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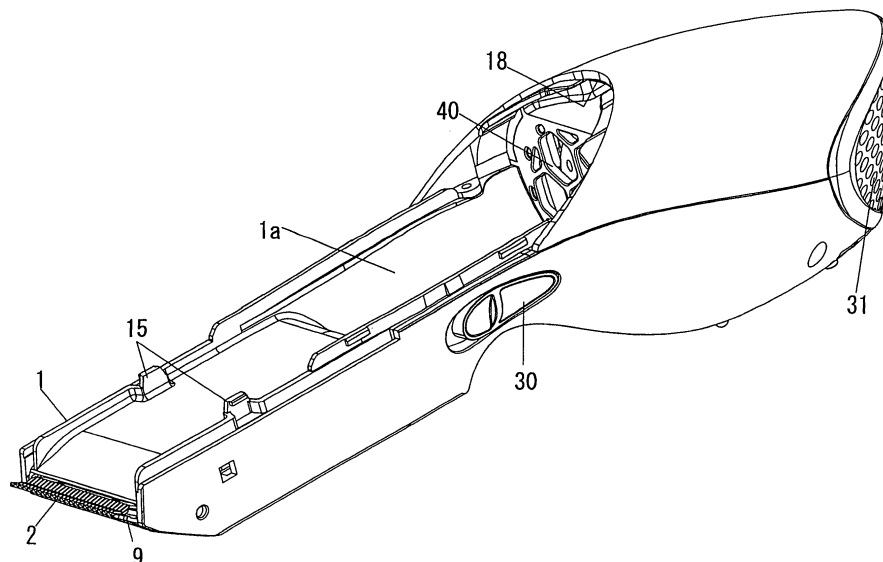
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(54) **Hair clipper**

(57) A hair clipper includes a hair clipper main body (1) having a cutter unit (2) for cutting hair, the cutter unit being installed at a leading end of the hair clipper main body, a hair suctioning section (B) for suctioning the hair cut by the cutter unit through a suction inlet (13) by means

of rotating a suction fan (3) to store the suctioned hair inside. A hair suctioning section's portion ranging from the suction inlet to a vicinity of the suction fan is formed by an exterior surface of a housing of the hair clipper main body and an inner surface (14a) of a suction case (14) detachably attached to the housing.

FIG.4



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Description

[0001] The present invention relates to a hair clipper having a function for suctioning cut hair.

[0002] Conventionally, there has been known a hair clipper having a hair suctioning section for suctioning cut hair (see, for example, Japanese Patent Laid-open Application No. 2002-253878). The hair suctioning section is configured to suction the cut hair into a hair suction path therein to collect them in the path by using a suction force generated as a result of rotating a fan. After completing a hair cut, a clipping trap forming a downstream portion of the path is separated from a housing of the hair clipper and the hair suctioned into the path is removed therefrom.

[0003] However, in case the amount of the hair collected in the path is great, it takes a considerable amount of time for a user to remove the hair. Further, the work of cleaning the inside of the path has been troublesome and inconvenient for a user.

[0004] It is, therefore, an object of the present invention to provide a highly convenient hair clipper having a hair suctioning section, wherein hair suctioned into a path of the hair suctioning section can be readily removed therefrom and the inside of the path of the hair suctioning section can be cleaned easily.

[0005] In accordance with the present invention, there is provided a hair clipper including: a hair clipper main body having a cutter unit for cutting hair, the cutter unit being installed at a leading end of the hair clipper main body; a hair suctioning section for suctioning the hair cut by the cutter unit through a suction inlet by means of rotating a suction fan to store the suctioned hair inside, wherein a hair suctioning section's portion ranging from the suction inlet to a vicinity of the suction fan is formed by an exterior surface of a housing of the hair clipper main body and an inner surface of a suction case detachably attached to the housing.

[0006] In the hair clipper having the above configuration, if the suction case is removed from the housing, the entire portion of the hair suctioning section ranging from the suction inlet to the vicinity of the centrifugal fan can be exposed outside. Accordingly, even in case a great amount of hair is collected in the hair suctioning section, the hair can be removed readily. Also, since the work of cleaning the inside of the hair suctioning section is easy, a high user convenience is provided.

[0007] The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction with the accompanying drawings, in which:

Figs. 1A and 1B illustrate an overall configuration of a hair clipper in accordance with a preferred embodiment of the present invention, wherein Fig. 1A is a rear side view of the hair clipper and Fig. 1B is a cross sectional view taken along a line X-X of Fig. 1A; Fig. 2 provides a perspective view of the hair clipper;

Fig. 3 sets forth a perspective view of the hair clipper showing a state where a suction inlet of the hair clipper is retreated;

Fig. 4 depicts a perspective view of the hair clipper from which a suction case is separated;

Figs. 5A and 5B show the suction case of the hair clipper, wherein Fig. 5A is a rear side view of the suction case and Fig. 5B is a cross sectional view of a connection portion;

Figs. 6A and 6B illustrate components of the suction case, wherein Fig. 6A is a rear side view of a downstream block and Fig. 6B is a front view of an upstream block;

Fig. 7 presents a perspective view of a fan block incorporated in the hair clipper;

Figs. 8A and 8B illustrate components of the fan block, wherein Fig. 8A is a perspective view showing a state where a fan cover is separated from the fan block and Fig. 8B is a perspective view of a diffuser unit;

Figs. 9A to 9C illustrate the hair clipper to which an attachment is assembled, wherein Figs. 9A and 9B are a rear side and a side view of the hair clipper, respectively and Fig. 9C is a side view showing a state where a trim length of the hair clipper is varied; Fig. 10 offers a perspective view of the hair clipper with the attachment assembled thereto;

Fig. 11 shows a perspective view of the hair clipper showing a state where a trim length of the hair clipper is varied; and

Fig. 12 sets forth a perspective view of the hair clipper to which another type of attachment is assembled.

[0008] Hereinafter, a preferred embodiment of the present invention will be described with reference to the accompanying drawings. Referring to Fig. 1A to Fig. 3 showing an overall configuration of a hair clipper in accordance with the preferred embodiment, the hair clipper includes: a hair cutting section A having a cutter unit 2 protruded from a leading end thereof; and a suction force generating section C having a centrifugal fan 3 serving as a suction fan. The hair cutting section A is disposed at an upper side of Fig. 1A (hereinafter referred to as a "leading end side") of two opposite lengthwise ends of a housing 1 forming a case of a slender hair clipper main body designed to be held with one hand, while the suction force generating section C is disposed at a lower side of Fig. 1A (hereinafter referred to as a "basal end side") of the housing 1. The hair cutting section A and the suction force generating section C incorporate therein motors 4 and 5 as their individual driving sources, respectively. The two sections A and C are formed in the housing 1 with a preset interval (which is set to be approximately identical with the length of each section A or C) maintained therebetween in the lengthwise direction. Further, a hair suctioning section B is provided at an inner space of the housing 1 including a back portion of the hair cutting section A and the interval between the two sections A

and C. The exterior air around the leading end of the cutter unit 2 of the hair cutting section A is suctioned into the suction force generating section C through the hair suctioning section B. Here, since the lengthwise direction is equivalent to a suctioning direction in the hair suctioning section B and the suction force generating section C, the "leading end side" in the above can be defined as an upstream side, while the "basal end side" can be defined as a downstream side. Also, the term "back portion" is defined with respect to a person whose hair is being cut.

[0009] Below, a configuration of each of the sections A to C will be explained in detail. First, the hair cutting section A has a cutter block 9 at its leading end, and the cutter block 9 has the cutter unit 2. Further, the hair cutting section A incorporates therein a motor 4 used as a power source, a driving cam 7 tightly fitted around an output shaft 4a of the motor 4, and a driving shaft 8 installed at a position deviated from a central axis of the driving cam 7. The driving shaft 8 is connected with a guide plate 10 provided at the cutter block 9, so that an eccentric rotational motion of the driving shaft 8 is transmitted to the cutter unit 2 by being converted into a reciprocating motion via the guide plate 10, thus allowing a movable blade 12 of the cutter unit 2 to slide in a widthwise direction of the hair clipper main body reciprocally with respect to a stationary blade 12 of the cutter unit 2. An operation button 30 (see Fig. 2 or 3) is exposed on a side surface of the housing 1 such that it is slidable in the lengthwise direction of the hair clipper main body. By manipulating the operation button 30, a supply of power to the motor 4 is controlled.

[0010] Next, the hair suctioning section B will now be described. The hair suctioning section B has an approximately cylindrical body having a suction inlet 13 opened near the back portion of the cutter unit 2 of the hair cutting section A. A basal end side of a hair suction path 6 formed within the cylindrical body communicates with the suction force generating section C.

