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(54) LIGHTING APPARATUS FOR A HAIR REMOVAL DEVICE

(57) Provided is a lighting apparatus (100) for a hair removal device (102), which hair removal device has a mechanical hair removal element (108) for removing hair from a bodily area. The lighting apparatus comprises a first frame portion (112A) for contacting the bodily area, a second frame portion (112B) for contacting the bodily area, and a connecting assembly (114) for connecting the first and second frame portions to the hair removal device adjacent the hair removal element. The first frame portion projects from a first location (116A) of the connecting assembly and extends towards the second frame portion, and the second frame portion projects from a second location (116B) of the connecting assembly opposite the first location and extends towards the first frame portion such that the first and second frame portions at least partially delimit a window (118) through which a region of the bodily area is viewable while the bodily area is being contacted by the first and second frame portions. The lighting apparatus further comprises a light emitting assembly (120) supported by at least one of the first and second frame portions. The light emitting assembly is arranged to emit a beam of light across the window and onto at least part of the hair removal element.

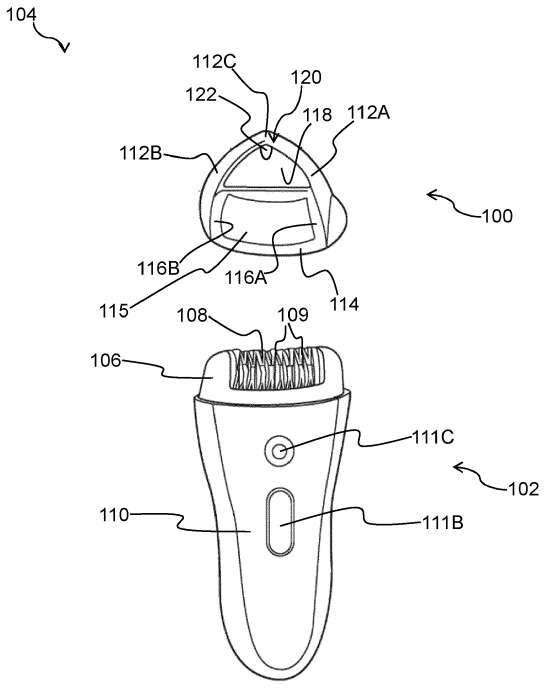

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a lighting apparatus for a hair removal device, such as an epilator. The invention further relates to a hair removal assembly comprising the lighting apparatus and the hair removal device.

BACKGROUND OF THE INVENTION

[0002] Hair removal devices are known for removing hair on bodily areas, such as skin portions of the arms or legs. In particular, hair removal devices are available that comprise mechanical hair removal elements whose movements enable plucking or cutting of hair. For example, motor-driven epilators and shavers are widely used.

[0003] Such hair removal devices, e.g. epilators, are sometimes equipped with light(s) arranged to illuminate the bodily area which is to be treated. Typically, such light(s) is or are positioned in a handle of the hair removal device and emit light from the handle onto the bodily area, e.g. skin, during use.

SUMMARY OF THE INVENTION

[0004] The invention is defined by the claims.

[0005] According to examples in accordance with an aspect of the invention, there is provided a lighting apparatus for a hair removal device, the hair removal device having a mechanical hair removal element for removing hair from a bodily area, the lighting apparatus comprising: a first frame portion for contacting the bodily area; a second frame portion for contacting the bodily area; a connecting assembly for connecting the first and second frame portions to the hair removal device adjacent the hair removal element, the first frame portion projecting from a first location of the connecting assembly and extending towards the second frame portion, and the second frame portion projecting from a second location of the connecting assembly opposite the first location and extending towards the first frame portion such that the first and second frame portions at least partially delimit a window through which a region of the bodily area is viewable while the bodily area is being contacted by the first and second frame portions; and a light emitting assembly supported by at least one of the first and second frame portions, the light emitting assembly being arranged to emit light across the window from a central region midway between the first and second locations to enable frontal lighting of at least part of the hair removal element by the light emitting assembly.

[0006] As well as supporting the light emitting assembly, the first and second frame portions may fulfil a skin stretching function. In particular, the region of the bodily area viewable through the window that is at least partly delimited by the first and second frame portions may be stretched by the first and second frame portions during movement over the bodily area. As well as facilitating hair removal, this stretching may work synergistically with the frontal lighting of the hair removal element provided by the light emitting assembly to assist the user to guide hairs onto the hair removal element. Thus, the lighting apparatus can enhance hair removal with the hair removal device.

[0007] As a result of the frontal illumination of the hair removal element, the light emitting assembly may provide more focused light onto the hair removal element.

[0008] In some embodiments, the light emitting assembly is arranged to emit light through the window to enable lighting of the region of the bodily area as well as the at least part of the hair removal element. Illuminating the region of the stretched bodily area viewable through the window as well as the hair removal element may assist the user to guide hairs onto the hair removal element. This may also enhance visibility of the region, e.g. skin, and assist the user to identify hairs missed by the hair removal element, and their growth direction.

[0009] In some embodiments, the first frame portion and the second frame portion extend to meet each other at the central region. Skin stretching may be enhanced by the first and second frame portions meeting each other in this manner.

[0010] In some embodiments, the first and second frame portions are arranged in a V-shape, with the apex of the V-shape defining the central region.

[0011] In some embodiments, the first and second frame portions are arranged in a U-shape, with a central part of the U-shape including the central region.

[0012] In some embodiments, the first frame portion comprises a first projecting section that projects from the first location, and a first lateral section, with the second frame portion comprising a second projecting section that projects from the second location, and a second lateral section. In such embodiments, the first and second lateral sections may extend towards, e.g. and meet, each other.

[0013] In such embodiments, the first lateral section may laterally extend transversely with respect to the first projecting section, and the second lateral section may laterally extend transversely with respect to the second projecting section to provide a rectangular, or at least substantially rectangular, window.

[0014] In other embodiments, the first and second frame portions project from the connecting assembly and extend towards each other to respective extremities that are spaced apart from each other.

[0015] In some embodiments, the connecting assembly is releasably connectable to the hair removal device. This releasable connection can enable detaching of the lighting apparatus from and (re-)attachment of the lighting apparatus to the hair removal device. Thus, the lighting apparatus can be straightforwardly removed, e.g. for cleaning and/or for attaching a different accessory to the hair removal device.

[0016] In other embodiments, the lighting apparatus is

integrated with, e.g. is non-detachable from, the hair removal device.

[0017] The hair removal device may include a head portion, for example a head portion that includes, e.g. houses, the hair removal element.

[0018] In some embodiments, the connecting assembly comprises a receiving portion for receiving at least part of the head portion of the hair removal device in order for the first and second frame portions to be connected to the hair removal device. The hair removal device may therefore be straightforwardly connected to the lighting apparatus by the hair removal device's head portion being inserted into the receiving portion of the connecting assembly.

