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(54) **Skin treatment device and attachment**

(57) The present invention is concerned with a skin treatment device that comprises an actuator (122) and at least a skin stimulation element (111; 112) arranged at a mounting structure (113), the mounting structure (113) being supported at the skin treatment device (1) and the mounting structure (113) being deformable or displaceable against a restoring force when an external

force (F) is applied on the skin stimulation element (111; 112). A contact portion (114a; 114b) of the mounting structure (113) is arranged to cooperate with the actuator (122) only in a deformed or displaced state of the mounting structure (113). This renders the device to operate on a low noise level when it is switched on but not pressed against the skin.

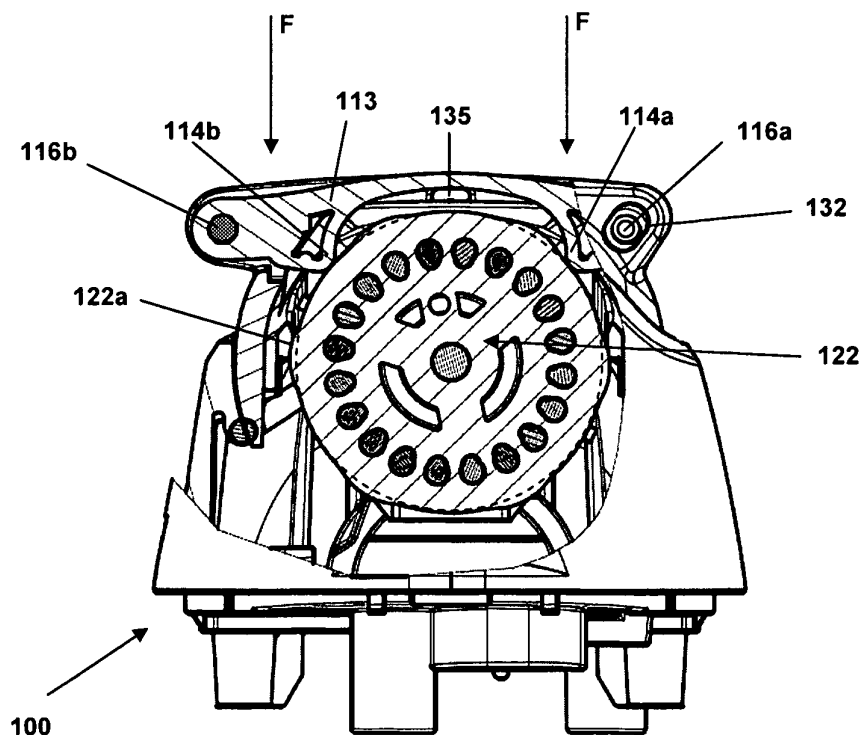


Fig. 4B

Description

FIELD OF THE INVENTION

[0001] The present invention is concerned with skin treatment devices in general and in particular with skin treatment devices that comprise a stimulation element for mechanically stimulating the skin during operation.

BACKGROUND OF THE INVENTION

[0002] International patent application WO 01/05267 A1 describes a skin treatment device, namely an epilation device that has a driven means for mechanically stimulating the skin during operation of the epilation device. The driven means are mounted such that displacement of the driven means is permitted. The intensity of the mechanical stimulation affected by the driven means during operation can be varied by the user.

[0003] It was found that such a device as described in WO 01/05267 A1 is relatively noisy and that users may retract from using the epilation device because of its "aggressive" noise when it is switched on.

[0004] International patent application WO 02/076260 A1 describes a noise protection cap that encloses an epilation cylinder and can be pressed against the skin with a closed circumference such that the epilation cylinder is sealed inside the noise protection cap during operation. The disadvantage of such a noise protection cap is that it obviates a good sight onto the area that is being treated with the skin treatment device. Further, noise generated by driven means as discussed before is not reduced when the epilator device is switched on.

SUMMARY OF THE INVENTION

[0005] It is hence desirable to improve known skin treatment devices concerning their noise behavior.

