



- (51) International Patent Classification:
B26B 21/38 (2006.01)
- (21) International Application Number:
PCT/IL2011/000893
- (22) International Filing Date:
21 November 2011 (21.11.2011)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/415,884 22 November 2010 (22.11.2010) US
- (72) Inventor; and
- (71) Applicant : BARAK, Benny [IL/IL]; 32 Elekhai Street,
69497 Tel Aviv (IL).
- (74) Agents: LUZZATTO & LUZZATTO et al.; P.O. Box
5352, 84152 Beer Sheva (IL).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: MANUAL HAIR REMOVAL APPARATUS

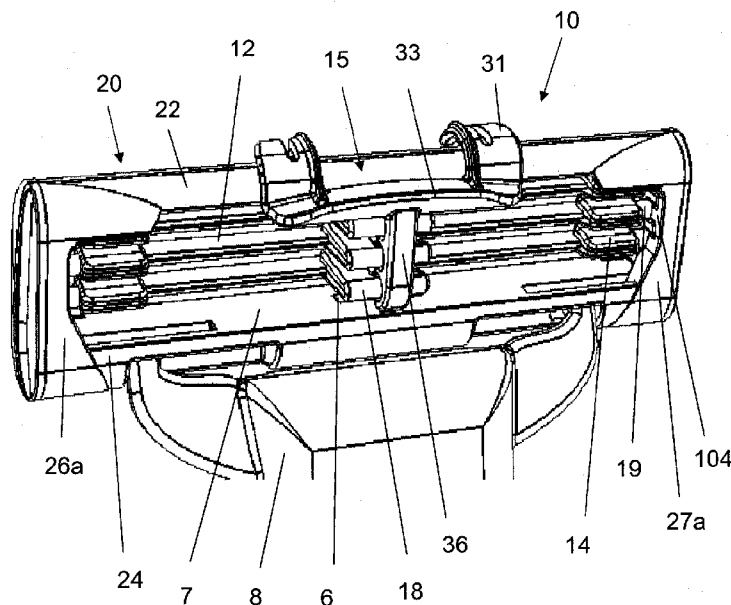


Fig. 1

(57) Abstract: A manual hair removal apparatus comprises a housing in which are rotatably mounted a plurality of razor blades, an actuator for simultaneously rotating all of the blades, and a fixation device for preventing inadvertent rotation of the blades during a hair removal operation. The fixation device may comprise an element positionable in abutting and rotation preventing relation with a side or intermediate blade holder. Each of the blades is securable to two longitudinally spaced side blade holders comprising an axle element rotatably mounted in a corresponding side member of the housing for facilitating rotation of the blades.



- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

MANUAL HAIR REMOVAL APPARATUS

Field of the Invention

The present invention relates to the field of hair removal apparatus. More particularly, the invention relates to manual hair removal apparatus comprising angularly displaceable razor blades.

Background of the Invention

Manual hair removal apparatus comprising a plurality of razor blades disposed in spaced and mutually parallel relation is considered to be effective in terms of hair removal efficiency. A blade housing fixates each blade at an acute angle with respect to a skin surface from which a hair filament is removed. Thus the cutting edge of a plurality of the housed blades becomes successively active during a hair removal stroke.

Over the course of time, various types of debris such as hair particles and viscous cleaning agents gradually deposit in and thus clog the space between the leading and following blades of the blade housing, adversely affecting the shaving characteristics of the apparatus. This debris has to be removed in order to improve the hair removal efficiency. Since most hair removal apparatus is not provided with means for discharging the debris, removal of the debris is generally accomplished by a relatively difficult and time consuming procedure of cleaning the blade housing, particularly when the space between adjacent blades is relatively small.

It would be desirable to provide means for simultaneously tilting the razor blades so that the gap between adjacent blades will increase and the deposited debris can be easily removed. However, tiltable razor blades will not effectively remove hair during a hair removal stroke due to the lack of blade rigidity.

- 2 -

It is an object of the present invention to provide a manual hair removal apparatus that has a plurality of razor blades that are simultaneously tiltable in order to easily remove deposited debris, yet that can be easily, quickly and reliably fixed in place in order to ensure an effective and safe hair removal operation.

Other objects and advantages of the invention will become apparent as the description proceeds.

Summary of the Invention

The present invention provides a manual hair removal apparatus, comprising a housing in which are rotatably mounted a plurality of razor blades, an actuator for simultaneously rotating all of said blades, and a fixation device for preventing inadvertent rotation of said blades during a hair removal operation.

This simultaneous rotation or tilting of the blades causes an increase in the angle and therefore the space between the blades. This change allows easy rinsing of hair stubble, remnants of hair, and viscous cleaning agents.

The use of the invention offers the following advantages:

- (1) Stress generated on the skin during a hair removal operation may cause pores of the skin to open. Optimal cleaning of the razors will prevent bacteria that accumulate on the skin or body hair during a hair removal operation and enter the body through the opened pores, as the use of the apparatus allows a more effective washing of hair and viscous cleaning agent residue.
- (2) After washing the debris, clean razor blades will provide a smooth and sanitary environment for the next hair removal operation.
- (3) Longer lifetime of the blades, as the entire apparatus is cleaner. Accordingly, the occurrence of rusty and corroded razor blades will decrease.

- 3 -

In one aspect, the actuator comprises a lever and a connecting member attached to said lever and to each of said blades, application of a force to said lever when the fixation device is released causing said connecting member and all of the blades to change their angular disposition, thereby increasing a gap between adjacent blades and facilitating cleaning of the blades.

In one aspect, each of the plurality of blades comprises a planar rearwardly disposed engageable portion secured to a blade holder, and a free frontwardly disposed portion that is inclined with respect to said engageable portion and that terminates with a cutting edge, each of said engageable portions being substantially mutually parallel when the fixation device is set to a fixating position.

In one aspect, the engageable portion of each of the blades is secured to an intermediate blade holder, the connecting member being engaged with each of said intermediate blade holders to cause all of the blades to simultaneously change their angular disposition upon application of the force to the lever when the fixation device is released.

In one aspect, the engageable portion of each of the blades is also secured to two longitudinally spaced side blade holders, each of said side blade holders comprising an axle element rotatably mounted in a corresponding side member of the housing for facilitating rotation of the blades and a main body in which the engageable portion is inserted being substantially longer than said axle element.

In one aspect, the fixation device comprises at least one securing element including an element positionable in abutting and rotation preventing relation with one of the side or intermediate blade holders.

- 4 -

In one aspect, the fixation device further comprises spring means which is biased to return the fixation device to the fixating position after being released therefrom.

In one aspect, the at least one securing element is connected to the spring means for setting the fixation device to the fixating position.

In one aspect, the spring means comprises two sinusoidal elements and a straight element connecting said two sinusoidal elements and being disposed below a lowermost intermediate blade holder.

In one aspect, the element positionable in abutting and rotation preventing relation with one of the side or intermediate blade holders is positionable in frictional engagement with one of the side holders to prevent blade rotation.

In one aspect, the at least one securing element comprises a connection box connected to the spring means, the height of said connection box being substantially equal to a gap between the main body of a lowermost side holder and a housing interior bottom so that rotation of all of the side holders and all of the blades is prevented when said connection box is inserted below said lowermost side holder.

In one aspect, the at least one securing element further comprises a pin outwardly extending from a sidewall of the connection box, said pin being receivable in a longitudinally extending groove formed in the housing interior bottom to guide the at least one securing element along a linear path while being longitudinally displaced to ensure that the connection box will be reliably placed in abutting relation with the lowermost side holder when a deformation force applied to the spring means is released.