[0019] In some embodiments, the receiving portion is arranged to receive the at least part of the head portion along a connection axis, with the first and second frame portions projecting from the connecting assembly in a plane that is angled with respect to the connection axis. This arrangement may assist to minimize the risk of unintentional disconnection of the lighting apparatus from the hair removal device during use, since movements over the bodily area parallel with the plane of the first and second frame portions may not entail, or entail only minimal, pulling along the connection axis.

[0020] In some embodiments, the light emitting assembly is configured for providing strobe lighting of the at least part of the hair removal element. The frontal lighting of the hair removal element can assist to create an enhanced strobe effect using pulsed light, for example relative to diffuse light being provided from a side of the hair removal element.

[0021] The strobe lighting may enable the user to perceive slower movement of the hair removal element and therefore assist the user to more accurately guide hairs onto the hair removal element. For example, in the case of an epilation process, the strobe lighting may assist to user to identify whether a hair is likely to be engaged by the hair removal element.

[0022] In particular, such strobe lighting can assist the user to discern region(s) on a rotating or reciprocating hair removal element. The user can accordingly guide hairs to such region(s).

[0023] The light emitting assembly may be switchable by the user between a strobing mode in which the strobe lighting is provided and a continuous, in other words non-strobing, light emitting mode.

[0024] In some embodiments, the light emitting assembly is configured for providing strobe lighting whose light flashes are delivered according to a frequency of movement of the hair removal element. In other words, the strobe lighting may be synchronized with the reciprocation or rotation of the hair removal element.

[0025] This may further assist the user to discern regions on a rotating or reciprocating hair removal element.

[0026] In some embodiments, the strobe lighting flashes at the frequency of the reciprocation or rotation of the hair removal element, or at a fraction of, e.g. half, that frequency, or at a multiple of, e.g. double, that frequency.

[0027] In some embodiments, the on versus off of the flashing may be about 82% on (±15%) and 18% off (±15%).

[0028] This may correspond to, for instance, one epilator assembly rotation or one open-close cycle of an automated tweezer.

[0029] In some embodiments, the light emitting assembly comprises at least one first light emitting element and at least one second light emitting element configured to emit light having a different spectral composition from that emitted by the at least one first light emitting element.

[0030] In such embodiments, the at least one first light emitting element may be configured to emit white light for lighting of a central region of the hair removal element, with the at least one second light emitting element being configured to emit non-white light for illuminating peripheral region(s) of the hair removal element that neighbor the central region. By the light incident on the central region of the hair removal element being whiter, the user may be assisted to focus on the central region and thereby helped to avoid missing hairs that he/she intends to remove.

[0031] In some embodiments, the lighting apparatus includes driver circuitry for controlling the light emitting assembly. The driver circuitry may be included in a printed circuit board assembly included in the lighting apparatus. The printed circuit board assembly may, for example, carry light emitting element(s) included in the light emitting assembly.

[0032] Such a printed circuit board assembly may, for instance, be included in the connecting assembly, the first frame portion and/or the second frame portion.

[0033] In some embodiments, the driver circuitry is configured to control the light emitting assembly to provide the strobe lighting.

[0034] According to another aspect there is provided a hair removal assembly comprising: a hair removal device having a mechanical hair removal element for removing hair from a bodily area; and a lighting apparatus according to any of the embodiments described herein.

[0035] In some embodiments, the hair removal device comprises driver circuitry for controlling the light emitting assembly, with electrical connections between the driver circuitry and the light emitting assembly being provided between the hair removal device and at least one of the first and second frame portions.

[0036] In such embodiments, the driver circuitry may be configured to control the light emitting assembly to provide the strobe lighting.

[0037] In some embodiments, the hair removal device comprises the above-mentioned head portion that includes the hair removal element, and a main body portion to which the head portion is mountable or mounted.

[0038] The main body portion may provide a handle portion for the user to grasp when moving the hair removal assembly over the bodily area.

[0039] Alternatively or additionally, the main body portion may include a motorized drive system for driving movement of the hair removal element.

[0040] In some embodiments, the head portion is detachably mountable to the main body portion.

[0041] In such embodiments, detachment of the head portion may facilitate cleaning of the hair removal element and/or may enable the hair removal element to be exchanged for a different tool, such as an exfoliator.

[0042] Movement of this different tool, e.g. exfoliator, may, for example, be driven by the motorized drive system when the different tool is attached to the main body portion.

[0043] In some embodiments, the driver circuitry is arranged in the main body portion. The main body portion may provide sufficient capacity for retaining the driver circuity, e.g. along with other control circuitry for controlling the hair removal device.

[0044] In some embodiments, the hair removal device comprises an epilator, with the hair removal element in the form of an epilator assembly comprising epilating elements. In such embodiments, at least some of the epilating elements may be arranged so as to be lit by the frontal light emitted by the light emitting assembly.

[0045] The lighting apparatus has been found to be particularly effective in assisting the user to guide hairs into epilating elements lit by light emitted by the light emitting assembly.

[0046] In other embodiments, the hair removal device comprises an electric razor.

[0047] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0048] For a better understanding of the invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, in which:

FIG. 1 shows a hair removal assembly comprising a hair removal device and a lighting apparatus according to an example;

FIG. 2 shows the hair removal assembly shown in FIG. 1 with the lighting apparatus attached to the hair removal device;

FIG. 3 provides a cutaway view showing a light emitting element and a hair removal element of a hair removal assembly according to another example;

FIG. 4 shows a lighting apparatus and a hair removal device according to a still another example;

FIG. 5 shows a lighting apparatus and a hair removal device according to a further example; and

FIG. 6 provides a graph representing on/off time ratio of a strobing mode of a lighting apparatus according to an example.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0049] The invention will be described with reference to the Figures.

[0050] It should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the apparatus, systems and methods, are intended for purposes of illustration only and are not intended to limit the scope of the invention. These and other features, aspects, and advantages of the apparatus, systems and methods of the present invention will become better understood from the following description, appended claims, and accompanying drawings. It should be understood that the Figures are merely schematic and are not drawn to scale. It should also be understood that the same reference numerals are used throughout the Figures to indicate the same or similar parts.

[0051] Provided is a lighting apparatus for a hair removal device, which hair removal device has a mechanical hair removal element for removing hair from a bodily area. The lighting apparatus comprises a first frame portion for contacting the bodily area, a second frame portion for contacting the bodily area, and a connecting assembly for connecting the first and second frame portions to the hair removal device adjacent the hair removal element. The first frame portion projects from a first location of the connecting assembly and extends towards the second frame portion, and the second frame portion projects from a second location of the connecting assembly opposite the first location and extends towards the first frame portion such that the first and second frame portions at least partially delimit a window through which a region of the bodily area is viewable while the bodily area is being contacted by the first and second frame portions. The lighting apparatus further comprises a light emitting assembly supported by at least one of the first and second frame portions. The light emitting assembly is arranged to emit a beam of light across the window and onto at least part of the hair removal element.

[0052] FIG. 1 shows a lighting apparatus 100 for a hair removal device 102. The lighting apparatus 100 may be included, together with the hair removal device 102, in a hair removal assembly 104.