[0006] An improved skin treatment device is provided in accordance with claim 1. Further embodiments are defined by the dependent claims.

[0007] The proposed skin treatment device Skin treatment device comprises an actuator and at least a skin stimulation element arranged at a mounting structure, the mounting structure being supported at the skin treatment device. The mounting structure is arranged to be deformable or displaceable against a restoring force when an external force is applied on the skin stimulation element. The mounting structure may therefore comprise at least a resilient part that e.g. bends under the applied external force or the mounting structure may comprise a spring, e.g. a leaf or helical spring. A contact portion of the mounting structure is positioned such that it cooperates with the actuator only in a deformed or displaced state of the mounting structure. As the contact portion is not in contact with the actuator when the skin treatment device is switched on but not pressed against the skin, the device will operate at a low noise level in the switched-

on state. When the device is pressed against the skin, the mechanical contact between contact portion and actuator is established and the noise level increases, which is acceptable to a user, as this is in coincidence with the regular operation of the device. Hence, the proposed skin treatment device is more appealing to a user than a skin treatment device in which a skin stimulation element is actuated already when the skin treatment device is switched on. Support of the mounting structure at the skin treatment device may be established by at least a support structure (e.g. a support pin) that establishes an essentially fixed point of the mounting structure when the external force is applied so that the mounting structure essentially deforms or displaces with respect to the support structure.

[0008] In an embodiment of the proposed skin treatment device, the skin stimulation element and the mounting structure are part of a detachable attachment.

[0009] In a further embodiment, the skin treatment device comprises a drivable skin treatment unit to which the actuator is mechanically coupled so that driving the skin treatment unit also drives the actuator.

[0010] In another embodiment, the external force required to bring the mounting structure into a deformed or displaced state in which the contact portion cooperates with the actuator lies in the range between about 0.2 N and about 5 N. In particular, this range may lie between about 0.5 N and about 2N.

[0011] In an even further embodiment, the skin treatment device is realized as an epilator device, where skin stimulation elements are used to suppress the pain from plucking out hairs. The skin treatment unit may then be realized as an epilation unit for gripping and pulling out hairs.

[0012] The invention is also concerned with a detachable attachment that comprises the mounting structure and the skin stimulation element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The invention will be further elucidated by explaining an exemplary embodiment and by reference to figures. In the figures

- 45 Fig. 1 shows an exemplary skin treatment device;
- Fig. 2 shows a magnified detail of the skin treatment device shown in Fig. 1;
- Fig. 3 shows an attachment of the skin treatment device shown in Figs. 1 and 2;
- 50 Fig. 4A is side view onto a head part of the skin treatment device as shown in the previous figures that partially is a cut open to show a cross-sectional cut through the head section in an unloaded state; and
- 55 Fig. 4B shows the same details as in Fig. 4A but in a loaded state in which an external force is applied onto the head part.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Fig. 1 is a perspective depiction of an exemplary embodiment of a skin treatment device 1 as proposed, which skin treatment device is realized as an epilator device. The skin treatment device 1 comprises a hand piece part 10 and a head part 100. The head part 100 comprises a detachable attachment 110 that has an aperture that allows for contacting the skin during operation of the skin treatment device 1 such that hairs growing on the skin can be removed by a skin treatment unit 120, which skin treatment unit 120 is here realized as an epilation unit. The attachment 110 further comprises skin stimulation elements 111. The skin treatment device 1 is connected to mains voltage via a cord 19, but the skin treatment device 1 could also be energized via a (rechargeable) battery that is arranged in the skin treatment device 1. In contrast to the shown embodiment, it is not necessary for the present invention that the skin treatment device 1 has a detachable attachment 110.