[0011] As for the hair suctioning section B of the cylindrical body shape, the hair suction path 6 is formed by a curved rear surface portion on one side 1a of an exterior surface of the housing 1 and an inner surface 14a of a half-cylindrical suction case 14 which is detachably attached to the exterior surface of the housing 1. Further, a pair of hook-shaped engaging pieces 15 is formed at both lateral end portions of the rear surface portion of the housing 1 such that they are protruded toward the back portion of the clipper main body (see Fig. 4). Further, a hook-shaped engaging piece 16 is formed at a basal end side of the suction case 14 such that it is protruded toward the basal end side of the housing 1 (see Figs. 5 and 6A). By hitching the engaging pieces 15 of the housing 1 to both lateral end portions of the suction case 14, the suction case 14 can be connected to the housing 1 such that it is slidable in the lengthwise direction. Furthermore, by bringing the periphery of a basal end of an upstream block 19 of the suction case 14 into contact with a stepped portion 17 formed at a leading end of a downstream block

20 and thereafter hitching the engaging piece 16 of the suction case 14 to an engagement recess 18 provided at the rear surface portion of the housing 1 (see Fig. 1), the sliding action of the suction case 14 with respect the housing 1 is stopped, and the suction case 14 is fixed to the exterior surface of the housing 1, thus forming the hair suctioning section B.

[0012] The suction case 14 is formed by connecting the half-cylindrical upstream block 19 forming an upstream portion of the suction case 14 and the half-cylindrical downstream block 20 located downstream of the upstream block 19 such that the upstream block 19 is overlapped on the downstream block 20, wherein the upstream block 19 is provided with the suction inlet 13 at its leading end. The downstream block 20 is a part fixed at the housing 1, and the upstream block 19 is a part connected to the downstream block 20 such that it can be slid in the lengthwise direction while being overlapped on the downstream block 20. By controlling the sliding amount of the upstream block 19, the degree of protrusion of the entire suction case 14 toward the leading end side can be varied.

[0013] Fig. 5B and Figs. 6A and 6B illustrate an engagement between the upstream block 19 and the downstream block 20. The downstream block 20 is provided with a sliding surface 21 at its leading end side. The sliding surface 21 is connected to the downstream block 20 through the stepped portion 17 so that it is lower than the downstream block 20. Furthermore, the upstream block 19 and the downstream block 20 are so configured that, when the upstream block 19 is covered on the sliding surface 21 while it is in contact with the stepped portion 17, their outer surfaces are connected with each other as a continuous surface. Further, a pair of slide engaging pieces 22, each having a hook-shaped cross section and elongated in the lengthwise direction, is protrudingly formed at the inner surface of the upstream block 19 in parallel to each other, and two pairs of slide engaging pieces 23, each having a hook-shaped cross section, are protrudingly formed at the sliding surface 21 in a parallel manner to be slidably engaged with the slide engaging pieces 22 in the lengthwise direction.

[0014] Further, by the slidable engagement of the slide engaging pieces 22 with the slide engaging pieces 23, the upstream block 19 can be moved between a protruded position as shown in Fig. 2, where the suction inlet 13 provided at the leading end of the upstream block 19 is fully protruded toward the leading end side of the clipper main body to the same extent as the leading end of the cutter unit 2, and a retrieved position as shown in Fig. 3, where the suction inlet 13 of the upstream block 19 is fully retrieved away from the leading end of the cutter unit 2 toward the basal end side of the clipper main body. Further, reference numeral 24 shown in Fig. 6A represents a click member, which is easily transformed elastically and is fixed on the sliding surface 21 of the downstream block 20. Reference numeral 25 shown in Fig. 6B is a pair of click engagement protrusions 25 protruded

from the inner surface of the upstream block 19, the click engagement protrusions 25 being distanced apart from each other with a preset interval maintained therebetween in the lengthwise direction. When the click member 24 is moved over the click engagement protrusions 25 while being transformed elastically, a user would feel a sense of clicking and the upstream block 19 is maintained at its protruded or retrieved position by a load exerted thereon when the click member 24 is moved over the click engagement protrusions 25.

[0015] Now, the suction force generating section C will be described with reference to Figs. 1A, 1B, 7 and 8. The suction force generating section C includes a fan block 29 fixed at the inner surface of the housing 1. The fan block 29 has: a fan unit 27 containing a centrifugal fan 3 in a fan cover 27; a diffuser unit 28 formed to have an air flow path, wherein the cross section of the air flow path is gradually expanded in a downstream direction so that the velocity of the air introduced by fan unit 27 is reduced for a static pressure recovery of the air; and a motor 5 for driving the centrifugal fan 3 in the fan unit 27, wherein the fan unit 27, the diffuser unit 28 and the motor 5 are installed in this sequence in the downstream direction while being continuously connected with each other as one body. Further, a filter 40 is installed at a part of the housing 1 where the hair suction path 6 in the hair suctioning section B comes into a contact with a space 50 in which the fan block 29 is disposed, and air discharge holes 31 are provided at the basal end portion of the housing 1 so as to communicate with the space 50. The air introduced into the hair suctioning section B from the outside of the leading end side of the housing 1 through the air inlet 13 is flown through the fan unit 27 and the diffuser unit 28 in the space 50 via the filter 40, to be finally discharged outside the basal end side of the housing 1 from the air discharge holes 31 after moving through an interval space between the motor 5 and the inner surface of the housing 1.

[0016] The fan block 29 is supported in the space 50 within the housing 1 by fitting an outer peripheral portion 32a of a cylindrical body 32, which forms a casing of the diffuser unit 28, into a groove provided on the inner surface of the housing 1. Further, the fan block 29 is so disposed that the largest diameter portion thereof is pressed by the housing 1 to prevent a vibration of the fan block 29 due to the rotation of the centrifugal fan 3. Further, for the purpose of preventing the generation of the vibration more securely, it is preferable to adhere a buffering material (not shown) to the outer peripheral surface of the diffuser unit 28 such that the buffering material is intervened between the outer peripheral portion 32a of the diffuser unit 28 and the groove on the inner surface of the housing 1.

[0017] The fan cover 26 forming the case of the fan unit 27 is a member formed by raising a sidewall 26b from the periphery of a base 26a having a central opening. By fixing the edge of the lead ending of the sidewall 26b at the cylindrical body 32 of the diffuser unit 28, a

space for accommodating the centrifugal fan 3 is formed between the fan cover 26 and the diffuser unit 28. The centrifugal fan 3 is formed of a hub 33 and a plurality of vanes 34 arranged on the hub 33 in a radial manner.

[0018] As shown in Fig. 8B, the diffuser unit 28 is a diffuser with vanes. Specifically, the diffuser unit 28 has a plurality of vanes 36 arranged in a radial manner to divide the peripheral portion of the cylindrical body 32 into a number of air flow paths 37. Further, formed at the central portion of the cylindrical body 32 is a through hole 38 for accepting an output shaft 5a of the motor 5. Each air flow path 37 is formed with its cross sectional area gradually expanded along an axial direction of the cylindrical body 32. The motor 5 is fixed to the diffuser unit 28 with its output shaft 5a inserted into the through hole 38 of the diffuser unit 28. By connecting the output shaft 5a of the motor 5 with the centrifugal fan 3 in the fan unit 27, a rotational force of the motor 5 can be transmitted to the centrifugal fan 3.

[0019] With regard to the fan block 29 described above, the number m of the vanes 36 of the diffuser unit 28 and the number n of the vanes 34 of the centrifugal fan 3 are different natural numbers, and the two numbers m and n are preferably set to be relatively prime. In the preferred embodiment, m and n are set to be 9 and 7, respectively. Given that the noise of the current of the centrifugal fan 3 increases when the vanes 34 of the centrifugal fan 3 approach adjacent structures (i.e., the vanes 36 of the diffuser unit 28), a simultaneous generation of a noise of the current of each vane 34 can be prevented by setting m and n as exemplified here, thus reducing the noise of the entire fan block 29.

[0020] Further, by installing the fan block 29 with the above configuration in the space 50 within the housing 1, there is formed an air exhaust path for directing the air introduced into the hair suctioning section B by the rotation of the centrifugal fan 3 to the basal end side through the fan block 29 in the space 50 to finally exhaust the air through the air discharge holes 31. The air exhaust path 39 is formed so as to direct the air sent by the centrifugal fan 3 in the centrifugal direction toward the basal end side in the axial direction after the air contacts the fan cover 26 in the fan unit 27 and then allow the air to flow through each air flow path 37 toward the basal end side in the axial direction in the diffuser unit 28. Moreover, the air exhaust path 39 is formed such that the air sent to the basal end side therethrough is made to contact the outer surface of the motor 5, thus cooling the motor 5. Also, the air exhaust path 39 is formed such that the air is exhausted from the air discharge holes 31 at the basal end side of the housing 1 in a direction opposite to the cutter unit 2, thus preventing the air from being exhausted toward the user, discomforting the user.

[0021] The hair clipper having the above configuration also includes an attachment 41 for adjusting a hair trim length as shown in Figs. 9A to 11, wherein the attachment 41 is detachably secured to the hair clipper. The attachment 41 has: a half-cylindrical base 42 slidably installed

on an exterior surface of the housing 1 of the clipper main body in the lengthwise direction; and a comb tooth-shaped portion 43 provided at the base 42 so as to be protruded therefrom 42. The base 42 is installed on one exterior surface (front surface) 1b of the housing 1 opposite to the surface (rear surface) 1a where the suction case 14 is installed. Accordingly, an attachment/separation of the suction case 14 and an adjustment of degree of protrusion of the suction case 14 at one exterior surface 1a and an attachment/separation of the attachment 41 and a manipulation of sliding the attachment 41 at the other exterior surface 1b can be performed independently without being hampered by each other.