[0053] In some embodiments, such as shown in FIG. 1, the hair removal device 102 comprises, e.g. is in the form of, an epilator. In other embodiments, the hair removal device 102 comprises, e.g. is in the form of, an electric razor.

[0054] The hair removal assembly 104 comprising the lighting apparatus 100 and the hair removal device 102 may be supplied to a user. In other embodiments, the lighting apparatus 100 may be supplied to a user without the hair removal device 102, with the hair removal device 102 being already in the user's possession or being sourced separately from the lighting apparatus 100. In such embodiments, and as shown in FIG. 1, the lighting apparatus 100 may be attachable to, e.g. and detachable from, the separately supplied hair removal device 102.

The hair removal assembly 104 may be assembled by attachment of the lighting apparatus 100 to the hair removal device 102.

[0055] The hair removal device 102 may comprise a head portion 106 that includes, e.g. houses, a mechanical hair removal element 108.

[0056] The term "mechanical hair removal element" is intended to mean a hair removal element 108 whose movement, e.g. reciprocating or rotating movement, causes hair to be removed from a bodily area, e.g. by cutting and/or plucking the hair.

[0057] In embodiments in which the hair removal device 102 comprises an epilator, the hair removal element 108 in the form of an epilator assembly may be rotatable, with rotation of the epilator assembly enabling epilating elements 109 included in the epilator assembly to pluck hair from the bodily area.

[0058] In embodiments in which the hair removal device 102 comprises an electric razor, the hair removal element 108 may, for example, comprise a guard blade for contacting the skin and a cutting blade arranged to slide on the guard blade in a reciprocating manner so as to cut hairs between adjacent edges of the guard and cutting blades.

[0059] More generally, the hair removal device 102 may include a main body portion 110 to which the head portion 106 is mountable or mounted. The main body portion 110 may provide a handle portion for the user to grasp when moving the hair removal assembly 104 over the bodily area.

[0060] Alternatively or additionally, the main body portion 110 may include a motorized drive system for driving movement of the hair removal element 108, e.g. rotation of the hair removal element 108 in the case of the hair removal device 102 comprising an epilator.

[0061] In some embodiments, the head portion 106 is detachably mountable to the main body portion 110. In such embodiments, detachment of the head portion 106 may facilitate cleaning of the hair removal element 108 and/or may enable the hair removal element 108 to be exchanged for a different tool, such as an exfoliator.

[0062] Movement of this different tool, e.g. exfoliator, may, for example, be driven by the motorized drive system when the different tool is attached to the main body portion 110.

[0063] In some embodiments, such as shown in FIG. 2, the hair removal device 102 may include a head portion release actuator 111A that is actuatable by the user to release the head portion 106 from the main body portion 110. The head portion release actuator 111A may, for example, be located on the main body portion 110.

[0064] In some embodiments, the head portion release actuator 111A may be in the form of a push button, with pushing of the push button causing release of the head portion 106 from the main body portion 110.

[0065] In some embodiments, such as shown in FIGs. 1 and 2, the hair removal device 102 comprises a user interface 111B, 111C for controlling the hair removal device 102, and in some embodiments for controlling the hair removal device 102 and the lighting apparatus 100.

[0066] To this end, the user interface 111B, 111C may comprise a user input device 111B, such as a control switch, for receiving user input from the user for controlling the hair removal device 102 and optionally the lighting apparatus 100.

[0067] Alternatively or additionally, the user interface 111B, 111C may communicate a status of the hair removal device 102 and optionally the lighting apparatus 100.

[0068] In some embodiments, such as shown in FIGs. 1 and 2, the user interface 111B, 111C includes an output device 111C, such as an indicator light, for communicating the status of the hair removal device 102 and optionally the lighting apparatus 100.

[0069] With continued reference to FIGs. 1 and 2, the lighting apparatus 100 comprises a first frame portion 112A for contacting the bodily area from which hair is to be removed by the hair removal element 108, and a second frame portion 112B for contacting the bodily area. A connecting assembly 114 connects the first and second frame portions 112A, 112B to the hair removal device 102 adjacent the hair removal element 108.

[0070] The connecting assembly 114 may connect the first and second frame portions 112A, 112B to the hair removal device 102, for example to the head portion 106 of the hair removal device 102, in any suitable manner, such as via clip(s), snap-fit joint(s), and so on.

[0071] In some embodiments, such as shown in FIG. 1, the connecting assembly 114 comprises a receiving portion 115 for receiving at least part of the head portion 106 of the hair removal device 102 in order for the first and second frame portions 112A, 112B to be connected to the hair removal device 102. The hair removal device 102 may therefore be straightforwardly connected to the lighting apparatus 100 by the hair removal device's 102 head portion 106 being inserted into the receiving portion 115 of the connecting assembly 114.

[0072] In some embodiments, the receiving portion 115 is arranged to receive the at least part of the head portion 106 along a connection axis A1, as shown in FIG. 2, with the first and second frame portions 112A, 112B projecting from the connecting assembly 114 in a plane that is angled with respect to the connection axis A1.

[0073] This arrangement may assist to minimize the risk of unintentional disconnection of the lighting apparatus 100 from the hair removal device 102 during use, since movements over the bodily area parallel with the plane of the first and second frame portions 112A, 112B in contact with the bodily area may not entail, or entail only minimal, pulling along the connection axis A1.

[0074] In some embodiments, the connecting assembly 114 is releasably connectable to the hair removal device 102, for example via pulling of the hair removal device 102 so that the head portion 106 is liberated from the receiving portion 115. This releasable connection can

enable the above-mentioned detachment of the lighting apparatus 100 from, as well as (re-)attachment of the lighting apparatus 100 to, the hair removal device 102. Thus, the lighting apparatus 100 can be straightforwardly removed, e.g. for cleaning and/or for attaching a different accessory to the hair removal device 102.

[0075] In other embodiments, the lighting apparatus 100 is integrated with, e.g. is non-detachable from, the hair removal device 102.

[0076] More generally, the first frame portion 112A projects from a first location 116A of the connecting assembly 114 and extends towards the second frame portion 112B, and the second frame portion 112B projects from a second location 116B of the connecting assembly 114 opposite the first location 116A and extends towards the first frame portion 112A such that the first and second frame portions 112A, 112B at least partially delimit a window 118 through which a region of the bodily area is viewable while the bodily area is being contacted by the first and second frame portions 112A, 112B.

[0077] Thus, the first and second frame portions 112A, 112B may fulfil a skin stretching function. In particular, the region of the bodily area viewable through the window 118 that is at least partly delimited by the first and second frame portions 112A, 112B may be stretched by the first and second frame portions 112A, 112B during movement over the bodily area, e.g. in a movement direction 119A that is perpendicular to a lateral axis 119B extending between the first and second locations 116A, 116B of the connecting portion 114.

[0078] In some embodiments, such as shown in FIGs. 1, 2, 4 and 5, the first frame portion 112A and the second frame portion 112B extend to meet each other at a central region 112C midway between the first and second locations 116A, 116B. Extension of the second frame portion 112B to meet the first frame portion 112A is denoted in FIG. 5 by a double-headed arrow 119C. Skin stretching may be enhanced by the first and second frame portions 112A, 112B meeting each other in this manner.

