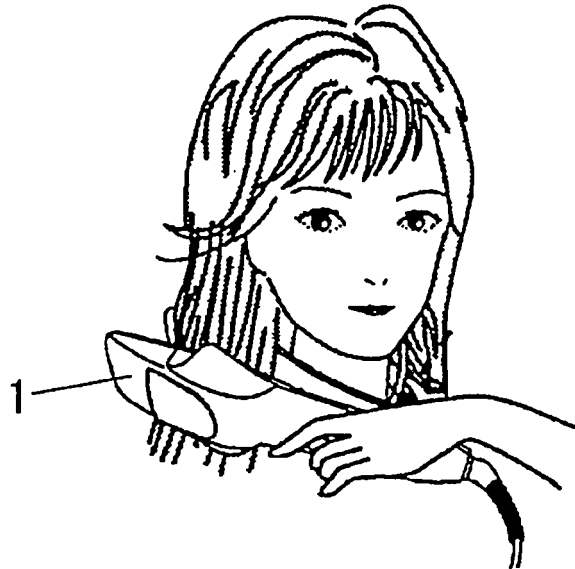


FIG. 6B

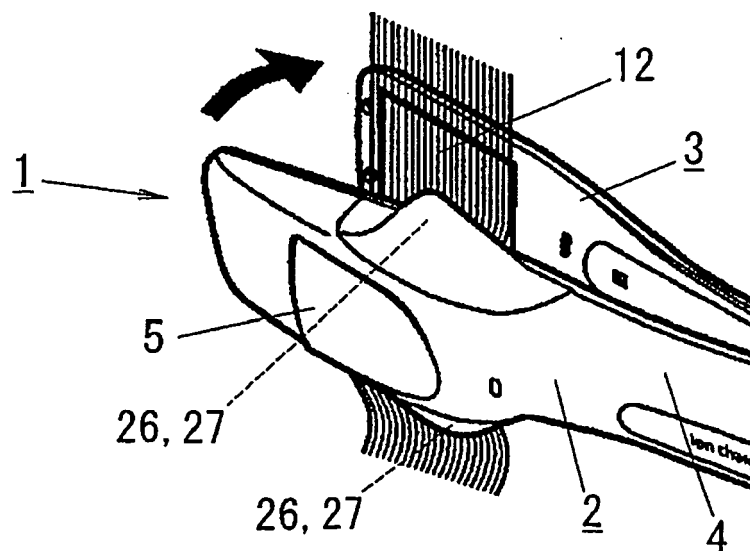


FIG. 6C

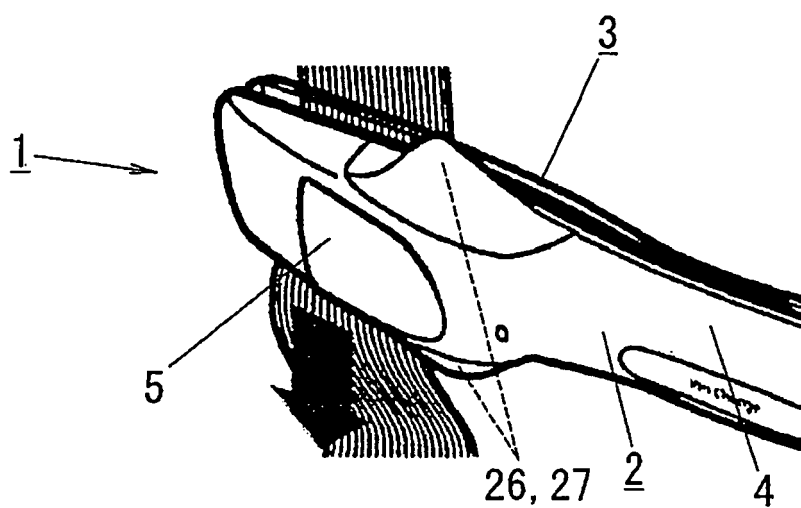


FIG. 7A

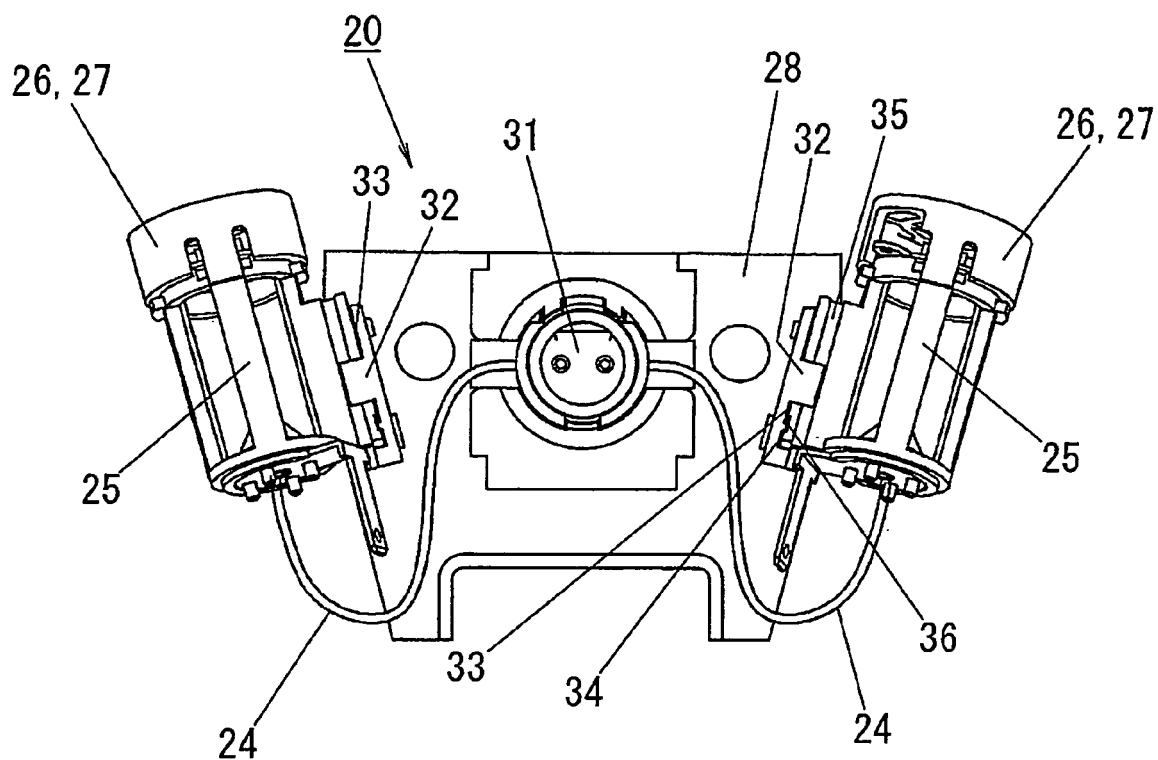


FIG. 7B