- 5 -

In one aspect, each of the intermediate holders comprises a frontwardly disposed, groove bearing main body for the insertion therein of the blade engageable portion, a rearwardly disposed, tubular and longitudinally extending rod element receivable in a corresponding concave element of the connecting member, and a narrow portion extending from said intermediate holder main body to said rod element to form a gap between said intermediate holder main body and said rod element.

In one aspect, the securing element comprises a stem head and a stem extending upwardly from a straight element of the spring means through the gap of each of the intermediate holders to said stem head, a portion of said stem which is contiguous with the straight element being thickened so as to be in abutting and rotation preventing relation with both the rod element and with a main body rear face of the lowermost intermediate blade holder when the fixation device is set to the fixating position and to enable rotation of the blades when said thickened portion is displaced downwardly from the gap of the lowermost intermediate blade holder.

In one aspect, the housing comprises a central section to which two longitudinally spaced side members are attachable, each of said two side members having a plurality of vertically spaced projections which are alignable with, and rearwardly spaced from, corresponding recessed surfaces of said central section to define the seat within which each axle element is rotatable without any interference.

Brief Description of the Drawings

In the drawings:

- Fig. 1 is a perspective view from the rear of hair removal apparatus according to one embodiment of the present invention;

- 6 -

- Fig. 2 is a perspective view from the rear of a side blade holder removed from the apparatus of Fig. 1;
- Fig. 3 is a perspective view from the front of a portion of a razor blade removed from the apparatus of Fig. 1;
- Fig. 4 is a perspective view from the top of an intermediate blade holder removed from the apparatus of Fig. 1;
- Fig. 5 is a perspective view from the front of an actuator removed from the apparatus of Fig. 1;
- Fig. 6 is a perspective view from the front of a fixation device operable in conjunction with the apparatus of Fig. 1;
- Fig. 7 is a perspective view from the rear of the hair removal apparatus of Fig. 1, with the addition of the fixation device of Fig. 6;
- Fig. 8 is an enlargement of Fig. 7, showing a securing element;
- Fig. 9 is a front view of a central housing section usable in conjunction with the apparatus of Fig. 1;
- Fig. 10 is a perspective view from the rear of the central section of Fig. 9;
- Fig. 11 is a perspective view from the side and front of a housing side member that can interact with the central section of Fig. 10;
- Fig. 12 is a rear view of the side member of Fig. 11;
- Fig. 13 is a perspective view from the rear of hair removal apparatus according to another embodiment of the present invention;
- Fig. 14 is a perspective view from the front of a fixation device operable in conjunction with the apparatus of Fig. 13;
- Fig. 15 is a perspective view from the rear of a central housing section removed from the apparatus of Fig. 13;
- Fig. 16 is a perspective view from the side of the apparatus of Fig. 13;
- Fig. 17 is a perspective view from the bottom of the apparatus of Fig. 13;
- Fig. 18 is a front view of the hair removal apparatus of Fig. 7, showing the blades in a closed position; and

- 7 -

- Fig. 19 is a front view of the hair removal apparatus of Fig. 7, showing the blades in an opened position.

Detailed Description of Preferred Embodiments

Fig. 1 illustrates manual hair removal apparatus according to one embodiment of the present invention, and is designated generally by numeral 10. Apparatus 10 comprises blade housing 20 in which are rotatably mounted a plurality of longitudinally extending razor blades 12, and an actuator 15 for simultaneously rotating all of the blades 12. An attachment 8 to which blade housing 20 is connected, e.g. pivotally connected, is attachable to a handle by which a user performs a hair removing operation.

Blade housing 20 is shown to have a rectilinear configuration with an upper member 22 substantially parallel to a lower member 24, and side members 26 and 27 which are substantially perpendicular to, and integrally formed with, or connected to, upper member 22 and lower member 24. An open blade housing interior 79 (Fig. 9) above bottom surface 7 in which the blades 12 and actuator 15 are positioned is defined by housing 20.

It will be appreciated, however, that the blade housing may assume any other configuration insofar as the plurality of blades 12 are maintained in a mutually parallel relation when fixated, as will be described hereinafter.

In order to tilt the blades 12, a plurality of side blade holders 14 are employed, each end of a blade being secured by a corresponding side blade holder. Each blade 12 is also secured to an intermediate blade holder 18.

As shown in Fig. 2, each side blade holder 14 has a rectangular main body 11 formed with a central groove 16, in which a blade is inserted and secured and which is parallel to the upper planar surface of main body 11, and an elongated,

- 8 -

longitudinally extending protrusion 19, preferably round. Groove 16 is formed in approximately half the length, i.e. the longitudinal dimension, of main body 11, extending from its front face to its rear face. Protrusion 19, which will be referred to hereinafter as an "axle element", is received in a complementary seat provided by a corresponding side member and acts as an axle for the blades while being rotated.

As shown in Fig. 3, blade 12 comprises a planar rearwardly disposed engageable portion 21 which is insertable within the groove of a side blade holder and of an intermediate blade holder, and a free frontwardly disposed portion 23 that is inclined with respect to planar portion 21 and terminates with cutting edge 28. Each engageable portion 21 of the plurality of blades 12 is maintained in a mutually parallel relation when the blades are fixated. An arcuate groove 32 pointing along the length of blade 12 is formed in planar portion 21, from side edge 25 thereof to approximately the interface 34 between planar portion 21 and free portion 23, for engaging groove side wall 9 of side blade holder 14 (Fig. 2) at the front face thereof.

Intermediate blade holder 18, which is illustrated in Fig. 4, has a frontwardly disposed, rectangular groove bearing main body 35 slightly longer and wider than that of side blade holder 14. Groove 37 in which a central portion of a blade is inserted and secured is parallel to the upper planar surface of main body 35, and is formed in approximately half the width of main body 35, i.e. perpendicular to the longitudinal direction, extending from front face 38 of main body 35 and terminating in the interior thereof.

Intermediate blade holder 18 also has a rearwardly disposed, tubular and longitudinally extending rod element 41. Narrow portion 44, which is integrally formed with main body 35 and is coincident therewith at side edge 46, extends to rod element 41, forming a gap 40 between main body 35 and rod element 41.

Actuator 15 shown in Figs. 1 and 5 has one or more arcuate bands 31 for movably grasping upper housing member 22, a substantially horizontal lever 33 disposed below and connected to, or integrally formed with, each band 31, and a connecting member 36 extending downwardly from lever 33. A plurality of vertically spaced and aligned, concave elements 39, e.g. three, are formed within connecting member 36 for receiving and engaging a corresponding number of intermediate blade holder rod elements 41 (Fig. 4). Connecting member 36 has a substantially vertical, planar back 42, which curves at a lower portion thereof in a direction towards connecting member terminal end 55, resulting in a gradually reduced connecting member thickness proximate to terminal end 55. A border element curves upwardly from terminal end 55 towards the lip of the lowermost concave element 39. Actuator 15 may be made of plastic, rubber, leather, or of any metallic material.

It will be appreciated that the intermediate holders may be configured in other ways, for example by a single piece that is both a groove bearing body and is receivable in the connecting member concave element. The concave element may also be configured differently, i.e. in accordance with the shape of the intermediate holder received thereby.

As referred to herein, directional terms such as "horizontal", "vertical", and "lower" are described with respect to a fixed blade position (which also may be considered a closed blade position), for example the illustrated disposition of actuator 15, when the housing side members are positioned perpendicular to an underlying ground surface. The same relative positions will be maintained when the housing side members are disposed at any other desired orientation.