[0079] In other embodiments which are not depicted in the Figures, the first and second frame portions 112A, 112B project from the connecting assembly 114 and extend towards each other to respective extremities that are spaced apart from each other.

[0080] In some embodiments, such as shown in FIGs. 1, 2, 4 and 5, the first and second frame portions 112A, 112B are arranged in a V-shape, with the apex of the V-shape defining the central region 112C.

[0081] Alternatively, the first and second frame portions 112A, 112B may be arranged in a U-shape, with a central part of the U-shape including the central region 112C.

[0082] In some embodiments, the first frame portion 112A comprises a first projecting section that projects from the first location 116A of the connecting assembly 114, and a first lateral section. The second frame portion 112B may similarly comprise a second projecting section that projects from the second location 116B of the connecting assembly 114, and a second lateral section. In such embodiments, the first and second lateral sections may extend towards, e.g. and meet, each other.

[0083] The first lateral section may laterally extend transversely with respect to the first projecting section, and the second lateral section may laterally extend transversely with respect to the second projecting section to provide a rectangular, or at least substantially rectangular, window 118.

[0084] More generally, and referring in particular to FIGs. 1 to 3, a light emitting assembly 120 is supported by at least one of the first and second frame portions 112A, 112B, with the light emitting assembly 120 being arranged to emit light across the window 118 so that light from the light emitting assembly 120 is directly incident on the hair removal element 108. This directly incident lighting, in other words without reflection, e.g. from the region of the bodily area, is represented in FIG. 3 by an arrow 121.

[0085] In particular, the light emitting assembly 120 shown in FIGs. 1 to 5 is arranged to emit light (at least) from the central region 112C midway between the first and second locations 116A, 116B to enable frontal lighting of at least part of the hair removal element 108 by the light emitting assembly 120.

[0086] As a result of the frontal illumination of the hair removal element 108, the light emitting assembly 120 may provide more focused light onto the hair removal element 108. As well as facilitating hair removal, the stretching provided by the first and second frame portions 112A, 112B may work synergistically with the frontal lighting of the hair removal element 108 provided by the light emitting assembly 120 to assist the user to guide hairs onto the hair removal element 108. Thus, the lighting apparatus 100 can enhance hair removal with the hair removal device 102.

[0087] A lateral distance along the lateral axis 119B may be defined between the first and second locations 116A, 116B, with this lateral distance being notionally divided equally into a central third and two peripheral thirds on either side of the central third. The light from the light emitting assembly 120 providing the frontal lighting may emanate from the central third.

[0088] In some embodiments, the light emitting assembly 120 is arranged to emit light through the window 118 to enable lighting of the region of the bodily area as well as the at least part of the hair removal element 108. Illuminating the region of the stretched bodily area viewable through the window 118 as well as the hair removal element 108 may assist the user to guide hairs onto the hair removal element 108. This may also enhance visibility of the region, e.g. skin, and assist the user to identify hairs missed by the hair removal element 108, and their growth direction.

[0089] The light emitting assembly 120, e.g. comprising one or more light emitting diodes, can be regarded as being positioned in a bracket that is at least partly defined by the first and second frame portion 112A, 112B. The

light emitting assembly 120 is positioned in front of the hair removal element 108 and shines light in the direction of the hair removal element 108, e.g. as well as the region of the bodily area, e.g. skin area, which will be treated.

[0090] In the case of the hair removal element 108 being an epilator assembly, the light emitting assembly 120 may shine light in the direction of the epilating elements 109, e.g. as well as the skin area which will be treated.

[0091] The light emitting assembly 120 may be configured in any suitable manner in order to provide the direct/frontal lighting of the hair removal element 108. In at least some embodiments, such as shown in FIGs. 1 to 5, the light emitting assembly 120 comprises at least one light emitting element 122, such as one or more light emitting diodes, arranged in the central region 112C to emit light towards the hair removal element 108.

[0092] The at least one light emitting element 122, e.g. light emitting diode(s), may be integrated inside the bracket at least partly defined by the first and second frame portions 112A, 112B.

[0093] In some embodiments which are not shown in the Figures, the light emitting assembly 120 is arranged to, in addition to providing the frontal lighting of the hair removal element 108, illuminate the hair removal element 108 from a first side region of the first frame portion 112A between the central region 112C and the first location 116A and/or from a second side region of the second frame portion 112B between the central region 112C and the second location 116B.

[0094] In such embodiments, the light emitting assembly 120 may include one or more additional light emitting elements arranged in the first side region and/or one or more additional light emitting elements arranged in the second side region.

[0095] In some embodiments, the light emitting assembly 120 comprises at least one first light emitting element and at least one second light emitting element configured to emit light having a different spectral composition from that emitted by the at least one first light emitting element.

[0096] In such embodiments, the at least one first light emitting element may be configured to emit white light for lighting of a central region of the hair removal element 108, with the at least one second light emitting element being configured to emit non-white light for illuminating peripheral region(s) of the hair removal element 108 that neighbor the central region. By the light incident on the central region of the hair removal element 108 being whiter, the user may be assisted to focus on the central region and thereby helped to avoid missing hairs that he/she intends to remove.

[0097] Alternatively or additionally, the light emitting assembly 120 may be configured for providing strobe lighting of the at least part of the hair removal element 108. The frontal lighting of the hair removal element 108 can assist to create an enhanced strobe effect using pulsed light, for example relative to diffuse light being provided from a side of the hair removal element 108.

[0098] It is noted that the speed of movement of the hair removal element 108, for example the number of revolutions per minute of the hair removal element 108 in the form of an epilator assembly, may render it difficult if not impossible to distinguish individual hair removal actions, e.g. tweezer actions of the epilator assembly's epilating elements 109. This may prevent the user from being able to aim for individual hairs and hence the user may be required to move the hair removal element 108 over the bodily area multiple times in order to remove such individual hairs. This may lead to skin irritation.

[0099] The strobe lighting may enable the user to perceive slower movement of the hair removal element 108 and therefore assist the user to more accurately guide hairs onto the hair removal element 108. For example, in the case of an epilation process, the strobe lighting may assist the user to identify whether a hair is likely to be engaged by the hair removal element 108.

[0100] In particular, such strobe lighting can assist the user to discern region(s) on a rotating or reciprocating hair removal element 108. The user can accordingly guide hairs to such region(s).

[0101] The light emitting assembly 120 may be switchable by the user, e.g. using the user input device 111B, between a strobing mode in which the strobe lighting is provided and a continuous, in other words non-strobing, light emitting mode.

[0102] For example, light emitting diode(s) of the light emitting assembly 120 can adopt the strobing mode or the continuous light emitting mode when the hair removal device 102, e.g. epilator, is initially switched on. While the hair removal device 102 remains switched on, the user may switch from one of the strobing mode and the continuous light emitting mode to the other of the strobing mode and the continuous light emitting mode, e.g. using the user input device 111B.