[0022] The attachment 41 is slidably attached on the exterior surface of the housing 1 by slidably fitting two lateral edges of the half-cylindrical base 42 into a pair of grooves 44 (see Figs. 2 and 3) which are respectively formed at two lateral edges between the exterior surfaces 1a and 1b of the housing 1 to be elongated in the lengthwise direction of the housing 1. Further, an engagement button 45 (see Fig. 1) is provided at a portion of housing's one exterior surface 1b which is covered by the attachment 41, wherein the engagement button 45 is projected or recessed freely and is kept pressurized by a coil spring (not shown) on the back side of the housing 1 in a projection direction. By inserting the engagement button 45 into one of engagement recesses (not shown), which are provided on the inner surface of the attachment 41 with a preset interval maintained therebetween, the sliding amount of the attachment 41 can be maintained at a certain degree set by one of plural steps provided.

[0023] Moreover, both lateral ends of the comb tooth-shaped portion 43 of the attachment 41 are configured to cover both lateral ends of the cutter unit 2 in the reciprocating direction, regardless of the sliding amount of the attachment 41. That is, when viewed from the side, both lateral ends of the comb tooth-shaped portion 43 are elongated to an extent that the cutter unit 2 is hidden by them. Thus, by covering the lateral ends of the cutter unit 2, both lateral ends of the comb tooth-shaped portion 43 function as a wall for preventing a dispersion of the cut hair.

[0024] To cut the hair by using the hair clipper with the attachment 41, the attachment 41 is appropriately slid on the hair clipper while the operation button 30 is kept off, and the attachment 41 is fastened to the housing 1 at a desired sliding position. Then, by inserting a plug (not shown) of an AC adaptor into a plug hole 47 provided at a basal end portion of the housing 1 and, at the same time, turning on the operation button 30, power is supplied to the motor 4 of the hair cutting section A and the motor 5 of the suction force generating section C. As a result, in the hair cutting section A, the movable blade 12 is made to slide reciprocally relative to the stationary blade 1 and, in the suction force generating section C, the centrifugal fan 3 is rotated to thereby generate a suction force for suctioning the air in the hair suctioning section B into the suction force generating section C to finally

discharge the air from the air discharge holes 31.

[0025] If the hair clipper main body is moved while the comb tooth-shaped portion 43 of the attachment 41 is kept in contact with the head of a person whose hair is being cut, the hair of the person is cut by the cutter unit 2 continually, and the cut hair is suctioned into the hair suction path 6 of the hair suctioning section B through the suction inlet 13 near the cutter unit 2 along with the exterior air. The suctioned exterior air is sucked into the suction force generating section C through the filter 40, while the suctioned cut hair is accumulated in the hair suction path 6. The air introduced into the suction force generating section C is flown through the interval space between the motor 5 and the housing 1 after passing through the fan unit 27 and the diffuser unit 28, to be finally exhausted outside through the air discharge holes 31 of the basal end of the housing 1.

[0026] Here, since the centrifugal fan 3 is installed in the suction force generating section C as a means for generating a suction force for sucking in the cut hair through the hair suctioning section B, a strong suction force can be obtained, though it has a small size. Further, by installing the diffuser unit 28, the air sent downstream of the centrifugal fan 3 undergoes a gradual static pressure recovery while it passes through the diffuser unit, so it is possible to output the air at a high efficiency without a loss. Accordingly, the hair clipper in accordance with the present invention can generate a strong suction force without increasing the size of the motor 5 incorporated therein. Thus, the hair clipper can powerfully suction the cut hair, while remaining small in size.

[0027] When the change in the trim length is required, it can be achieved by just a sliding of the attachment 41 in the lengthwise direction of the housing 1. Further, the adjustment of the protruding degree of the suction inlet 13 is realized by just a sliding of the upper block 19 of the suction case 14 in the lengthwise direction. Further, since the attachment 41 and the suction case 14 are independently installed at two opposite surfaces 1a and 1b of the housing 1 on the leading end side thereof where the hair cutting section A is provided, the attachment/separation and the sliding manipulation of the two components 41 and 14 can be performed independently without being hampered by each other.

[0028] Here, another type of attachments 41', one of which is illustrated in Fig. 12, can be utilized instead of the attachment 41. The attachments 41' have different heights of comb tooth-shaped portions 43', and one of them is connected to the leading end portion of the housing 1 in a manner that no sliding motion is allowed. By appropriately changing the attachments 41' with the comb tooth-shaped portions 43' having different heights, the trim length can be varied.

[0029] After completing the haircut, the operation button 30 is turned off, stopping the reciprocating motion of the cutter unit 2 and the rotation of the centrifugal fan 3. Then, the suction case 13 is separated from the housing 1 to remove the cut hair from the hair suctioning section

B. Here, in accordance with the preferred embodiment, it is possible to open the entire hair suctioning section B, from the suction inlet 13 to the vicinities (right before the filter 40) of the centrifugal fan 3 by separating the suction case 14. Thus, the cut hair accumulated in the hair suction path 6 can be removed completely and effectively.

[0030] Moreover, though the attachment 41 is not used when cutting, e.g., the hair around ears of a person whose hair is being cut, the parts around of the suction inlet 13 of the suction case 14 come into contact with the head of the person, hampering the hair cutting action. For this reason, the upstream block 19 is kept retrieved when cutting the hair around the ears. As such, by controlling the protruded amount of the suction inlet 13 depending on a region where the hair is being cut, user convenience can be improved.

[0031] In accordance with the present invention, it is possible to provide the highly convenient hair clipper having the hair suctioning section. Further, hair suctioned into the hair suctioning section can be readily removed therefrom and the inside of the hair suctioning section can be cleaned easily.

[0032] While the invention has been shown and described with respect to the preferred embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

is slid in the lengthwise direction of the hair clipper main body.

Claims

1. A hair clipper comprising:

a hair clipper main body having a cutter unit for cutting hair, the cutter unit being installed at a leading end of the hair clipper main body;
a hair suctioning section for suctioning the hair cut by the cutter unit through a suction inlet by means of rotating a suction fan to store the suctioned hair inside,
wherein a hair suctioning section's portion ranging from the suction inlet to a vicinity of the suction fan is formed by an exterior surface of a housing of the hair clipper main body and an inner surface of a suction case detachably attached to the housing.

2. The hair clipper of claim 1, wherein the suction case includes: an upstream block having the suction inlet at a leading end thereof; and a downstream block disposed downstream of the upstream block, and the upstream block is configured to be slidably moved with respect to the downstream block, which is fixed to the housing of the hair clipper main body.