Upon applying a downward force to lever 33 such as with a finger, each band 31 rotates about upper housing member 22 to change the disposition of connecting

- 10 -

member 36. The applied force is therefore transmitted to each blade 12 by means of a corresponding intermediate blade holder 18, causing the axle elements of each blade to simultaneously rotate about a corresponding seat. The angle of each blade with respect to a front face of housing 20 is increased, allowing easy removal of debris that has accumulated between blades 12 due to the increased gap therebetween and easy cleaning of housing 20, to improve the quality of future hair removal operations.

The axle elements continue to be angularly displaced until connecting member 36 contacts housing interior bottom surface 7. The maximum angular displacement of the axle elements is increased by advantageously providing a portion of reduced thickness proximate to connecting member terminal end 55.

Fig. 18 illustrates a front view of housing 20 while blades 12a-c are in a closed position.

Fig. 19 illustrates a front view of housing 20 while blades 12a-c are in an open position, after bands 31 have been angularly displaced with respect to the position shown in Fig. 18, defining a gap G between the cutting edge of adjacent blades to facilitate cleaning of the blades and removal of debris that has accumulated on the blades. Gap G ranges from 0.3-0.7 mm, e.g. 0.5 mm, when the blades are closed to a fullest extent, and ranges from 0.5-1.7 mm, e.g. 1.0 mm, when the blades are in an opened position. The angle between the cutting edge and a skin surface ranges from 25-40 degrees, e.g. 30 degrees, when the blades are closed to a fullest extent, and from 30-50 degrees, e.g. 45 degrees, when the blades are in an opened position.

After blades 12a-c have been rotated, the uppermost blade 12a is displaced upwardly within an opening formed in housing 20 so as to be rearwardly disposed

- 11 -

from a strip 114 of skin treatment material attached, e.g. adhesively attached, to upper housing member 22, for use during a hair removal operation.

As shown in Figs. 9 and 10, the housing may comprise a central rectilinear section 81 to which the side members are attachable. Central section 81 provided with upper housing member 22, lower housing member 24, and front side panels 75a and 75b defines an open interior 79 above bottom 7, and is also formed with a secondary opening 83 above interior 79 into which a blade is introducible during a hair removal operation. Secondary opening 83, which may have a shorter longitudinal dimension than interior 79, may be covered by strip 114 of skin treatment material (Fig. 19). One or more apertures 78 within which an attachment for facilitating a hair removal operation is connected, e.g. by means of a spring biased element 84, may be formed within central section 81 below interior 79.

At the rear side of central section 81 are provided two pairs of horizontally disposed and vertically spaced, rearwardly extending protrusions 86 and 87. Vertically adjacent to protrusions 86 and 87 are three spaced planar surfaces 111, 112 and 113, which are recessed with respect to protrusions 86 and 87. Protrusions 86 and 87 longitudinally extend between a corresponding side edge 82 of central section 81 and a wall 85 which rearwardly extends from an intermediate portion of a corresponding front side panel. Wall 85 is formed with a plurality of concave elements 89 in order to accommodate the axle elements.

Fig. 11 illustrates a housing side member 27A that interacts with central section 81. Side member 27A comprises a transversally oriented flange 96, i.e. in the direction between the front and rear of the apparatus, which is positionable at a side wall of the housing, and may have a continuous and curved edge 98. A top elongated piece 91 longitudinally flares to a terminal end 93 that has a reduced height than the height of the top piece at interface region 92 with flange 96, and

- 12 -

interfaces with the center and top of flange 96 until a transversal extremity 99 thereof. A thickened base 94 protrudes longitudinally from flange 96, from flange bottom 97 to a height corresponding to approximately a third of the height of flange 96. Top piece 91 and base 94 are receivable in complementary recessed portions 80 and 88, respectively, of central section 81 (Fig. 10).

Side member 27A has a vertical planar wall 101 that extends downwardly from top piece 91 to base 94 and extends longitudinally from flange 96 for a fraction of the length of top piece 91. Protruding transversally from wall 101 are vertically spaced projections 103, 104 and 105, which all have a substantially coplanar front face 108 and interface with flange 96. Projections 103, 104 and 105 are adapted to be aligned with, and rearwardly spaced from, surfaces 111, 112 and 113, respectively, of central section 81.

The other side member which is not shown is configured with mirror symmetry with respect to side member 27A.

The free portion F of flange 96, i.e. which does not interface with top piece 91, base 94, or with projections 103-105, is placed in abutment with side edge 82 of central section 81. By virtue of the configuration of side member 27A, protrusions 86 and 87 of central section 81 will abut wall 101 of side member 27A when top piece 91 and base 94 of side member 27A are received in, and preferably attached to, recessed portions 80 and 88, respectively, of central section 81. That is, projection 86 will be received in the interspace between projections 103 and 104, and projection 87 will be received in the interspace between projections 104 and 105. The tight spacing provided between projections 103, 104 and 105 and surfaces 111, 112 and 113, respectively, constitute the seat within which each axle element is able to rotate without any interference. An axle element 19 is shown in Fig. 1 to be forwardly spaced from projection 104.

Fig. 12 illustrates side member 27A from the rear. The terminal end of top piece 91 may be formed with an oblique edge 109 that sloped downwardly and outwardly towards flange 96, to ensure that the blades will be able to rotate without interference.

Alternatively, a side member may be formed with a seat which is complementary to the shape of the axle element.

Figs. 6 and 7 illustrate a flexible fixation member 45 for releasably fixating the plurality of blades 12 and for enabling the tilting of the blades when released from the hair removal apparatus. Fixation member 45 is shown to be removed from the housing in Fig. 6 and is shown in Fig. 7 to be mounted at a fixating position within housing 20 whereby the blades are prevented from being tilted even when a force is applied to the actuator.

Fixation member 45 comprises two longitudinally spaced, relatively rigid securing elements 49, e.g. made from plastic, by which fixation member 45 is temporarily secured to the hair removal apparatus. Interposed between the two securing elements 49 are spring means for providing spring assisted displacement of fixation member 45 in order to enable the tilting of blades 12 after the securing elements 49 are released from the hair removal apparatus.

Securing element 49 may comprise a positioning element 51, e.g. having a triangular cross section, which may be insertable within the interspace between the main body 11 of a corresponding set of side blade holders 14 and a housing side member, e.g. side member 26 (Fig. 1). After positioning element 51 is inserted within the interspace, movement of securing element 49 is restricted. The upper edge of positioning element 51 defining a line may be disposed perpendicularly to the blade engageable portions 21. A finger accessible element 53 may extend longitudinally outwardly, i.e. towards a housing side member,

- 14 -

from positioning element 51 to assist in releasing fixation member 45. Alternatively, fixation member 45 may comprise a positioning element that is also a finger accessible element.

The spring means is shown to be undulated, having two sinusoidal elements 47, each of which being located between one set of side blade holders 14 and the intermediate blade holders 18. It will be appreciated, however, that any other suitable type of spring means well known to those skilled in the art is also within the scope of the invention. A straight longitudinally extending element 43 connects the two sinusoidal elements 47 and is disposed below the lowermost intermediate blade holder 18. An engagement element 54, e.g. having an inverted U-shaped configuration with a widened bottom contour, extends downwardly from straight element 43 and is securably insertable within one or more recesses 6 formed within housing interior bottom 7 (Fig. 1).

Each sinusoidal element 47 is connected to a corresponding securing element 49 by means of a connection box 59 according to connecting means well known to those skilled in the art. Connection box 59 is integrally formed with securing element 49 and protrudes frontwardly from the front face 57 of positioning element 51. A transitional curvilinear portion 56 extends from the rear face and lower edge of positioning element 51 to the rear edge 71, e.g. a curved edge, of the horizontal and planar construction box upper face 73. Bottom face 74 of connection box 59 may be parallel to upper face 73 thereof. The height of connection box 59, i.e. between upper face 73 and bottom face 74, is considerably less than the height of positioning element 51, e.g. one-half or one-third the height. A sidewall 76 at the outward face of connection box 59 is engaged with an outwardly extending pin 77, e.g. by means of a concave seat.