[0015] Fig. 2 is a perspective view onto the magnified head of the skin treatment device 1 as shown in Fig. 1 in which details of the head part 100 are better visible. The attachment 110 comprises two rows of skin stimulation elements 111 realized as rotatably mounted annuli where every other annulus has radially extending spikes for point-like stimulation of the skin during operation of the skin treatment device 1. Each of the rows of skin stimulation elements 111 is mounted on an axis (see Figs. 4A and 4B). Each end of each of the axes is supported in a recess provided in an outer arm of a mounting structure 113. Further skin stimulation elements 112 realized as knobs are arranged on a bridge structure connecting the outer arms of the mounting structure 113. The skin treatment unit 120 is realized as an epilation unit comprising an epilation cylinder that is equipped with several pairs of tweezers 121 for gripping and pulling out hairs during operation. The epilation cylinder extends into an aperture of the attachment 110 such that hairs growing on the skin can be gripped and plucked out during regular operation when the head part of the epilator device is drawn over the skin. It is to be noted that this specific example is not to be taken as limiting the invention, but any other realization of a skin treatment unit 120 should also be covered, specifically any other realization of an epilation unit. The front row of skin stimulation elements 111 is arranged closer to the skin treatment unit 120 than the back row of skin stimulation elements 111. It was found that such an asymmetric arrangement of rows of stimulation elements leads to an improved stimulation effect. This can be accounted e.g. to the larger stroke of the back row of stimulation elements 111 (this will be explained in more detail with respect to Fig. 4B).

[0016] Fig. 3 is a perspective view onto the attachment 110 as shown in Fig. 2 in a detached state. In the shown embodiment, the attachment 110 comprises an outer casing 130 that will be fixedly attached to the head part 100 and an inner casing 131 that is movably mounted in

the outer casing 130 to allow a swivel motion of the inner casing 131. The mounting structure 113 is supported by a support pin 135 of the inner casing 131 (the mounting structure 113 is supported by a further support pin on the opposite side of the aperture, which further support pin is not visible in the shown view). In the shown embodiment, the mounting structure 113 is realized as an asymmetric H, wherein the bridge structure 113c that connects the two outer arms 113a and 113b of the H is arranged with an offset to the vertical centre axis of the H. Skin stimulation elements 112 realized as knobs are arranged on the skin side of the bridge structure 113c. A front row and a back row of skin stimulation elements 111 a and 111 b are each arranged on an axis, where each axis is supported at an end of the outer arms of the mounting structure 113 (it is to be noted that only a single skin stimulation element 111 may be arranged on each axis instead of a plurality of skin stimulation elements as shown). The support pin 135 is further arranged with an offset to the vertical centre axis of the H so that the back row 111 b of skin stimulation elements is farther away from the support pin than the front row 111 a of skin stimulation elements. In the discussed embodiment, the skin treatment unit 120 is arranged centered with respect to the support pins 135 so that the front row and back row of stimulation elements 111 a and 111 b lead to a stimulation pattern (or distribution of stimulation events) that is asymmetric with respect to the skin treatment area during operation. It was found that such an asymmetric stimulation pattern leads to an improved stimulation result and hence to a better pain suppression for e.g. an epilation treatment.

[0017] Fig. 4A is a side view onto a partial cross-sectional cut through the head part 100. The partial cross-sectional cut is made along line A-A as indicated in Fig. 2. In Fig. 4A, the head part 100 is shown in an unloaded state in which no external forces are applied. The front and back row of stimulation elements 111 a and 111 b as shown in the previous figures are mounted on a front and a back axis 116a and 116b, respectively, where front axis 116a carries the front row of skin stimulation elements 111 a and back axis 116b carries the back row of skin stimulation elements 111 b. Front axis 116a is extending into an elongated hole 132 of the inner casing 131. Likewise, back axis 116b may extend into an elongated hole of the inner casing 131. The mounting structure 113 is supported by a support pin 135 of the inner casing 131 (a further such support pin is arranged opposite to the support pin 135). The support pin 135 is arranged asymmetrically so that the distance of the back axis 116b to the support pin 135 is larger than the distance of the front axis 116a to the support pin 135. On each outer arm section of the mounting structure 113 that extends away from the support pin 135, a contact portion 114a and 114b is arranged. The contact portions 114a and 114b are arranged symmetrically with respect to the support pin 135. Further, the head part 100 comprises an actuator 122 realized as a circular disc having a plu-