[0103] In some embodiments, the light emitting assembly 120 is configured for providing strobe lighting whose light flashes are delivered according to a frequency of movement of the hair removal element 108. In other words, the strobe lighting may be synchronized with the reciprocation or rotation of the hair removal element 108. This may further assist the user to discern regions on a rotating or reciprocating hair removal element 108.

[0104] Driver circuitry for controlling the light emitting assembly 120 may receive an input signal, e.g. from the motorized drive system, indicative of the frequency of movement of the hair removal element 108, and may send a control signal to the light emitting assembly 120 based on the input signal in order that the light flashes/pulses are delivered according to the frequency of movement of the hair removal element 108.

[0105] In some embodiments, the strobe lighting flashes at the frequency of the reciprocation or rotation of the hair removal element, or at a fraction of, e.g. half, that frequency, or at a multiple of, e.g. double, that frequency. FIG. 6 provides a graph representing on/off time ratio of a strobing mode of the light emitting assembly

120, and in particular shows a sample period comprising "on" pulses/flashes 123 and "off' periods 124 between the pulses 123.

[0106] In some embodiments, the on versus off of the flashing may be about 82% on (±15%) and 18% off (±15%). This may correspond to, for instance, one epilator assembly 108 rotation or one open-close cycle of an automated tweezer.

[0107] In some embodiments, the lighting apparatus 100 includes driver circuitry for controlling the light emitting assembly 120. The driver circuitry may be included in a printed circuit board assembly included in the lighting apparatus 100. The printed circuit board assembly may, for example, carry light emitting element(s) 122 included in the light emitting assembly 120. The printed circuit board assembly may, for instance, be included in the connecting assembly 114, the first frame portion 112A and/or the second frame portion 112B.

[0108] In embodiments in which the lighting apparatus 100 is attachable to and/or detachable from the hair removal device 102, the driver circuitry may be attached to/detached from the hair removal device 102 together with the rest of the lighting apparatus 100.

[0109] Alternatively or additionally, the hair removal device 102 may comprise driver circuitry for controlling the light emitting assembly 120.

[0110] In such embodiments, electrical connections between the driver circuitry and the light emitting assembly 120 may be provided between the hair removal device 102 and at least one of the first and second frame portions 112A, 112B.

[0111] Alternatively or additionally, the driver circuitry may be arranged in the main body portion 110, e.g. handle portion, of the hair removal device 102. The main body portion 110 may provide sufficient capacity for retaining the driver circuity, e.g. along with other control circuitry for controlling the hair removal device 102 and the motorized drive system.

[0112] In such embodiments, driver circuitry, in other words driving electronics, that determines the flash rate of the strobe lighting may be an integrated part of the main body portion 110, e.g. handle portion.

[0113] For example, the on/off time ratio of the strobe lighting that is in sync with the revolutions per minute of the motorized drive system's motor may be electronically controlled by the driver circuitry in the main body portion 110, e.g. handle portion.

[0114] It is generally noted that irrespective of whether the driver circuity is included in the lighting apparatus 100, the hair removal device 102 or both, the driver circuitry may be configured to control the light emitting assembly 120 to provide the strobe lighting.

[0115] As mentioned above, and referring in particular to FIGs. 4 and 5, the hair removal device 102 may comprise, e.g. be, an epilator, with the hair removal element 108 in the form of an epilator assembly being rotatable about a rotation axis 125 extending parallel with the above-mentioned lateral axis 119B between opposing first and second locations 116A, 116B of the connecting assembly 114, and comprising epilating elements 109, e.g. tweezers. In such embodiments, at least some of the epilating elements 109 may be arranged so as to be lit by the frontal light emitted by the light emitting assembly 120.

[0116] The lighting apparatus 100 has been found to be particularly effective in assisting the user to guide hairs into epilating elements 109 lit by light emitted by the light emitting assembly 120.

[0117] Thus, in a non-limiting example, an epilator equipped with a light emitting assembly 120 illuminates the epilating, i.e. hair extraction, elements 109. The light may be stroboscopic light in order to allow the user to distinguish the hair extraction elements/tweezers and relate them with the position of hairs.

[0118] Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality.

[0119] The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0120] If the term "adapted to" is used in the claims or description, it is noted the term "adapted to" is intended to be equivalent to the term "configured to".

[0121] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A lighting apparatus (100) for a hair removal device (102), the hair removal device having a mechanical hair removal element (108) for removing hair from a bodily area, the lighting apparatus comprising:

   a first frame portion (112A) for contacting the bodily area;
   a second frame portion (112B) for contacting the bodily area;
   a connecting assembly (114) for connecting the first and second frame portions to the hair removal device adjacent the hair removal element, the first frame portion projecting from a first location (116A) of the connecting assembly and extending towards the second frame portion, and the second frame portion projecting from a second location (116B) of the connecting assembly opposite the first location and extending towards the first frame portion such that the first and second frame portions at least partially delimit a window (118) through which a region of the bodily area is viewable while the bodily area

is being contacted by the first and second frame portions; and

a light emitting assembly (120) supported by at least one of the first and second frame portions, the light emitting assembly being arranged to emit light across the window from a central region (112C) midway between the first and second locations to enable frontal lighting of at least part of the hair removal element by the light emitting assembly.

2. The lighting apparatus (100) according to claim 1, wherein the light emitting assembly (120) is arranged to emit light through the window (118) to enable lighting of the region of the bodily area as well as the at least part of the hair removal element (108).

3. The lighting apparatus (100) according to claim 1 or claim 2, wherein the first frame portion (112A) and the second frame portion (112B) extend to meet each other at the central region (112C).

4. The lighting apparatus (100) according to any one of claims 1 to 3, wherein the connecting assembly (114) is releasably connectable to the hair removal device (102).

5. The lighting apparatus (100) according to any one of claims 1 to 4, wherein the connecting assembly (114) comprises a receiving portion (115) for receiving at least part of a head portion (106) of the hair removal device (102) in order for the first and second frame portions (112A, 112B) to be connected to the hair removal device.

6. The lighting apparatus (100) according to claim 5, wherein the receiving portion (115) is arranged to receive the at least part of the head portion (106) along a connection axis (A1), the first and second frame portions (112A, 112B) projecting from the connecting assembly (114) in a plane that is angled with respect to the connection axis.

7. The lighting apparatus (100) according to any one of claims 1 to 6, wherein the light emitting assembly (120) is configured for providing strobe lighting of the at least part of the hair removal element (108).

8. The lighting apparatus (100) according to any one of claims 1 to 7, wherein the light emitting assembly (120) is configured for providing strobe lighting whose light flashes are delivered according to a frequency of movement of the hair removal element (108).

9. The lighting apparatus (100) according to any one of claims 1 to 8, wherein the light emitting assembly (120) comprises at least one first light emitting element and at least one second light emitting element configured to emit light having a different spectral composition from that emitted by the at least one first light emitting element; optionally wherein the at least one first light emitting element is configured to emit white light for lighting of a central region of the hair removal element (108) and the at least one second light emitting element is configured to emit non-white light for illuminating peripheral region(s) of the hair removal element that neighbor the central region.