As shown in Fig. 8, connection box 59 constitutes the means for preventing the tilting of blades 12. When connection box 59 is inserted between main body 11 of

- 15 -

the lowermost side blade holder and housing interior bottom 7, the upper face of connection box 59 is placed in abutting relation, e.g. frictional engagement, with the lower face of the lowermost side blade holder. Since rotation of the lowermost side blade holder is prevented, rotation of all of the blades is likewise prevented. It will be appreciated that connection box 59 may be inserted between two adjacent side holders so as to prevent rotation of the blades insofar as transitional portion 56 is suitably configured.

After the two securing elements 49 are squeezed together or separately, connection box 59 is inwardly displaced and becomes separated from the side holder. The blades 12 are therefore allowed to be tilted when a force is applied to the actuator. While the two securing elements 49 are squeezed together, the two sinusoidal elements 47 become deformed. When the two securing elements 49 cease to be squeezed together, the spring force built up in the two sinusoidal elements 47 is released, causing connection box 59 to be automatically returned to the interspace between main body 11 of the lowermost side blade holder and housing interior bottom 7.

To guide securing element 49 while being longitudinally displaced so that connection box 59 will be reliably placed in abutting relation with the side holder, a longitudinally extending groove 29 may be formed in housing interior bottom 7. Groove 29 is sized to receive pin 77 of fixation member 45 (Fig. 6) to ensure that the latter will follow a linear path when the spring means becomes elastically deformed and then afterwards when the deformation force is released, immediately bringing securing element 49 into a fixating position.

Figs. 13-17 illustrate hair removal apparatus according to another embodiment of the invention wherein the fixation device coacts with the actuator.

- 16 -

Hair removal apparatus 120 illustrated in Fig. 13 comprises housing 130, a fixation device 140 that is fixedly attached to housing 130, and actuator 150 for simultaneously rotating all of the blades 12.

The plurality of blades 12 are rotatably mounted in housing 130 as described hereinabove by means of the side holders 14, central section 131, and side members 26B and 27B. Actuator 150 is identical to actuator 15 of Fig. 5 for transmitting motion to the intermediate holders 18 by means of connecting member 36, with the exception of opening 157, e.g. a rectangular opening, formed in lever 153 to accommodate T-shaped stem 167, as will be described hereinafter.

Fig. 14 illustrates flexible fixation device 140. Fixation device 140 comprises two sinusoidal elements 47 and a straight element 143 extending therebetween. Stem 167 extends upwardly, and a portion thereof may slightly curve upwardly, from straight element 143 to head 169 of stem 167, e.g. horizontal. Portion 171 of stem 167 which is contiguous with straight element 143 is preferably thickened. At each outward end of a sinusoidal element 47 is connected a longitudinally extending pin 149, which is fixedly secured to a corresponding side member, for example to a cavity formed therewithin.

Fig. 15 illustrates central section 131. Central section 131 comprises upper housing member 132, lower housing member 134, and two vertical end walls 139 from each of which rearwardly extend vertically spaced protrusions 136 and 137, defining therebetween a seat 139 for a corresponding axle element that is adapted for interaction with a protrusion of a housing side member. A secondary opening 142 which is slightly inwardly spaced from a corresponding end wall 139 and slightly longer the length of a side holder main body, may be formed in housing upper member 132 to permit rotation of the blades without interference.

- 17 -

A central groove 144, e.g. rectangular, is formed in housing upper member 132. Two columns 147 and 148 between which the intermediate holders are positioned vertically extend between housing interior bottom 136 and housing upper member 132. An aperture 152 may be formed within housing interior bottom 136, outwardly and/or forwardly from columns 147 and 148. Bottom 136 may be formed with one or more rearward protrusions 153 to accommodate aperture 152.

With reference to Figs. 13, 14 and 16, stem 167 extends through the gap 40 of each intermediate holder 18 (Fig. 4) and through opening 157 formed in lever 153, to assure that stem head 169 will be above lever 153. Thickened stem portion 171 is in abutting and rotation preventing relation with both rod element 41 and with main body rear face 48 of intermediate holder 18 (Fig. 4) when fixation device 140 is set to a fixating position. When thickened portion 171 becomes dislodged from gap 40 of intermediate holder 18, the intermediate holders, and therefore the blades, are free to rotate.

Upon applying a downward force to stem head 169, lever 153 is contacted by stem head 169 and follows a downward path rearwardly from column 148. Since fixation device 140 is in a fixating position, the plurality of blades 12 will be prevented from rotating when lever 153 is initially downwardly displaced. However, when lever 153 and stem head 169 are additionally downwardly displaced, thickened portion 171 becomes dislodged from gap 40 of intermediate holder 18, allowing each band 31 to rotate about upper housing member 132 during subsequent downwardly displacement of lever 153 while undergoing some elastic deformation and causing a change in the disposition of connecting member 36. The applied force is therefore transmitted to each blade 12 by means of a corresponding intermediate blade holder 18, causing each blade to be simultaneously rotated. The blades 12 may continue to be rotated until each band 31 reaches its limit of elastic deformation and becomes rigid. The blades 12 may also cease to be rotated when a band 31 contacts a column 148.

- 18 -

As shown in Figs. 13 and 17, each aperture 152 formed in housing interior bottom 136 is a through hole. When lever 153 is downwardly displaced to a significant degree, sinusoidal elements 47 become deformed. A portion of each sinusoidal element 47, e.g. a lower elbow 158, is therefore able to pass through a corresponding aperture 152 when being downwardly displaced by lever 153 without being restricted. However, when a portion of each sinusoidal element 47 is passing through aperture 152, a sinusoidal element portion may contact an outward edge 154 of aperture 152. This contact serves as an additional means for limiting rotation of blades 12 and deformation of sinusoidal element 47. When the force is released, the fixation device automatically returns to the fixating position, i.e. the stem thickened portion becomes in abutting and rotting preventing relation with the intermediate holder, and the blades become closed.

It will be appreciated that the downward force that is described is in reference to the illustrated orientation of the housing, and the apparatus of the present invention is operable at any other desired disposition.

While some embodiments of the invention have been described by way of illustration, it will be apparent that the invention can be carried out with many modifications, variations and adaptations, and with the use of numerous equivalents or alternative solutions that are within the scope of persons skilled in the art, without departing from the spirit of the invention or exceeding the scope of the claims.

CLAIMS

1. A manual hair removal apparatus, comprising a housing in which are rotatably mounted a plurality of razor blades, an actuator for simultaneously rotating all of said blades, and a fixation device for preventing inadvertent rotation of said blades during a hair removal operation.
2. The apparatus according to claim 1, wherein the actuator comprises a lever and a connecting member attached to said lever and to each of said blades, application of a force to said lever when the fixation device is released causing said connecting member and all of the blades to change their angular disposition, thereby increasing a gap between adjacent blades and facilitating cleaning of the blades.
3. The apparatus according to claim 2, wherein each of the plurality of blades comprises a planar rearwardly disposed engageable portion secured to a blade holder, and a free frontwardly disposed portion that is inclined with respect to said engageable portion and that terminates with a cutting edge, each of said engageable portions being substantially mutually parallel when the fixation device is set to a fixating position.
4. The apparatus according to claim 3, wherein the engageable portion of each of the blades is secured to an intermediate blade holder, the connecting member being engaged with each of said intermediate blade holders to cause all of the blades to simultaneously change their angular disposition upon application of the force to the lever when the fixation device is released.
5. The apparatus according to claim 4, wherein the engageable portion of each of the blades is also secured to two longitudinally spaced side blade holders, each of said side blade holders comprising an axle element rotatably mounted in

- 20 -

a corresponding side member of the housing for facilitating rotation of the blades and a main body in which the engageable portion is inserted being substantially longer than said axle element.