3. The hair clipper of claim 2, wherein the hair clipper main body is of a slender shape and the upper block

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FIG. 1A

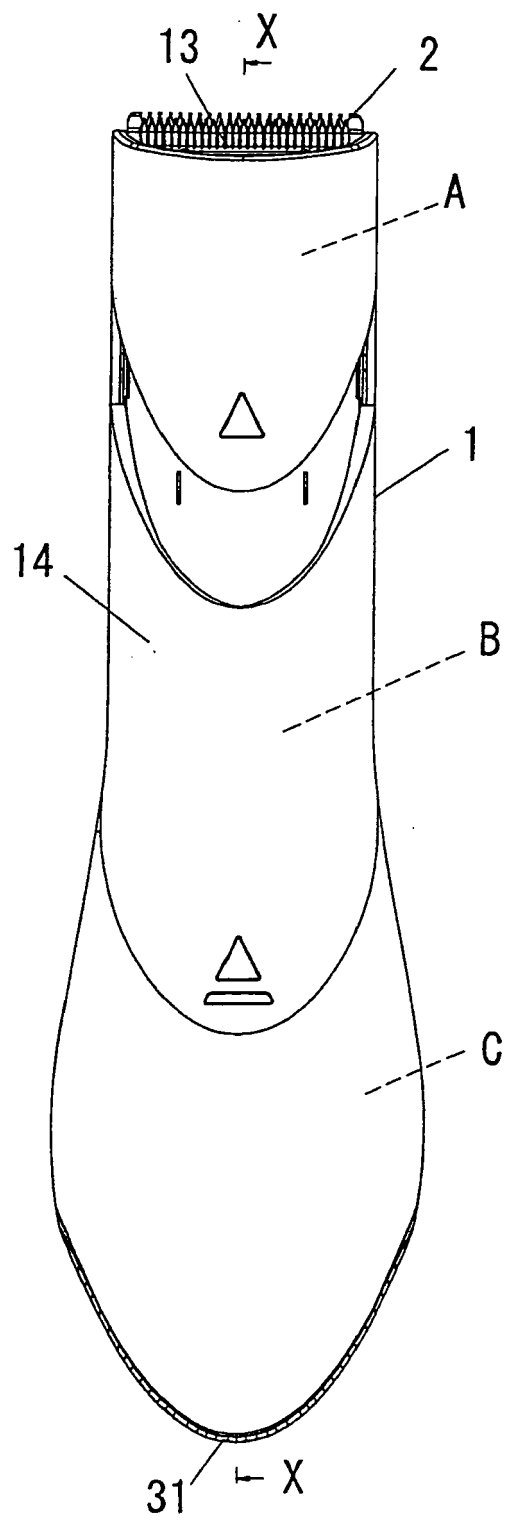


FIG. 1B

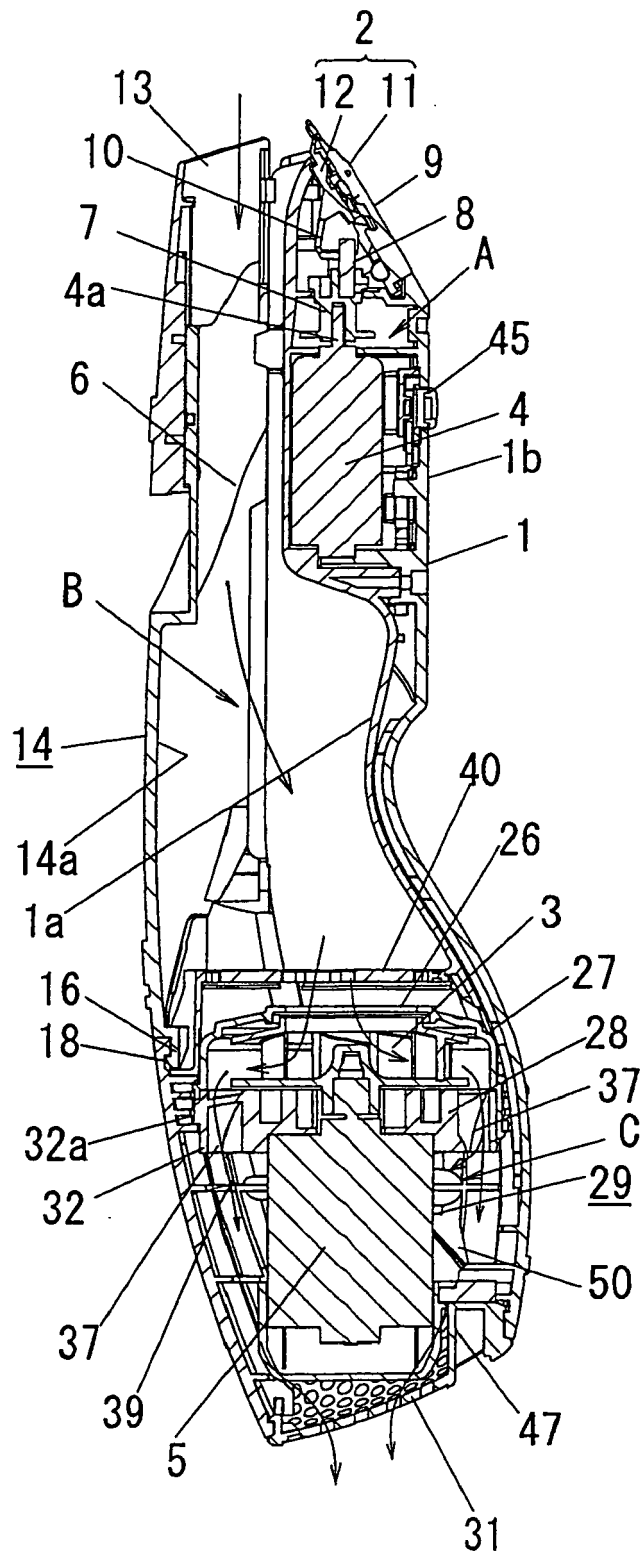


FIG.2

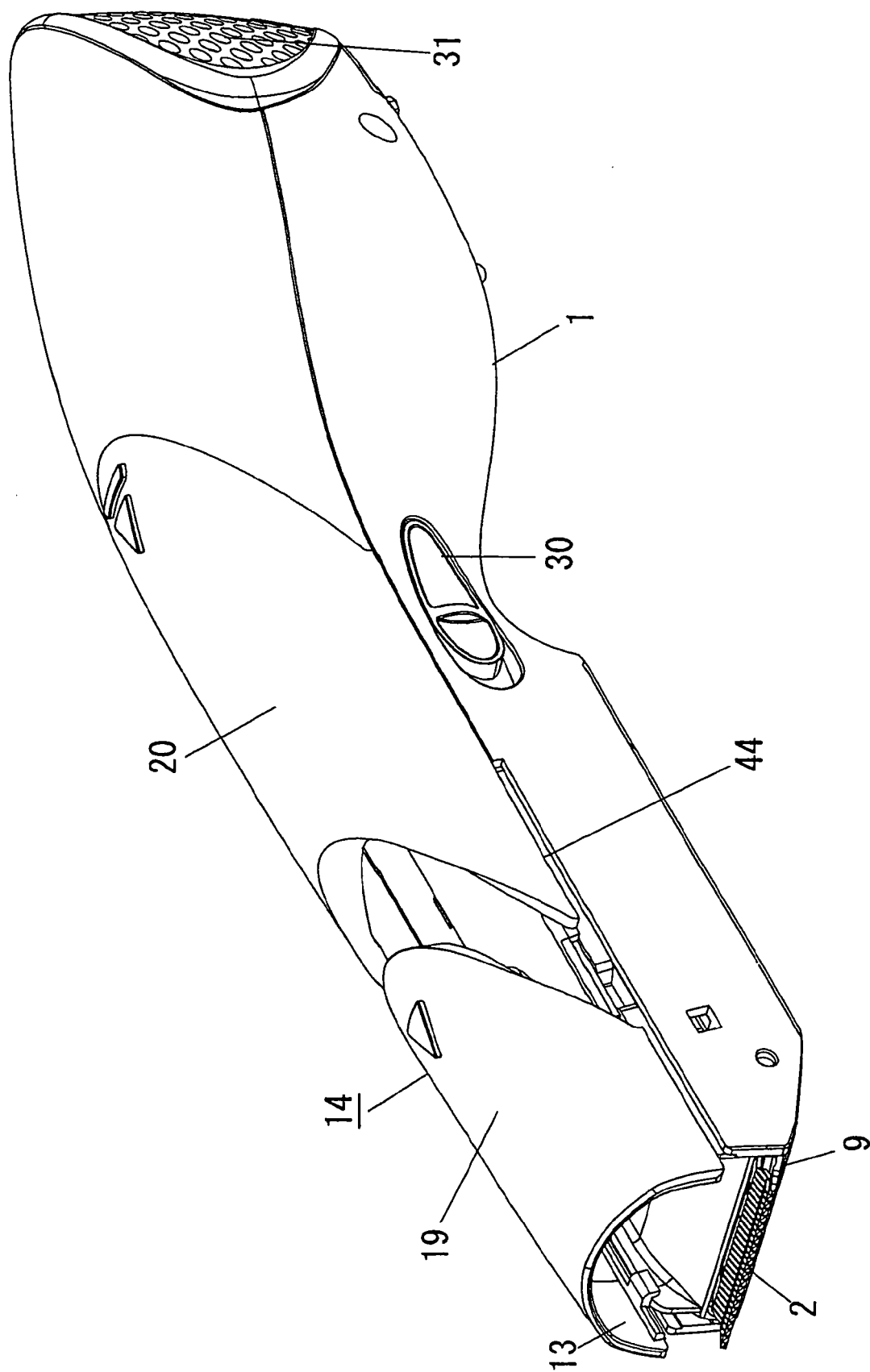


FIG. 3

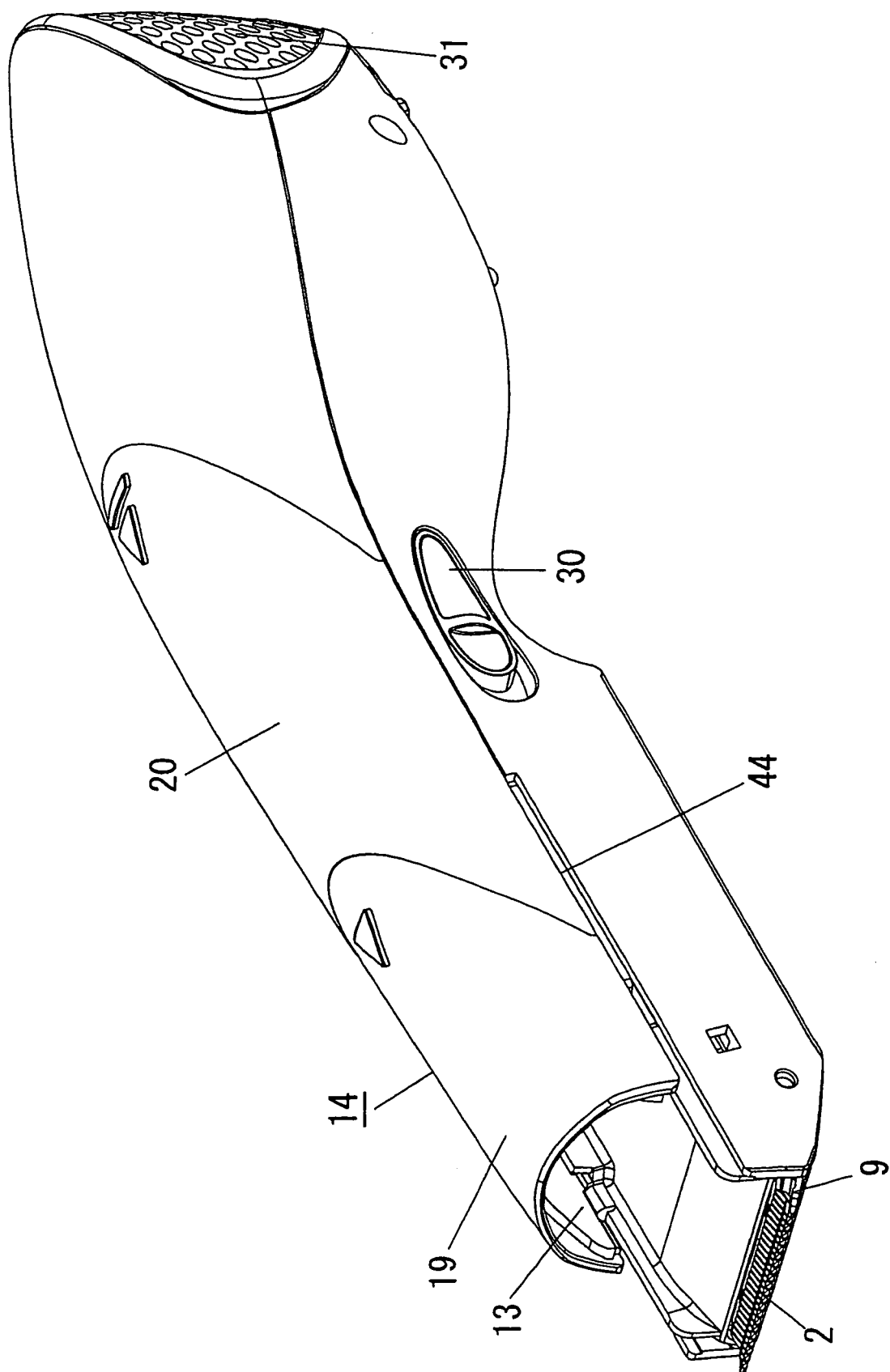


FIG. 4

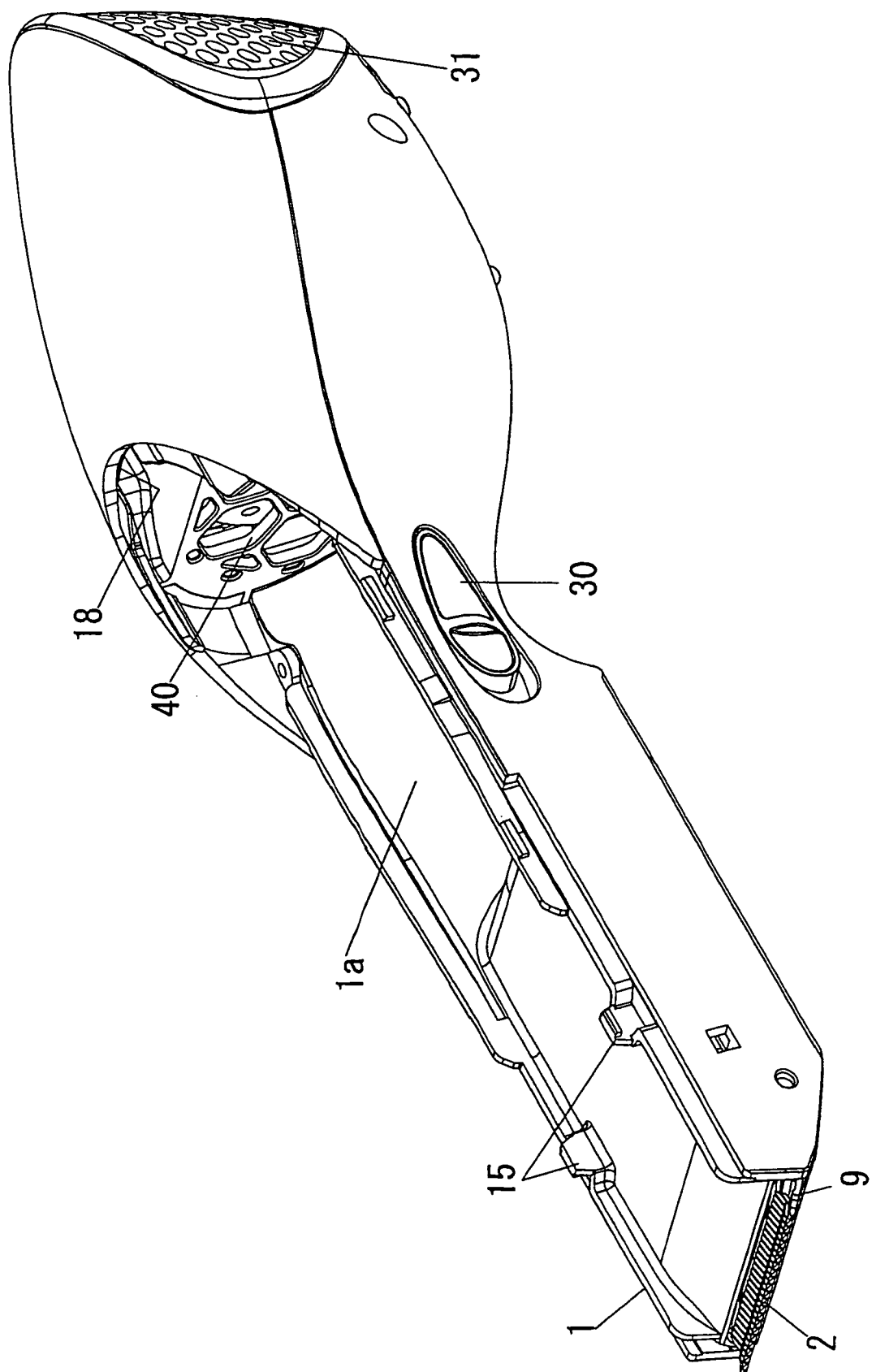


FIG. 5A

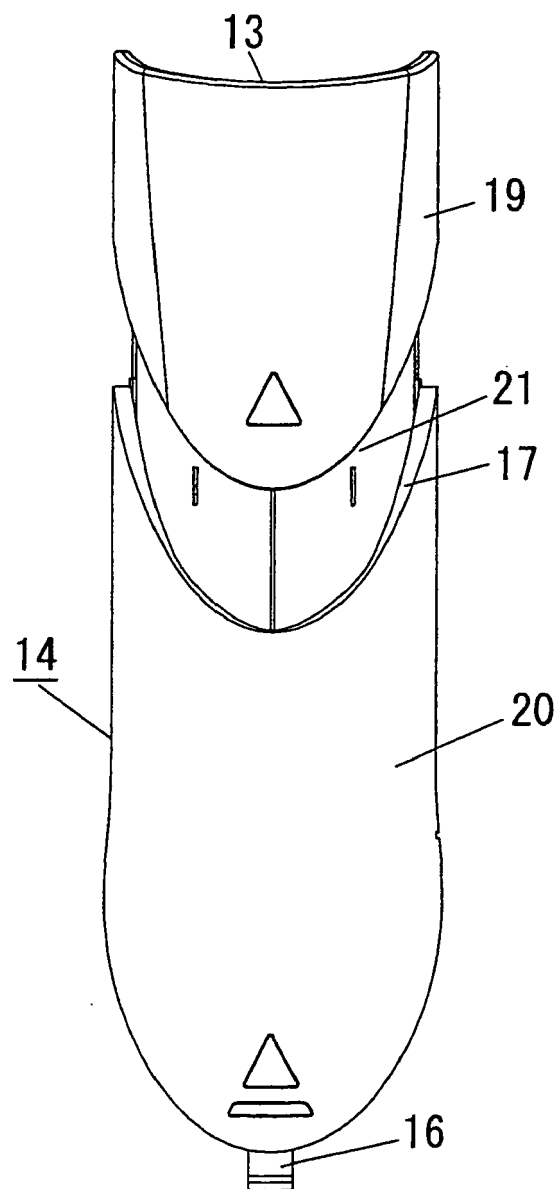


FIG. 5B

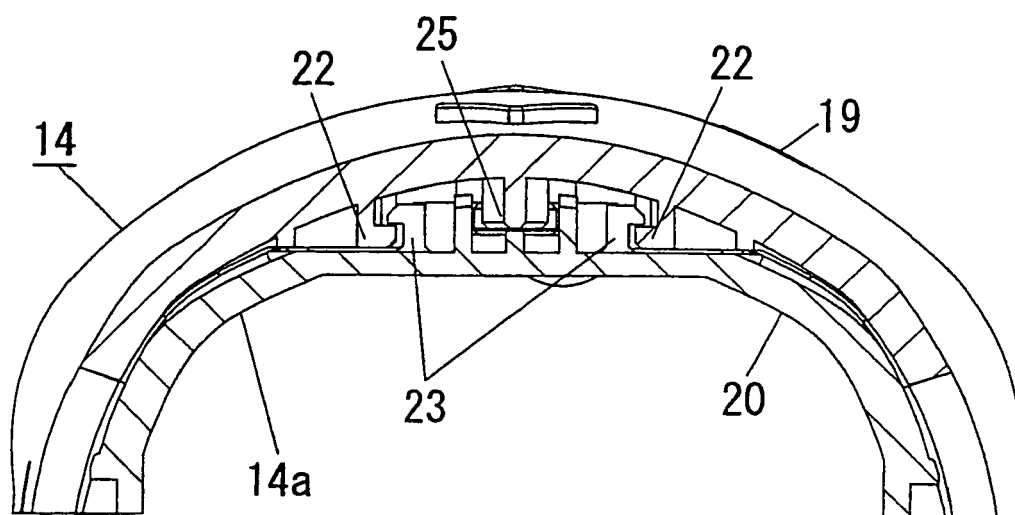