10. The lighting apparatus (100) according to any one of claims 1 to 9, comprising driver circuitry for controlling the light emitting assembly (120).

11. A hair removal assembly (104) comprising:

a hair removal device (102) having a mechanical hair removal element (108) for removing hair from a bodily area; and

a lighting apparatus (100) according to any one of claims 1 to 10.

12. The hair removal assembly (104) according to claim 11, wherein the hair removal device (102) comprises driver circuitry for controlling the light emitting assembly (120), and wherein electrical connections between the driver circuitry and the light emitting assembly are provided between the hair removal device (102) and at least one of the first and second frame portions (112A, 112B).

13. The hair removal assembly (104) according to claim 11 or claim 12, comprising a head portion (106) that includes the hair removal element (108), and a main body portion (110) to which the head portion is mountable or mounted.

14. The hair removal assembly (104) according to claim 13 as according to claim 12, wherein the driver circuitry is arranged in the main body portion (110).

15. The hair removal assembly (104) according to any one of claims 11 to 14, wherein the hair removal device (102) comprises an epilator, the hair removal element (108) comprising epilating elements (109), wherein at least some of the epilating elements are arranged so as to be lit by the frontal light emitted by the light emitting assembly (120).

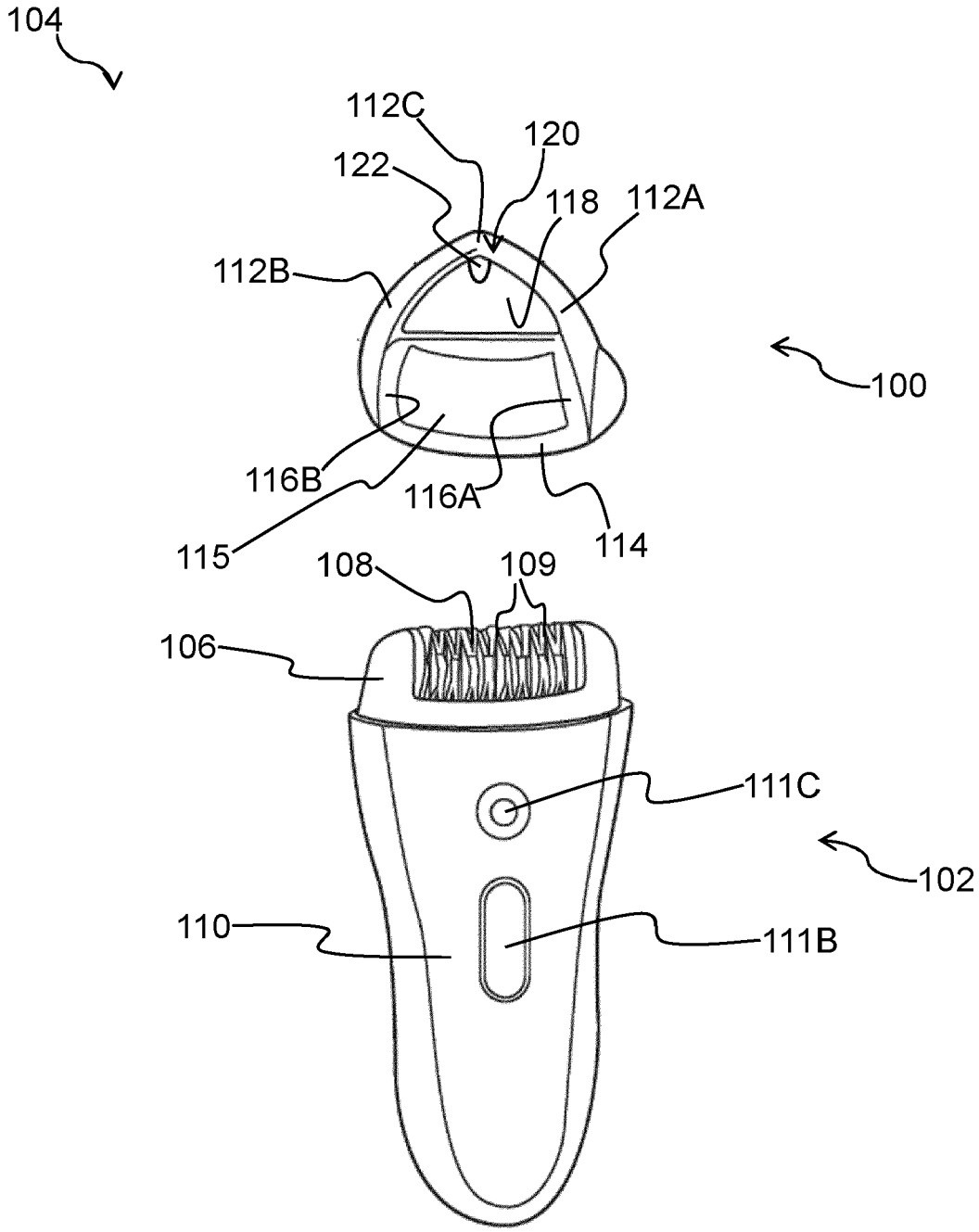
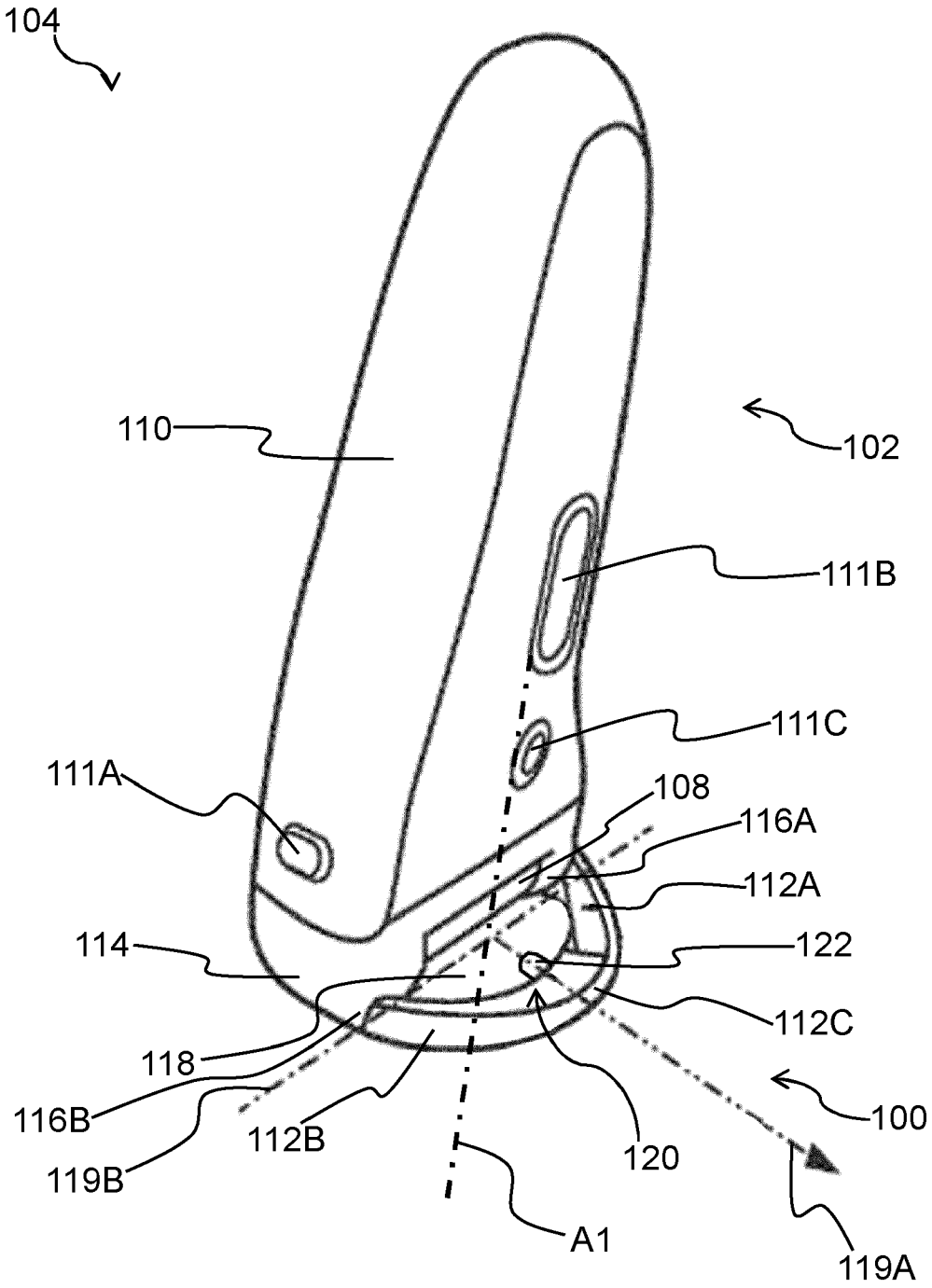