ality of angularly spaced projections 122a that radially extend over the radius of the disc. The actuator 122 is fixedly mounted on a central axis 123 that also carries the epilation cylinder. During operation of the skin treatment device, the actuator will thus rotate with the speed of the epilation cylinder. In the unloaded state as shown in Fig. 4A, the contact portions 114 do not contact the actuator 122 and specifically not the projections 122a. In case, the skin treatment device is switched on, the skin treatment device will operate at a low noise level as no mechanical interaction between the mounting structure 113 and the actuator 122 is established.

[0018] Fig. 4B is the same partial cross-sectional cut through the head part 100 of the skin treatment device but shown in a loaded state, where an external force F is applied on the mounting structure 113, which is affected by a user pushing the skin treatment device against the skin. The flexible mounting structure 113 is deformed as a result of the applied force. Specifically, the outer arm sections of the mounting structure 113 are bending under the applied force F . In the deformed state, the contact portions 114a and 114b contact the outer surface of the actuator 122. During operation, the angularly spaced projections 122a of the actuator 122 induce a vibration of the mounting structure 113 and hence a vibration of the skin stimulation elements 111 arranged at the mounting structure 113, which generates a modulated stimulation experience on the skin. As the back axis has a larger distance to the support pin 135 than the front axis 116a, the stroke of the back axis 116b is higher and thus the skin stimulation induced by the back row of skin stimulation elements 111 b is more pronounced than the stimulation induced by the front row of skin stimulation elements 111 a. As is understandable from Fig. 4B, a contact between the contact portions 114a and 114b and the actuator 122 is only established when the device is pushed against the skin with a certain force. The increase in noise level is acceptable to a user as the noise increase coincides with the active use of the skin treatment device when pressed against the skin. The external force F required bringing the contact portions 114a and 114b in contact with the actuator 122 may lie in the range of about 0.2 N to about 5 N, in particular in the range of about 0.5 N to about 2 N.

[0019] In a specific embodiment of the attachment as shown, the outer arms of the mounting structure 113 have a width of 1.2 mm and a height of 1 mm. The lengths of the outer arms of the mounting structure between support pin 135 and the front and back axes 116a and 116b, respectively, that carry the skin stimulation elements 111 is 9.45 mm and 12.15 mm, respectively. The distance between the nearest edge of the contact portions 114a and 114b to the surface of the actuator 122 is 1 mm and the elasticity modulus is 2000 N/mm² (polyamide PA66 is chosen as material of the mounting structure). Under these assumptions, the force F required bringing the contact portions 114a and 114b in contact with the actuator 122 is about 0.67 N and about 1.42 N, respectively. Under

the external force F , the outer arms of the support structure 113 behave like leaf springs. The skin treatment device is usually pressed against the skin with a force of more than 2 N so that the contact portions 114 will always get into contact with the actuator 122 during regular operation of the skin treatment device. In another embodiment only skin stimulation elements 112 realized as knobs are present, which knobs are an integral part of the mounting structure 113.

[0020] In an alternative embodiment, a skin stimulation element is mounted on a mounting structure that is realized as a helical spring. The spring constant is chosen such that the helical spring is compressed so that a respective contact portion contacts an actuator when pressing the skin treatment device against the skin with a typically applied force. The actuator may be realized as a vibrator, e.g. as a piezoelectric vibrator.

[0021] The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Claims

1. Skin treatment device comprising:

an actuator (122); and
at least a skin stimulation element (111; 112) arranged at a mounting structure (113), the mounting structure (113) being supported at the skin treatment device (1) and the mounting structure (113) being deformable or displaceable against a restoring force when an external force (F) is applied on the skin stimulation element (111; 112), wherein a contact portion (114a; 114b) of the mounting structure (113) is arranged to cooperate with the actuator (122) only in a deformed or displaced state of the mounting structure (113).