6. The apparatus according to claim 5, wherein the fixation device comprises at least one securing element including an element positionable in abutting and rotation preventing relation with one of the side or intermediate blade holders.

7. The apparatus according to claim 6, wherein the fixation device further comprises spring means which is biased to return the fixation device to the fixating position after being released therefrom.

8. The apparatus according to claim 7, wherein the at least one securing element is connected to the spring means for setting the fixation device to the fixating position.

9. The apparatus according to claim 8, wherein the spring means comprises two sinusoidal elements and a straight element connecting said two sinusoidal elements and being disposed below a lowermost intermediate blade holder.

10. The apparatus according to claim 6, wherein the element positionable in abutting and rotation preventing relation with one of the side or intermediate blade holders is positionable in frictional engagement with one of the side holders to prevent blade rotation.

11. The apparatus according to claim 8, wherein the at least one securing element comprises a connection box connected to the spring means, the height of said connection box being substantially equal to a gap between the main body of a lowermost side holder and a housing interior bottom so that rotation of all of the

- 21 -

side holders and all of the blades is prevented when said connection box is inserted below said lowermost side holder.

12. The apparatus according to claim 11, wherein the at least one securing element further comprises a pin outwardly extending from a sidewall of the connection box, said pin being receivable in a longitudinally extending groove formed in the housing interior bottom to guide the at least one securing element along a linear path while being longitudinally displaced to ensure that the connection box will be reliably placed in abutting relation with the lowermost side holder when a deformation force applied to the spring means is released.

13. The apparatus according to claim 6, wherein each of the intermediate holders comprises a frontwardly disposed, groove bearing main body for the insertion therein of the blade engageable portion, a rearwardly disposed, tubular and longitudinally extending rod element receivable in a corresponding concave element of the connecting member, and a narrow portion extending from said intermediate holder main body to said rod element to form a gap between said intermediate holder main body and said rod element.

14. The apparatus according to claim 13, wherein the securing element comprises a stem head and a stem extending upwardly from a straight element of the spring means through the gap of each of the intermediate holders to said stem head, a portion of said stem which is contiguous with the straight element being thickened so as to be in abutting and rotation preventing relation with both the rod element and with a main body rear face of the lowermost intermediate blade holder when the fixation device is set to the fixating position and to enable rotation of the blades when said thickened portion is displaced downwardly from the gap of the lowermost intermediate blade holder.

- 22 -

15. The apparatus according to claim 5, wherein the housing comprises a central section to which two longitudinally spaced side members are attachable, each of said two side members having a plurality of vertically spaced projections which are alignable with, and rearwardly spaced from, corresponding recessed surfaces of said central section to define the seat within which each axle element is rotatable without any interference.