104
112C
120
122
118
112A
112B
100
116B
116A
115
114
108
109
106
111C
102
110
111B

FIG. 1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110
102
111B
111C
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116B
112B
120
100
119B
A1
119A

FIG. 2

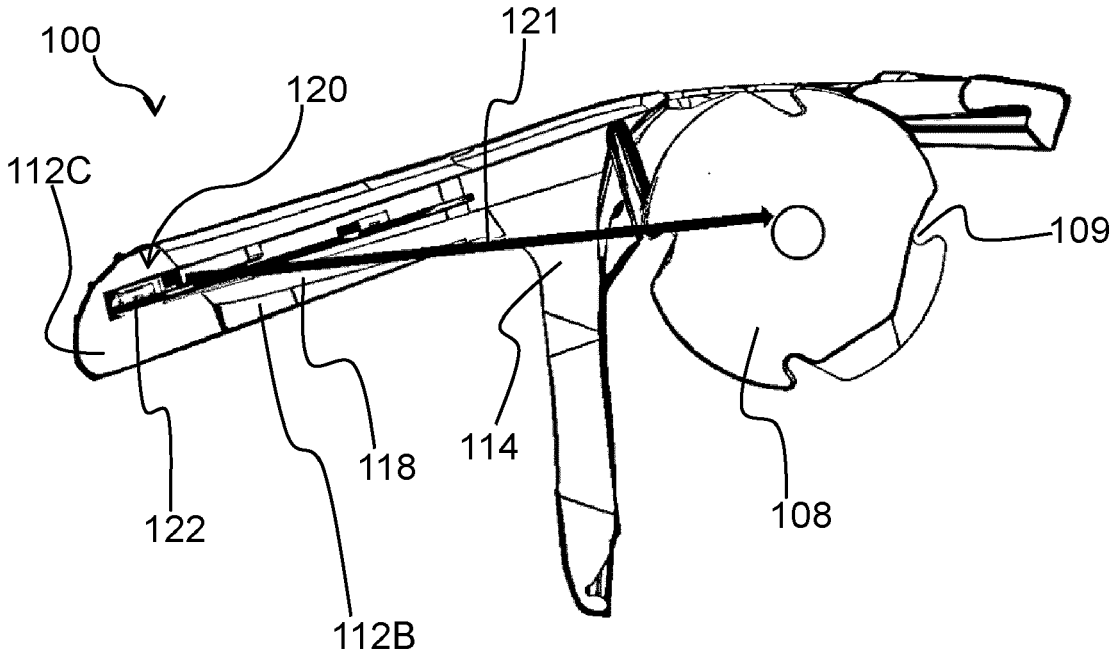
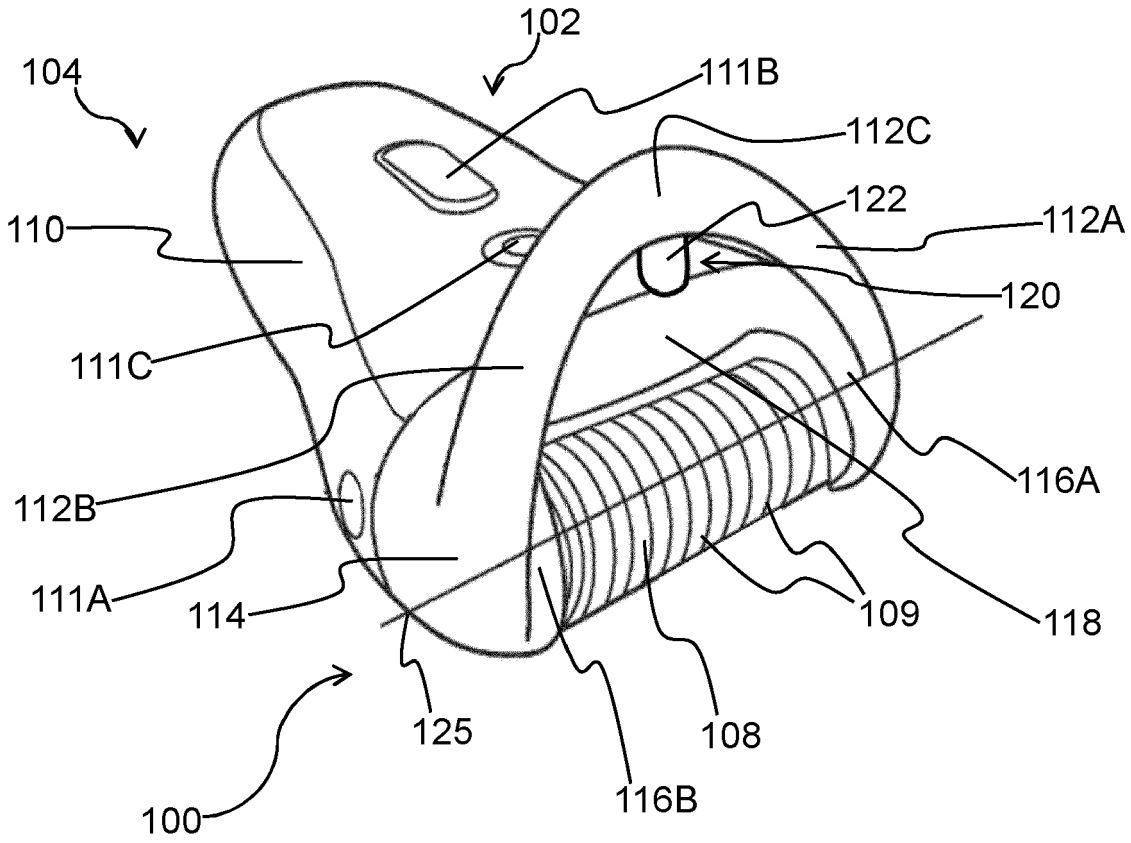