2. Skin treatment device according to claim 1, wherein the skin stimulation element (111; 112) and the mounting structure (113) are part of a detachable attachment (110).

3. Skin treatment device according to claim 1 that further comprises a drivable skin treatment unit (120) to which the actuator (122) is mechanically coupled such that driving the skin treatment unit (120) also drives the actuator (122).

4. Skin treatment device according to claim 1, wherein the external force (F) necessary to bring the mounting structure into the deformed or displaced state in

which cooperation between the contact portion (114a; 114b) and the actuator (122) is established, lies in the range of about 0.2 N to about 5 N.

5. Skin treatment device according to any one of the preceding claims, wherein the skin treatment device (1) is realized as an epilator. 5
6. Detachable attachment of a skin treatment device (1), the attachment (110) comprising at least a skin stimulation element (111; 112) arranged at a mounting structure (113), the mounting structure (113) being supported at the attachment (110) and the mounting structure (113) being deformable or displaceable against a restoring force when an external force (F) is applied on the skin stimulation element (111; 112), wherein a contact portion (114a; 114b) of the mounting structure (113) is arranged to cooperate with an actuator (122) of the skin treatment device (1) only in a deformed or displaced state of the mounting structure (113) when the attachment is in an attached state. 10 15 20

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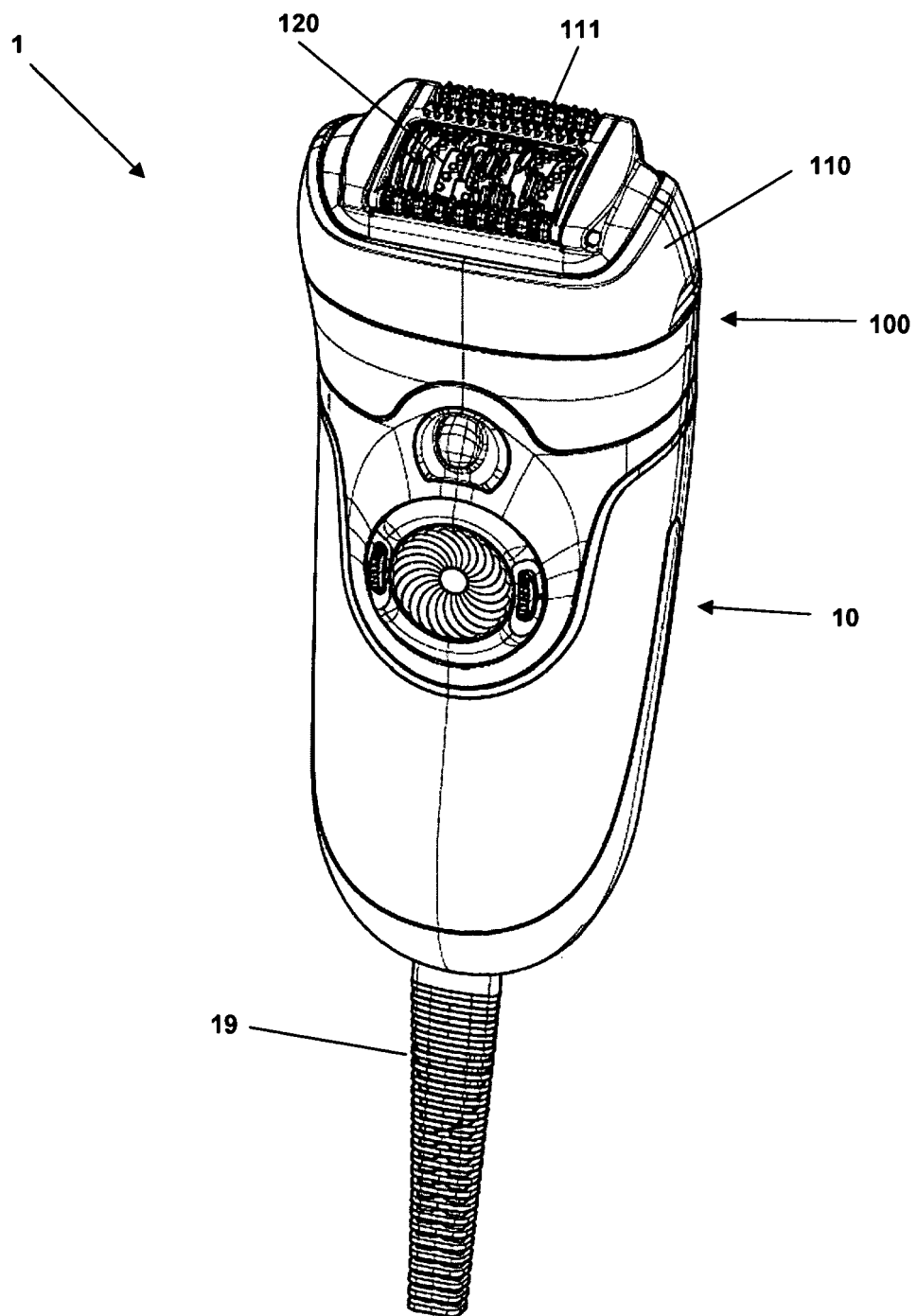
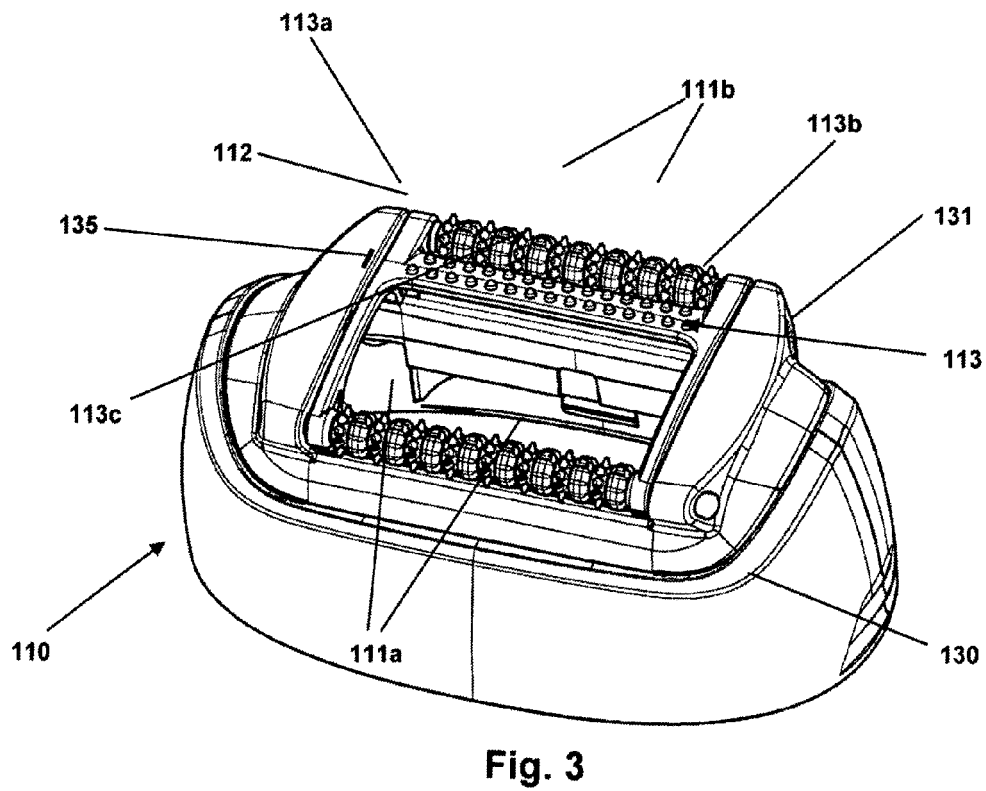
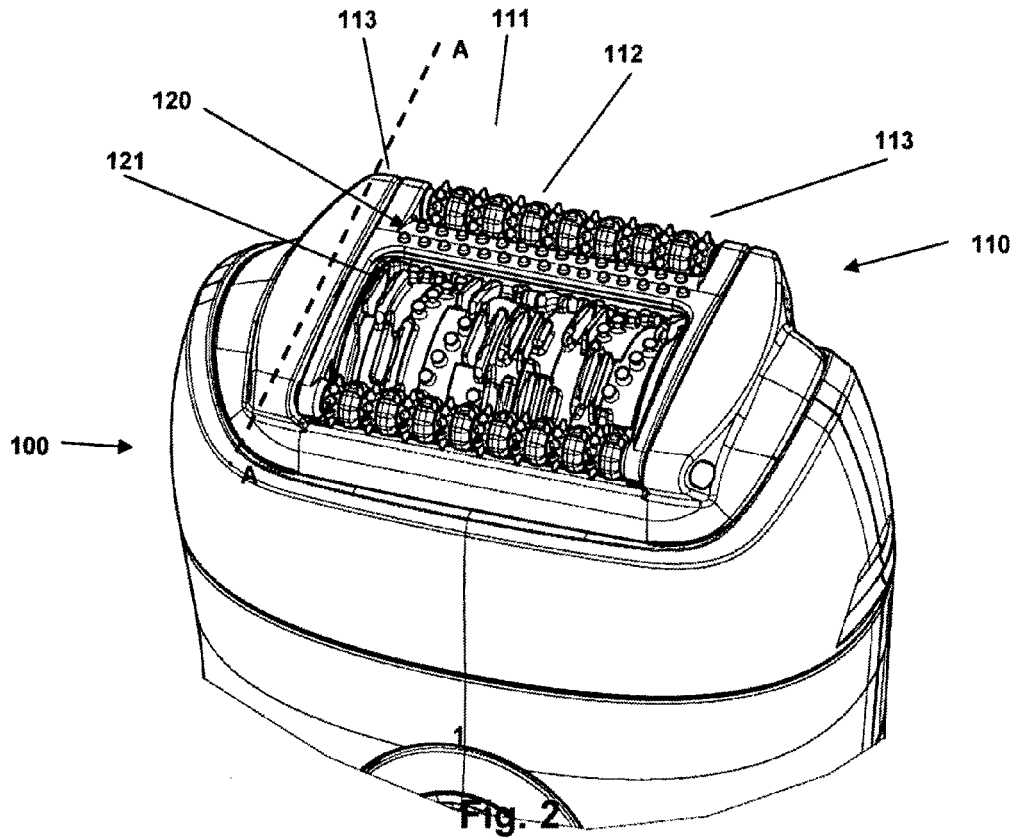