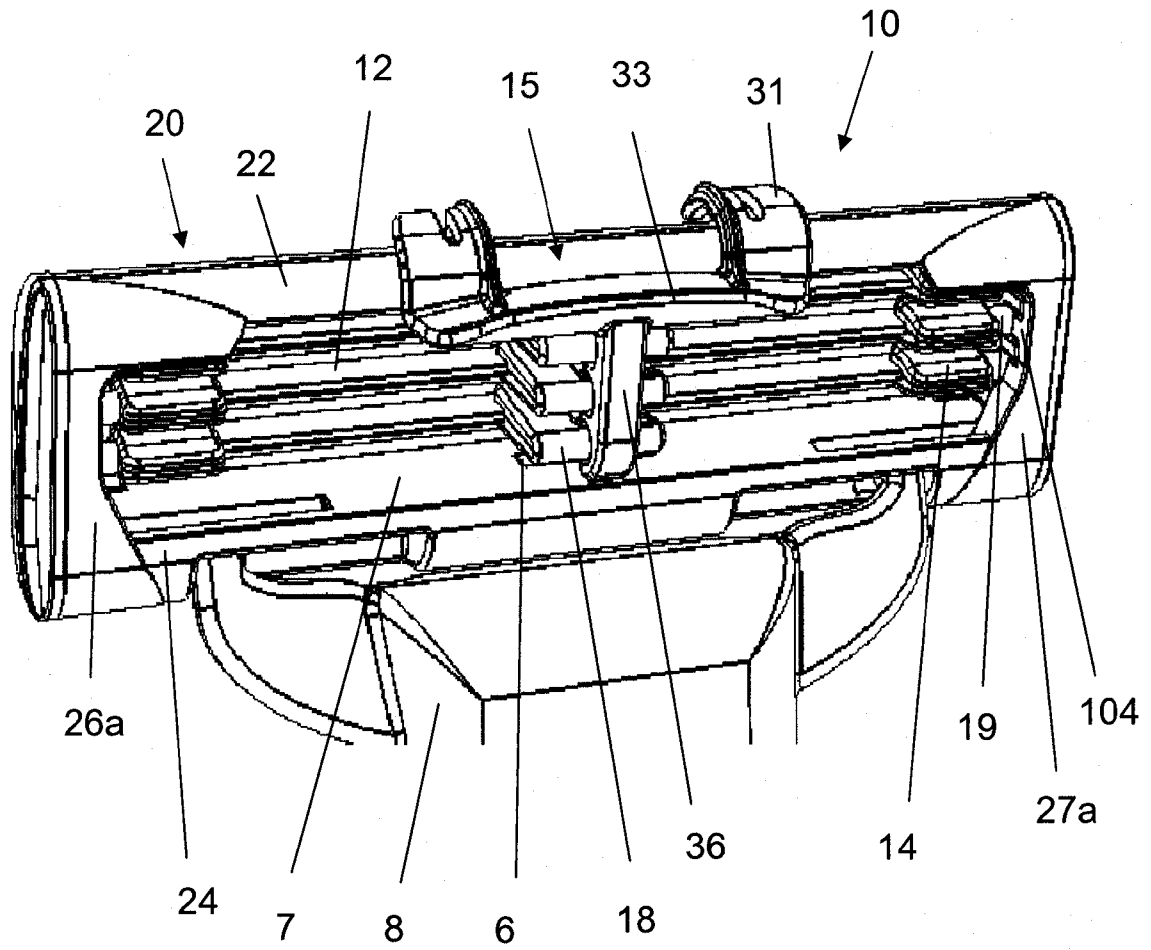


Fig. 1

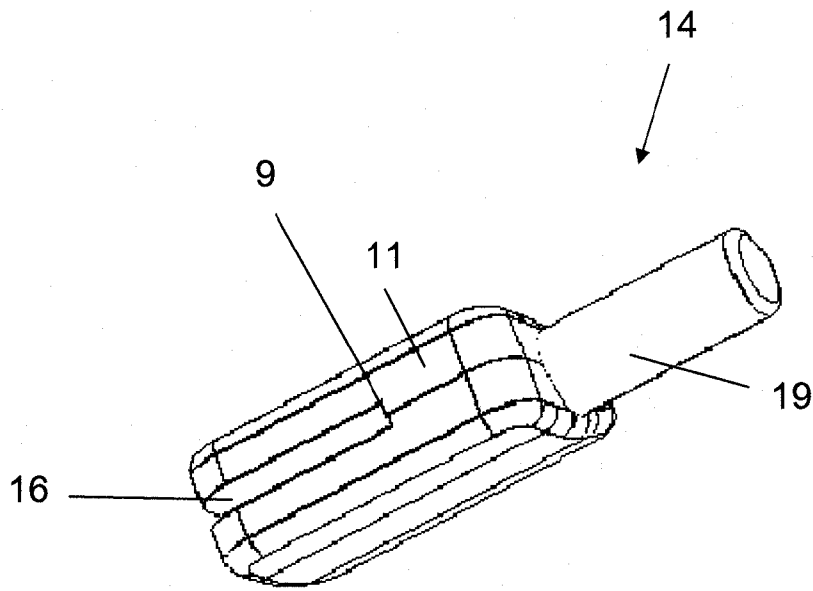


Fig. 2

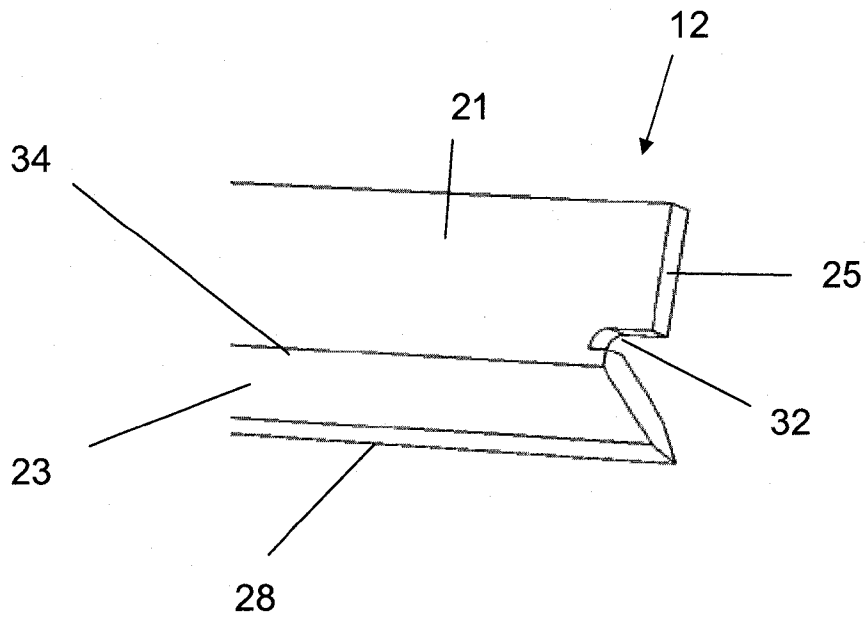


Fig. 3

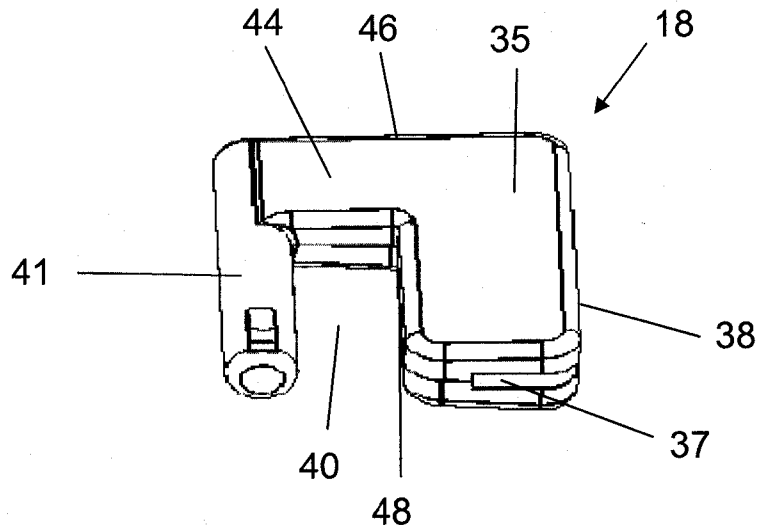