FIG. 3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104
111B
112C
122
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111C
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112B
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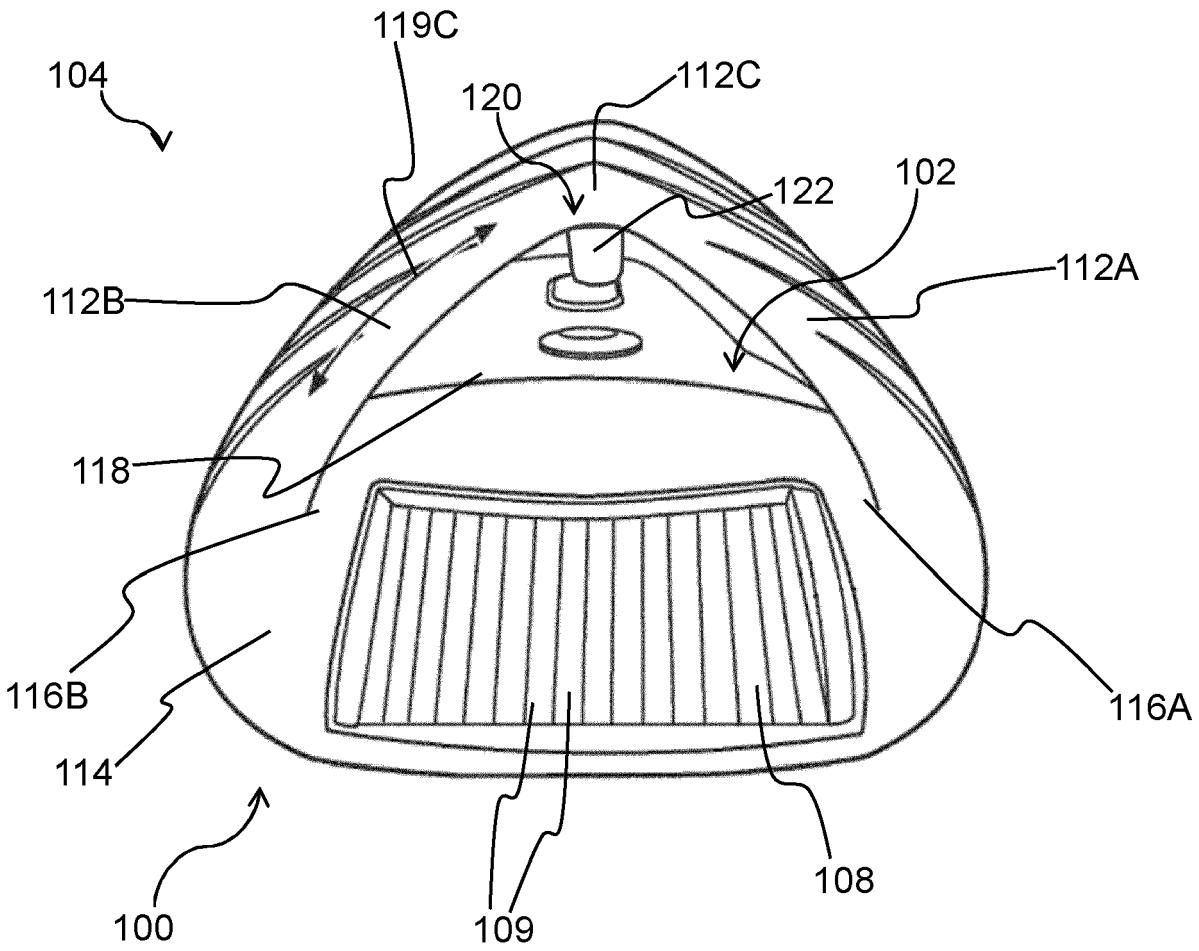
114
109
118
125
108
116B
100

FIG. 4


119C
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120
112C
122
102
112A
112B
118
116B
116A
114
108
100
109

FIG. 5

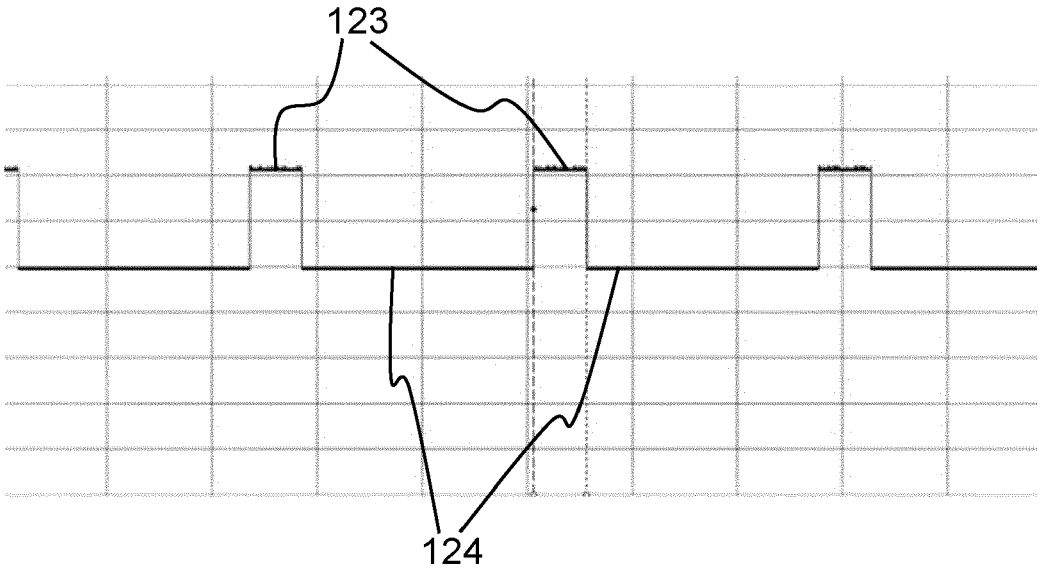

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 9130

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2017/258198 A1 (STEEMAN JONNE [NL] ET AL) 14 September 2017 (2017-09-14) * paragraphs [0040], [0041], [0055], [0058], [0059], [0072], [0075] * * figures 1,3,5,7 *	1-15	INV. B26B19/46 B26B19/38 B26B19/42
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B26B
A45D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 November 2023	Schouten, Adri

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