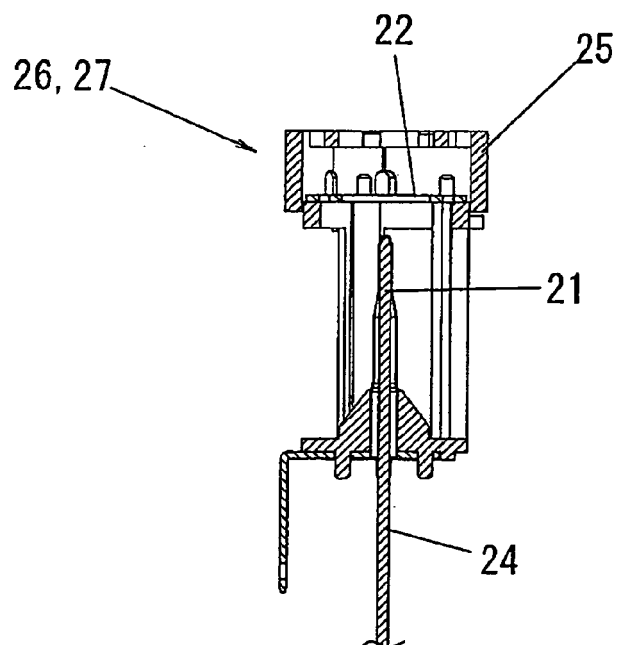


FIG. 8

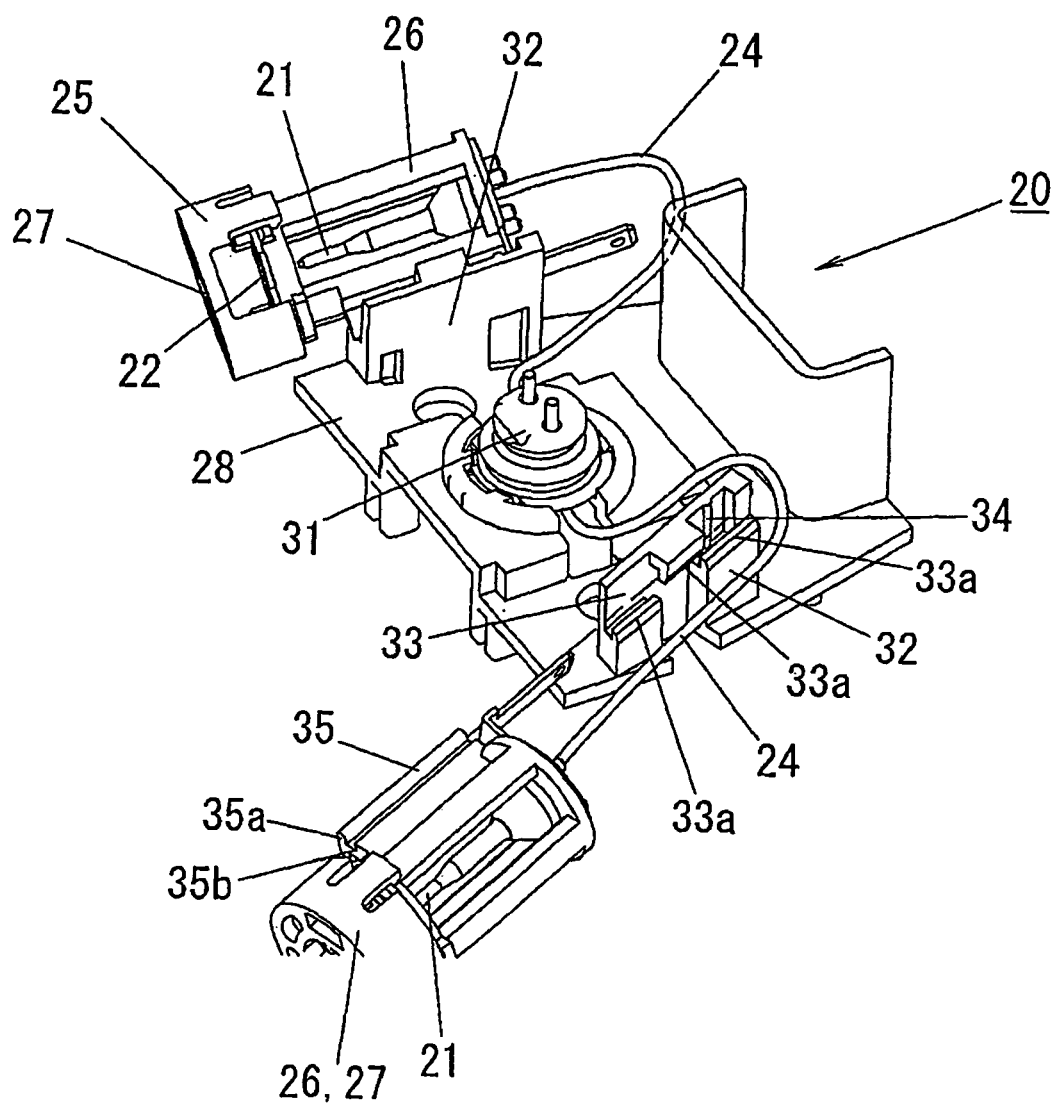


FIG. 9A

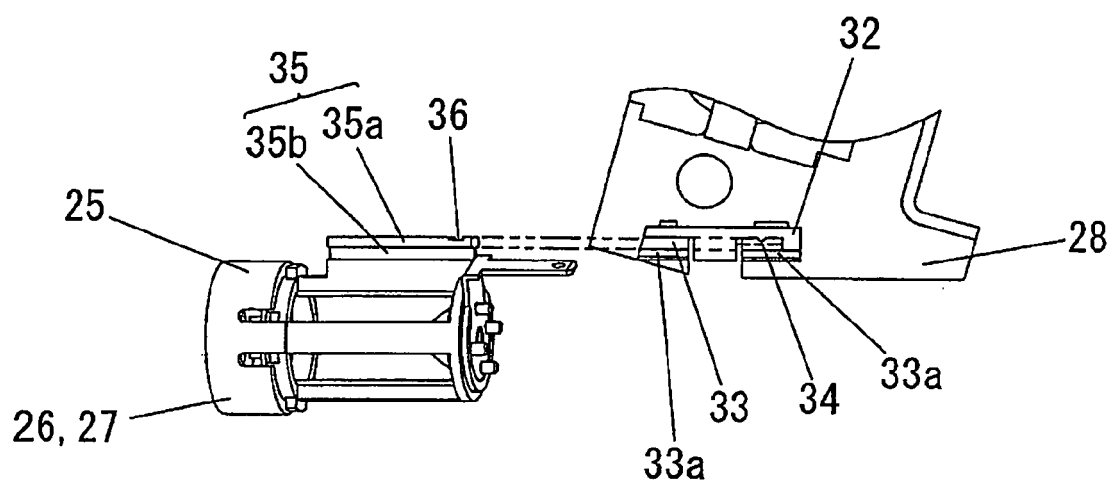
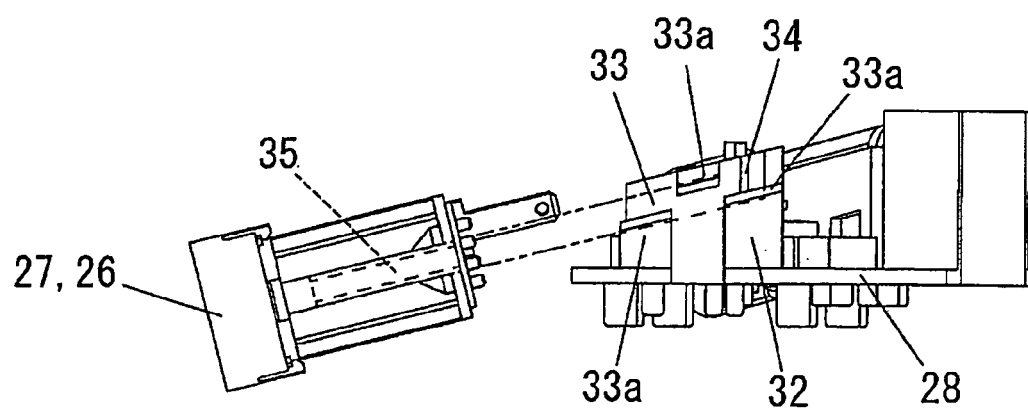


FIG. 9B





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 6568

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 10 December 2007	Examiner WITKOWSKA-PIELA, A
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EPO FORM 1503 03.82 (P04C01)

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

EP 07 01 6568

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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10-12-2007

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