Fig. 4

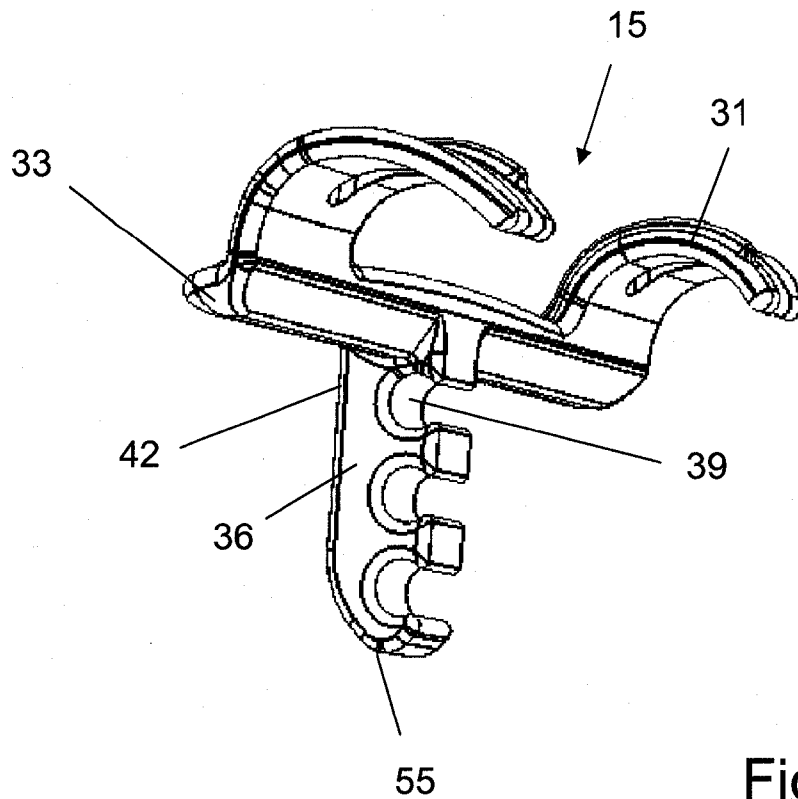


Fig. 5

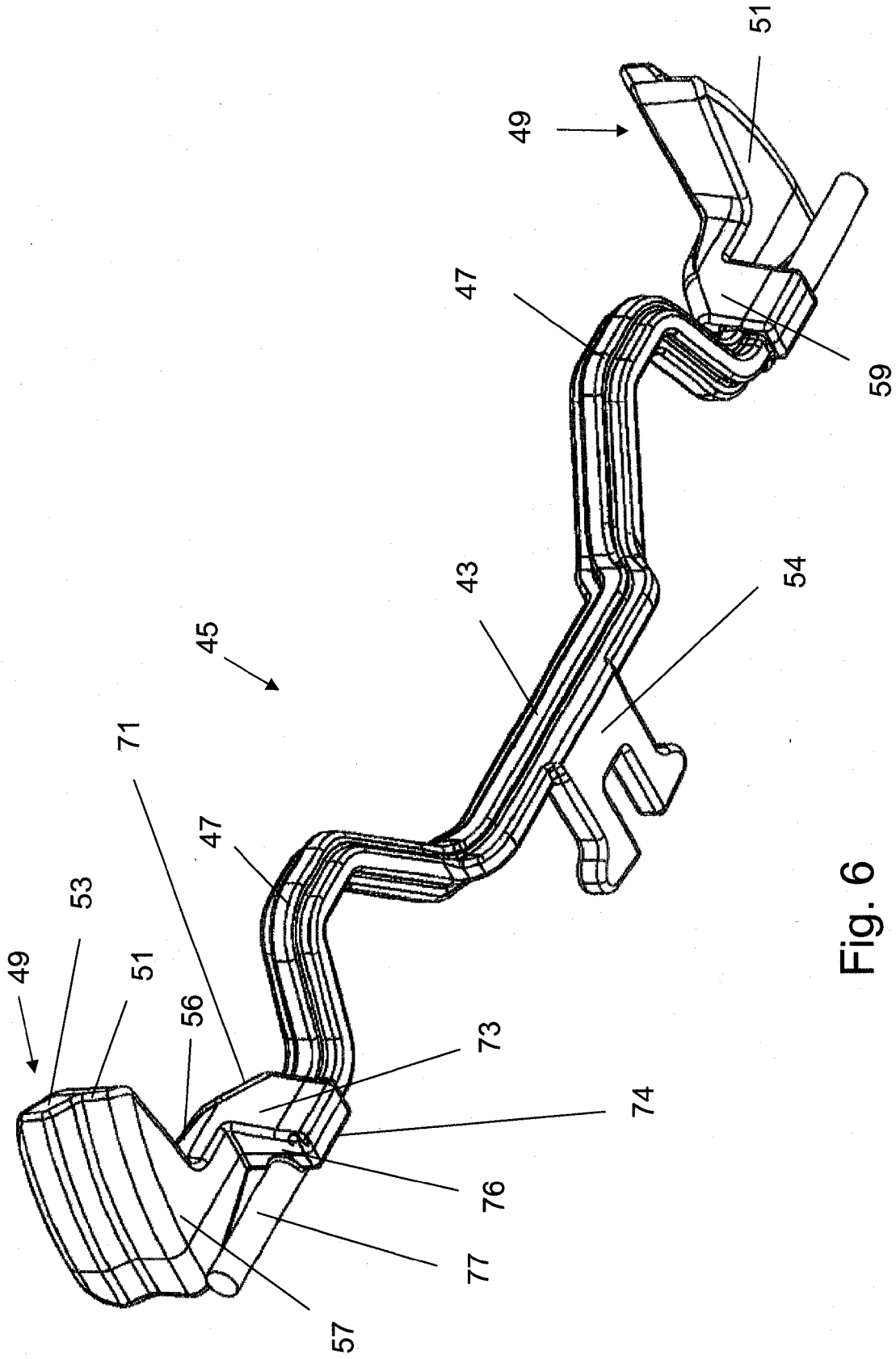


Fig. 6

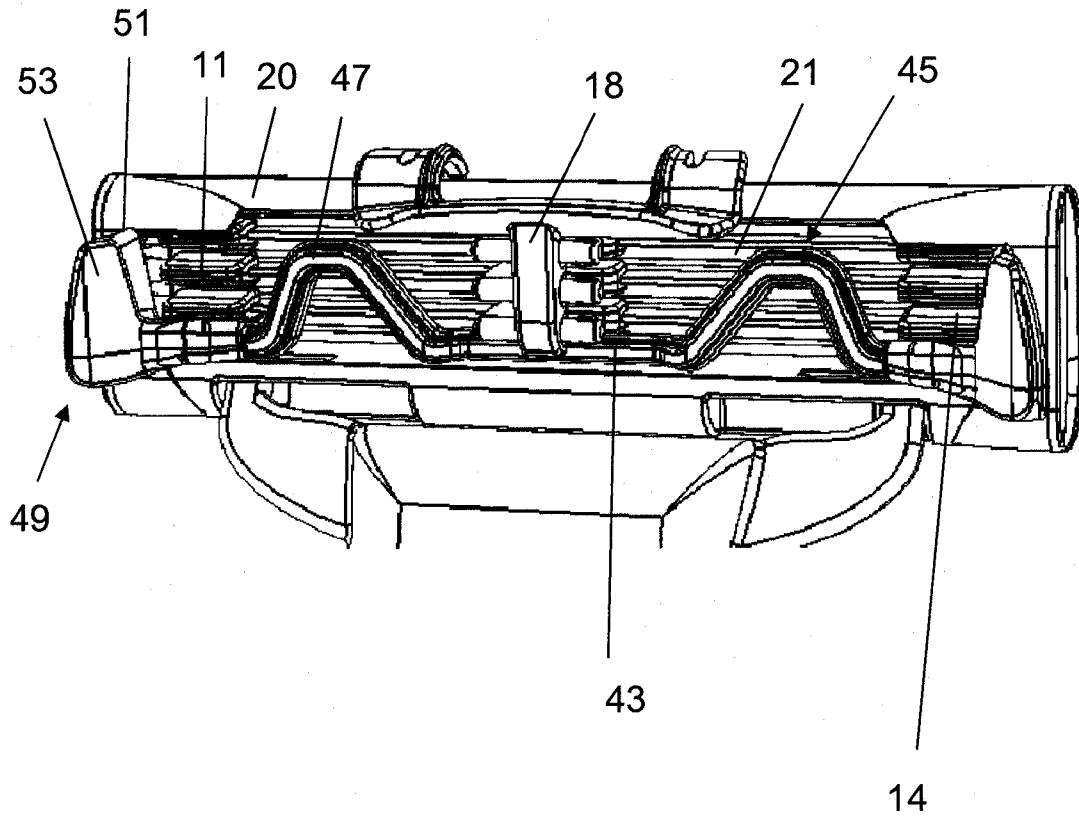


Fig. 7