FIG. 6A

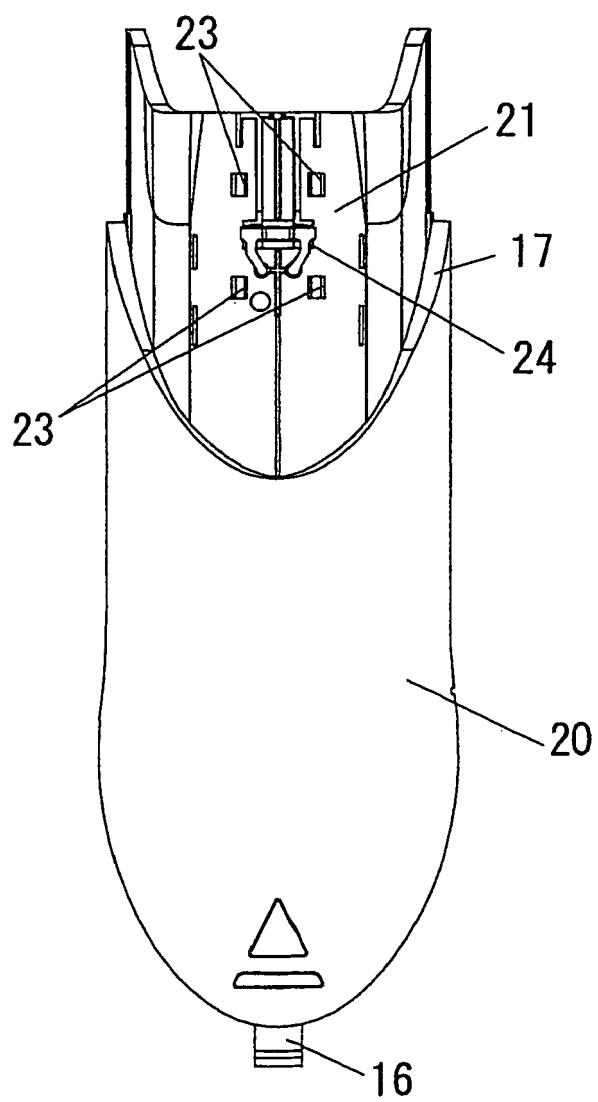


FIG. 6B

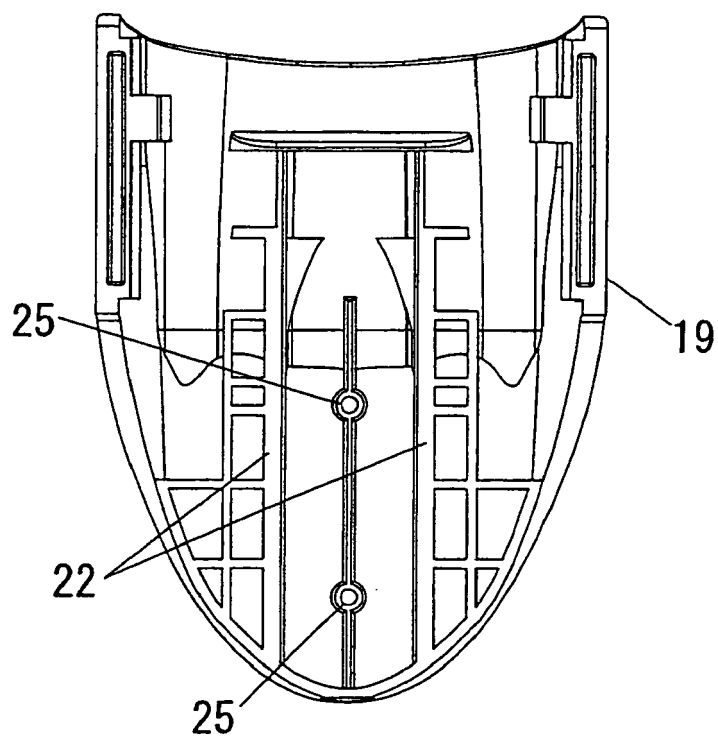


FIG. 7

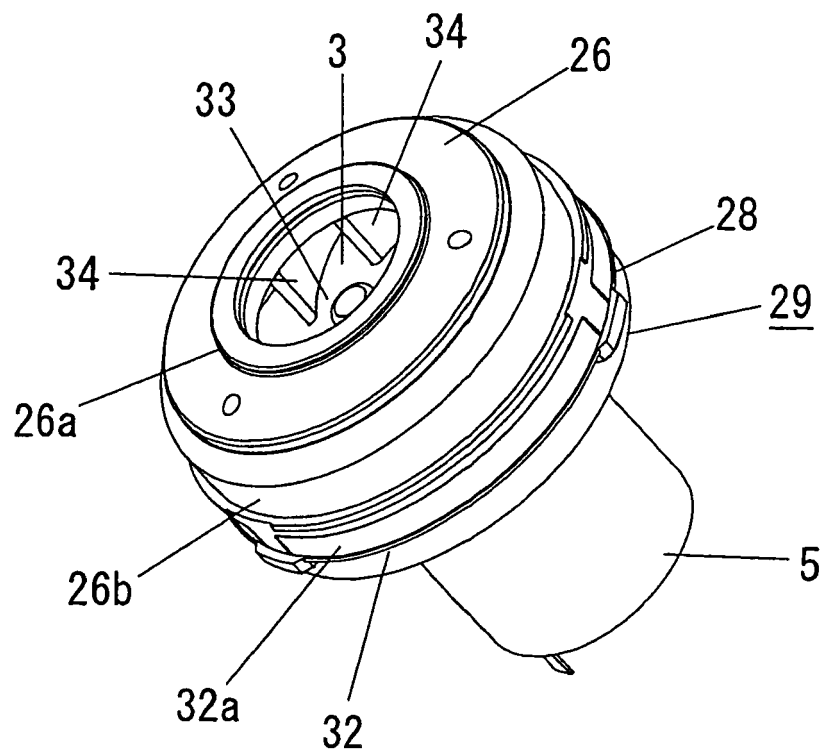


FIG. 8A

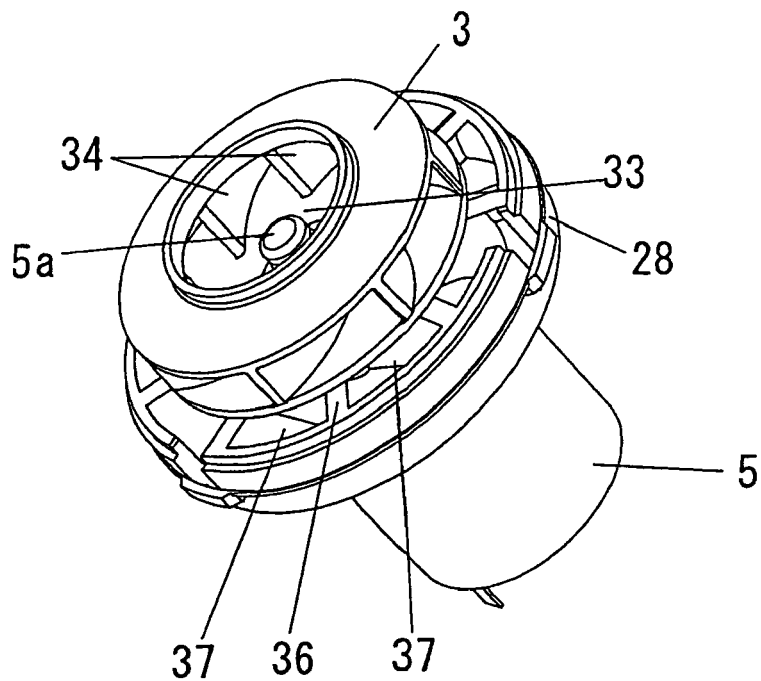


FIG. 8B

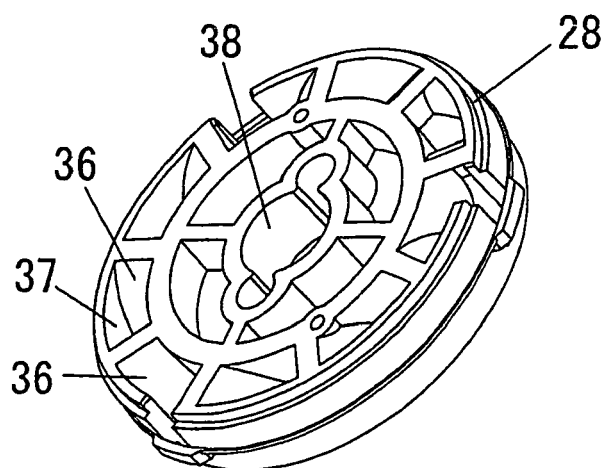


FIG. 9C

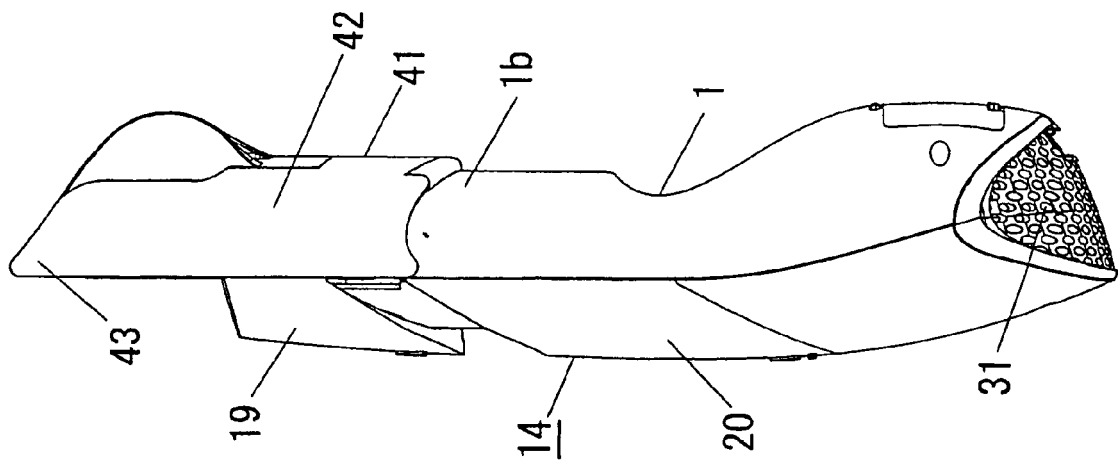


FIG. 9B

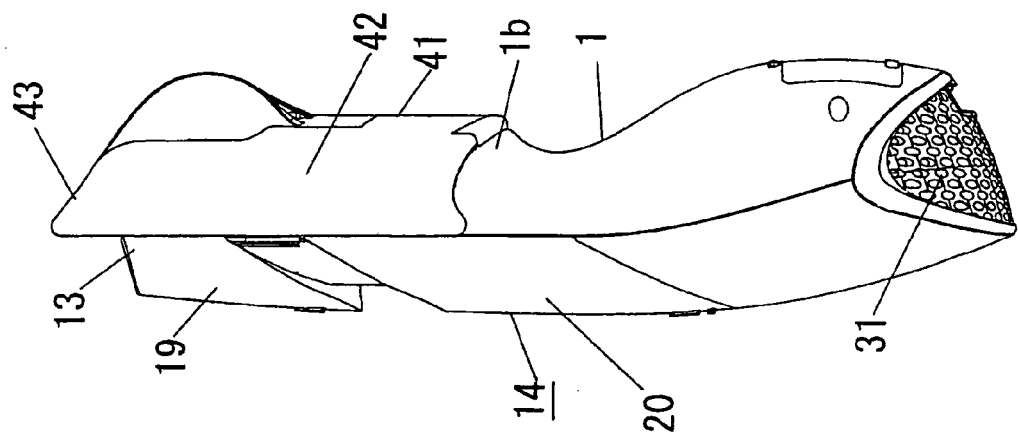


FIG. 9A

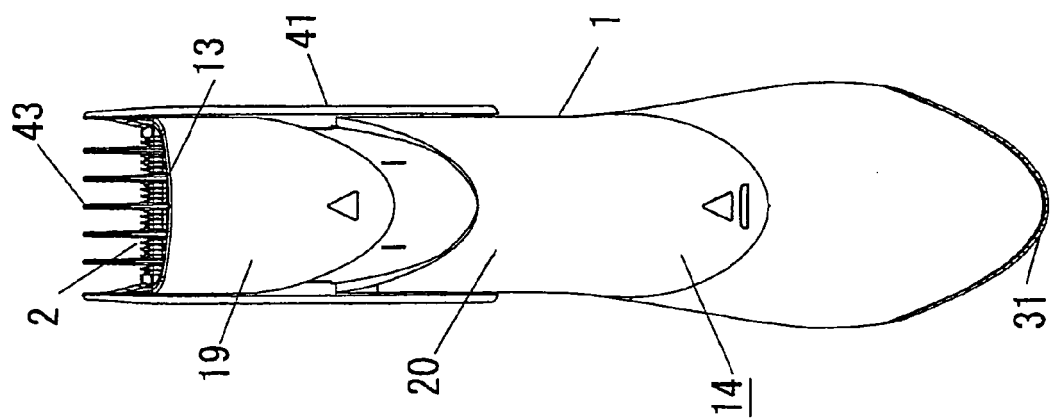


FIG. 10

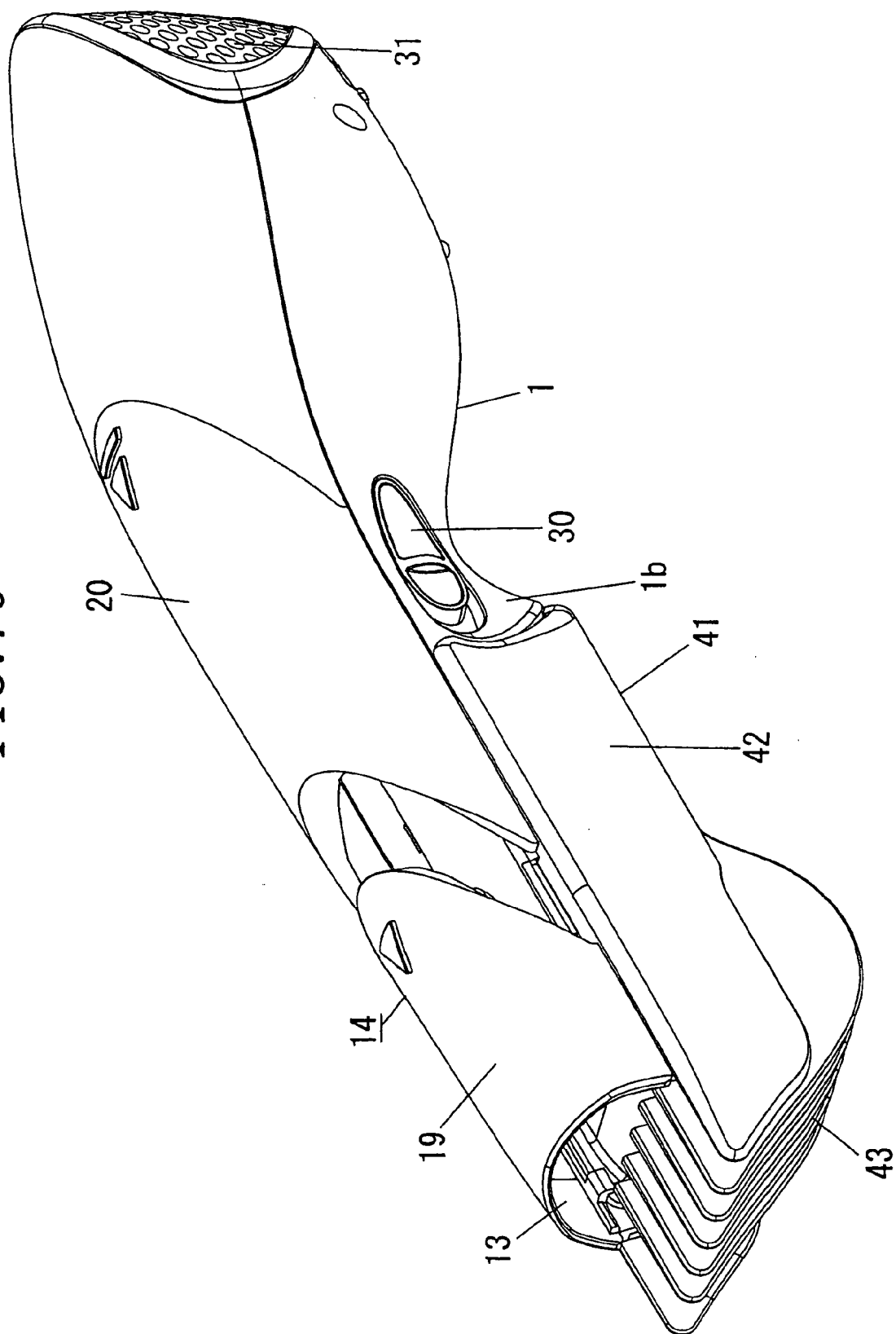


FIG. 11

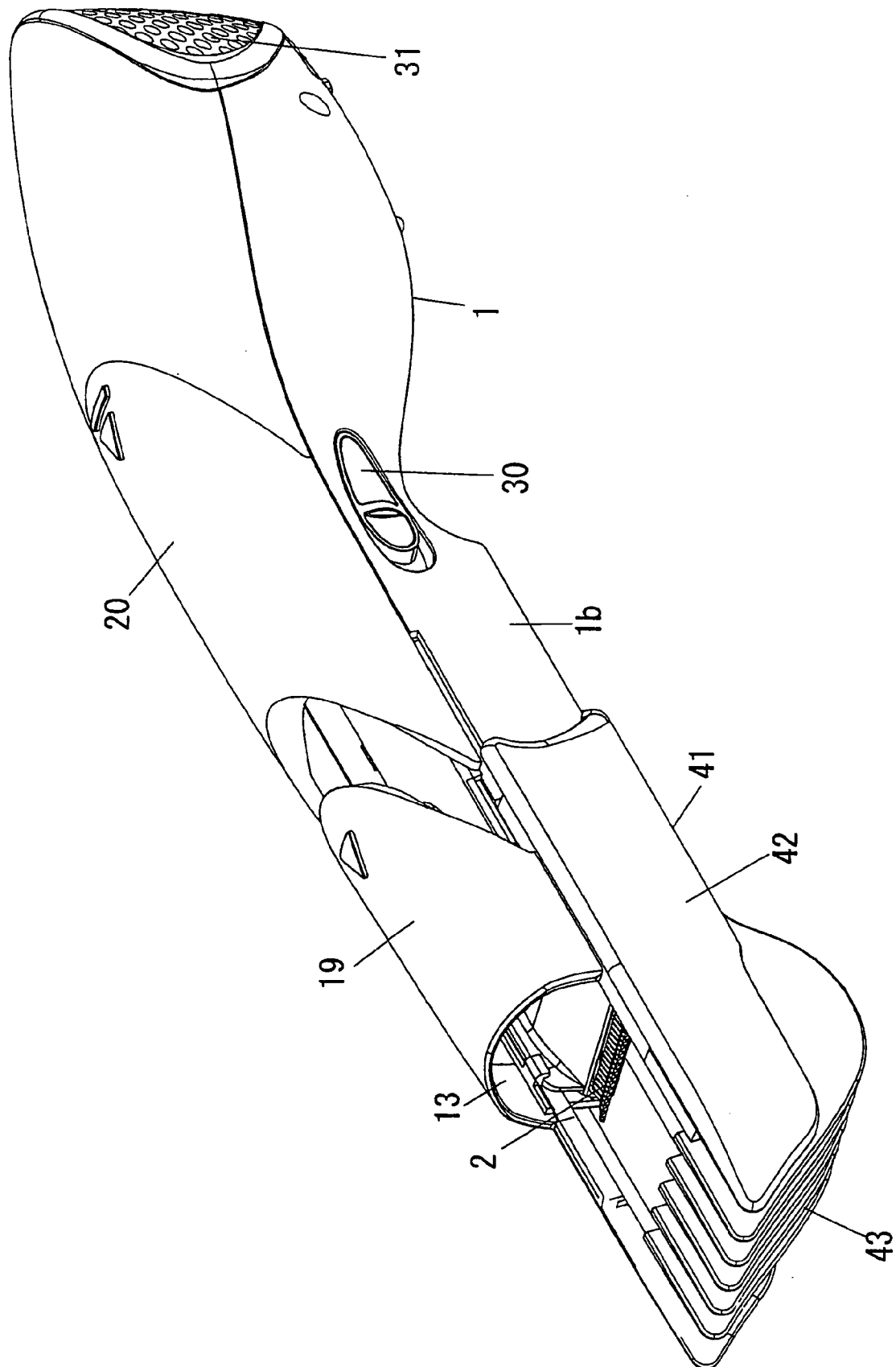