Fig. 1



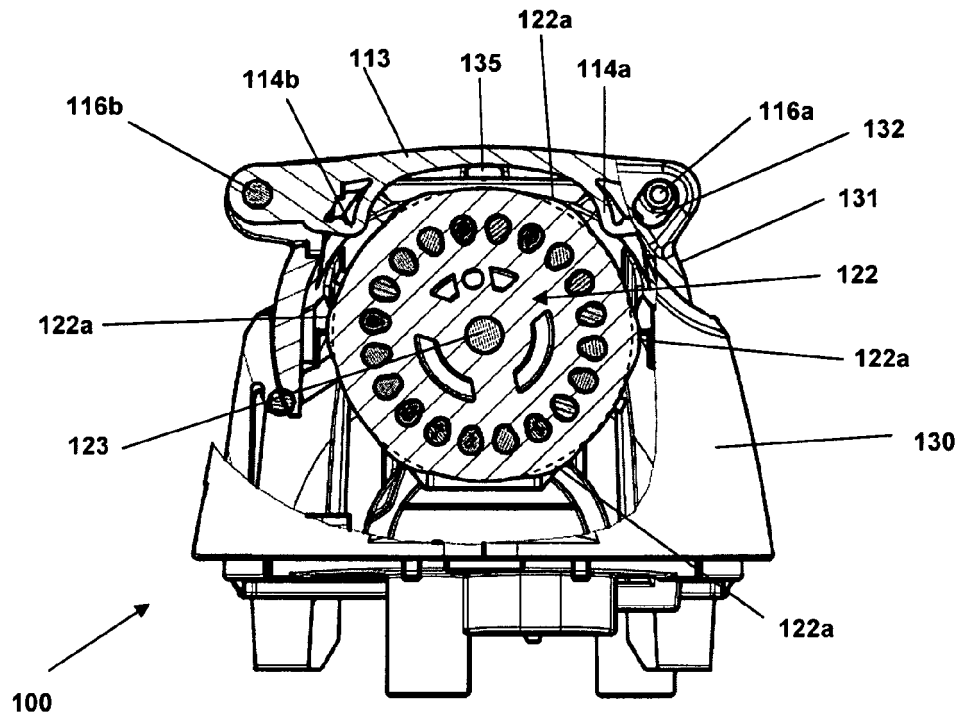


Fig. 4A

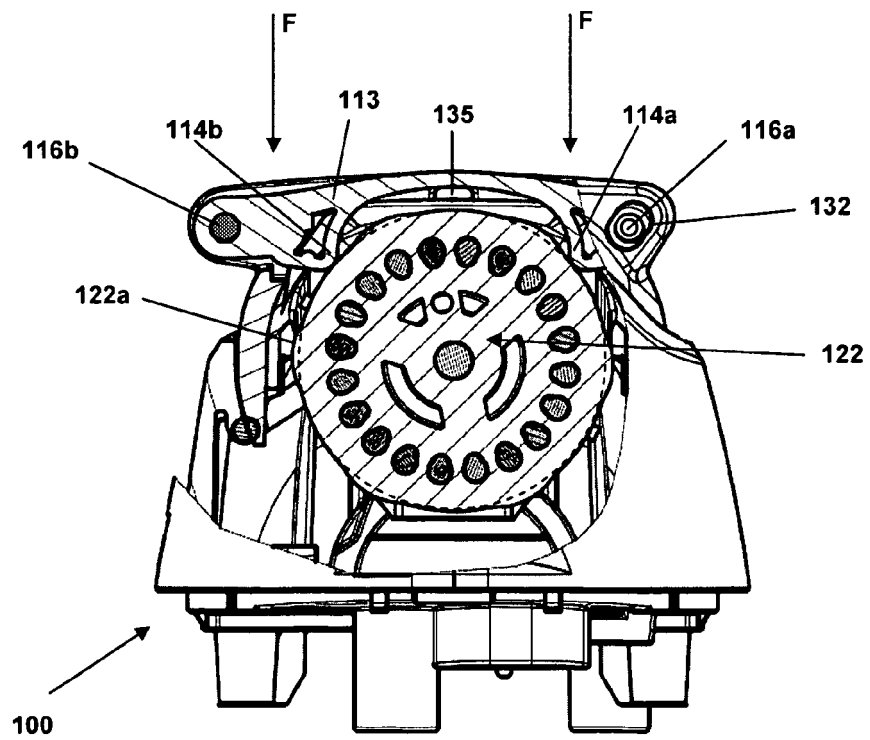


Fig. 4B



EUROPEAN SEARCH REPORT

Application Number
EP 09 00 5994

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 199 32 884 C1 (BRAUN GMBH [DE]) 10 August 2000 (2000-08-10) * column 1, line 66 - column 2, line 46 * * column 3, line 47 - column 5, line 24 * * figures *	1-6	INV. A45D26/00
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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 31 August 2009	Examiner Frank, Lucia
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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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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