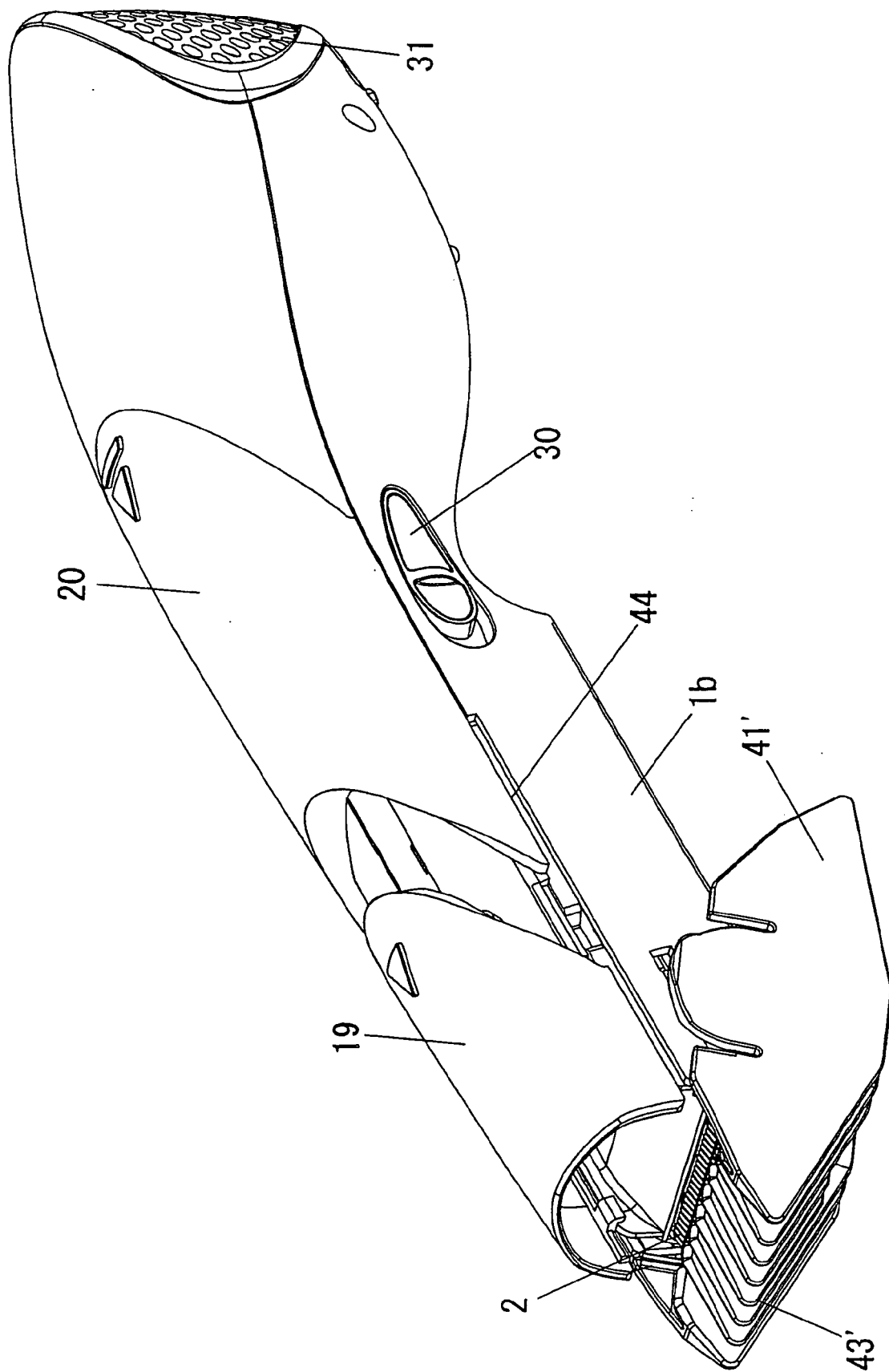


FIG. 12





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 02 1141

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	US 4 972 584 A (BAUMANN JOHN H [US]) 27 November 1990 (1990-11-27) * column 4, lines 48-60; figures 1,2 *	1	INV. B26B19/44 B26B19/06
A	US 3 384 919 A (JORDING CLIFFORD H ET AL) 28 May 1968 (1968-05-28) * column 1, line 72 - column 2, line 10; figures 1-3 *	1	
A	US 5 075 971 A (MCCAMBRIDGE JAMES E [US]) 31 December 1991 (1991-12-31) * column 3, lines 32-37; figures 1-3,16 *	1	
A	GB 2 410 457 A (RITCHIE GARRY [GB]) 3 August 2005 (2005-08-03) * page 7, paragraph 2-4; figures 1,2 *	1	
A	US 3 063 146 A (BRAY MUREL B) 13 November 1962 (1962-11-13) * column 3, line 55 - column 4, line 3; figures 1,9 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B26B
Place of search		Date of completion of the search	Examiner
Munich		17 January 2007	RATTENBERGER, B
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1
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ON EUROPEAN PATENT APPLICATION NO.**

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The members are as contained in the European Patent Office EDP file on
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17-01-2007

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4972584	A	27-11-1990	NONE	
US 3384919	A	28-05-1968	GB 1133276 A	13-11-1968
US 5075971	A	31-12-1991	NONE	
GB 2410457	A	03-08-2005	NONE	
US 3063146	A	13-11-1962	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2002253878 A [0002]