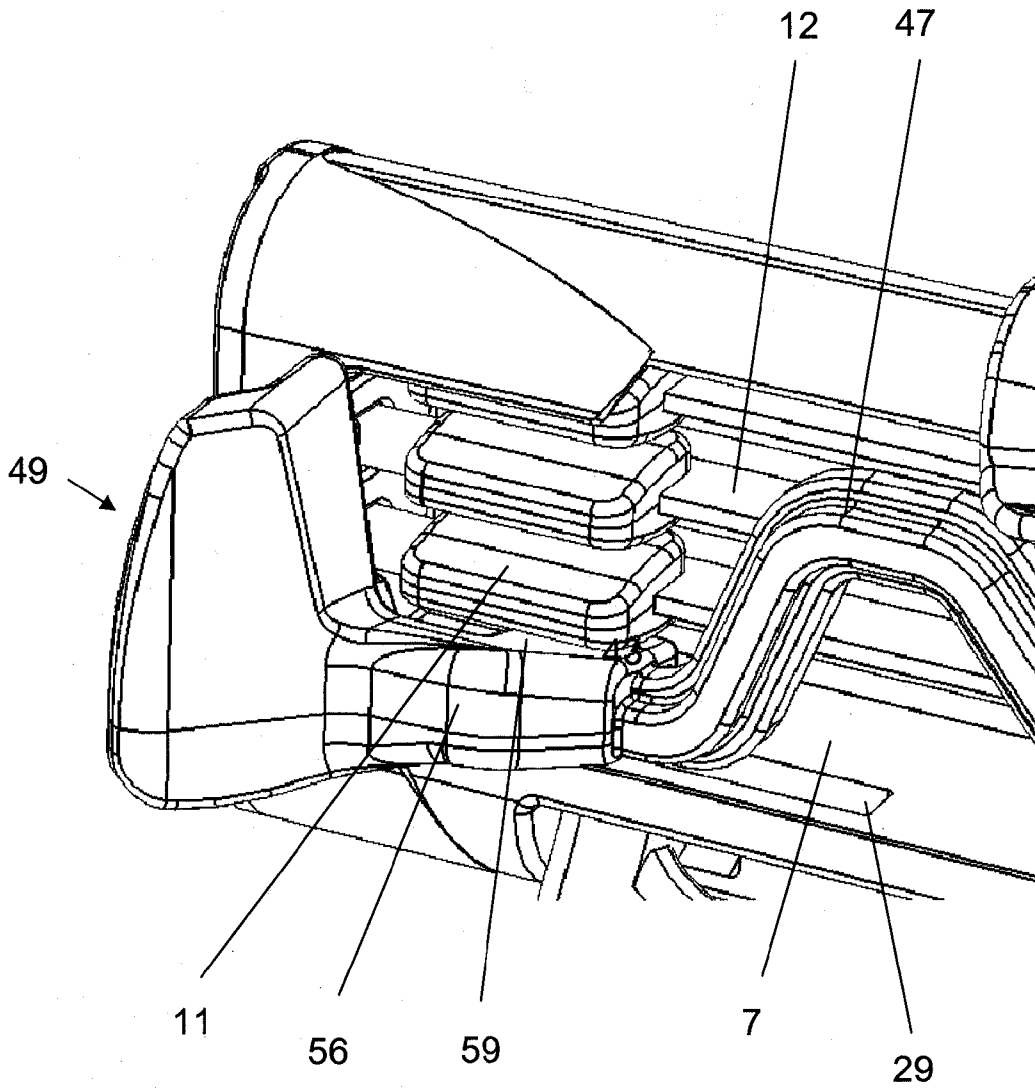


Fig. 8

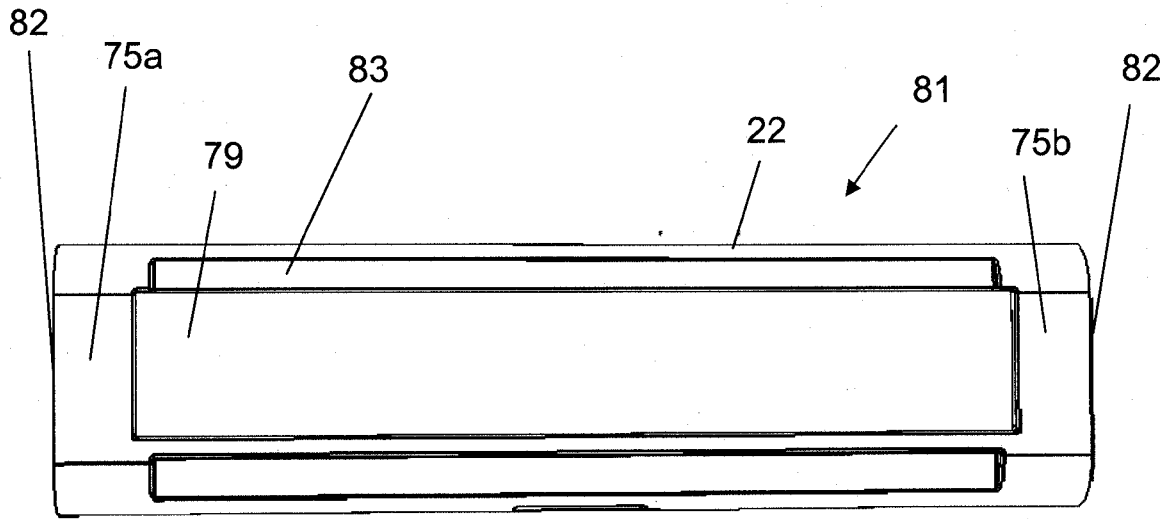


Fig. 9

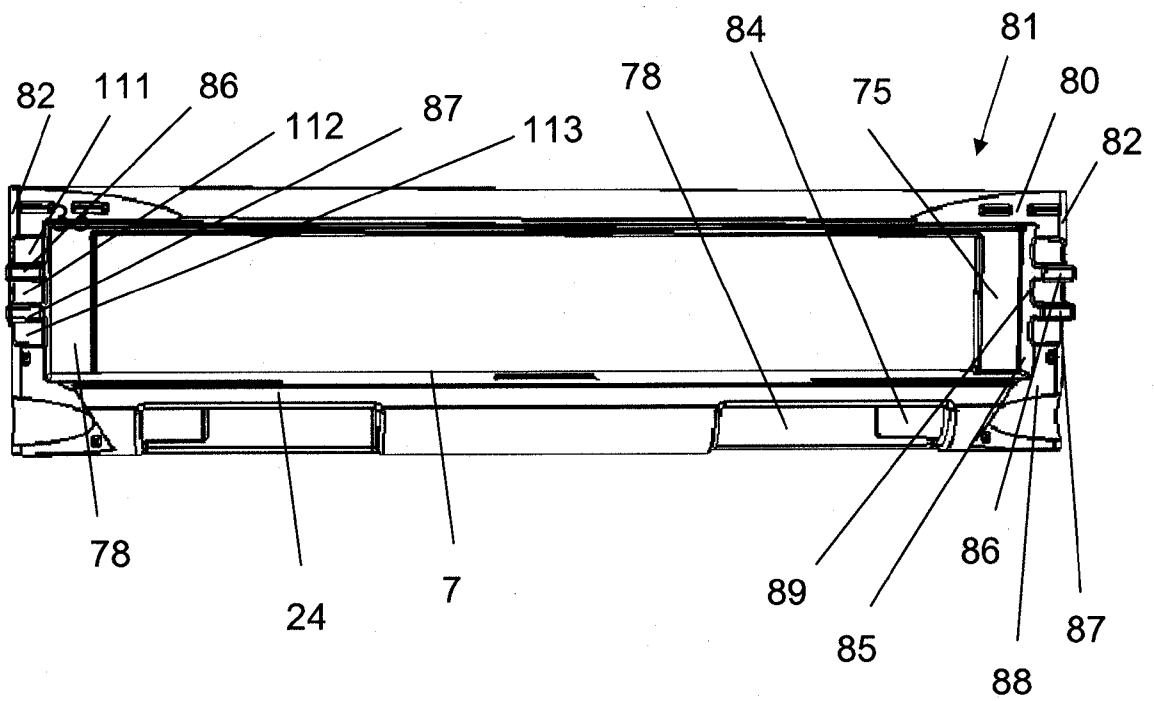


Fig. 10

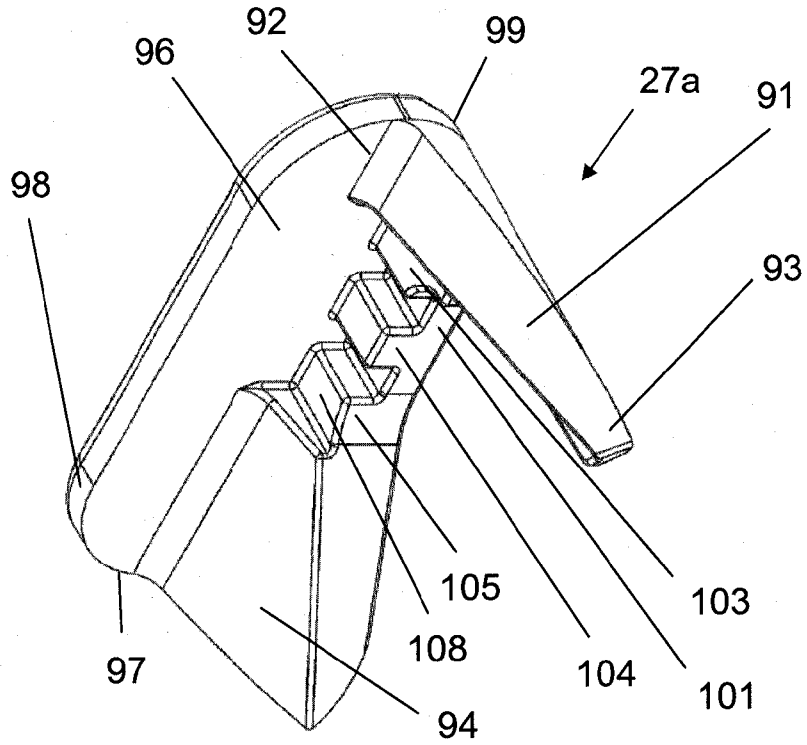


Fig. 11

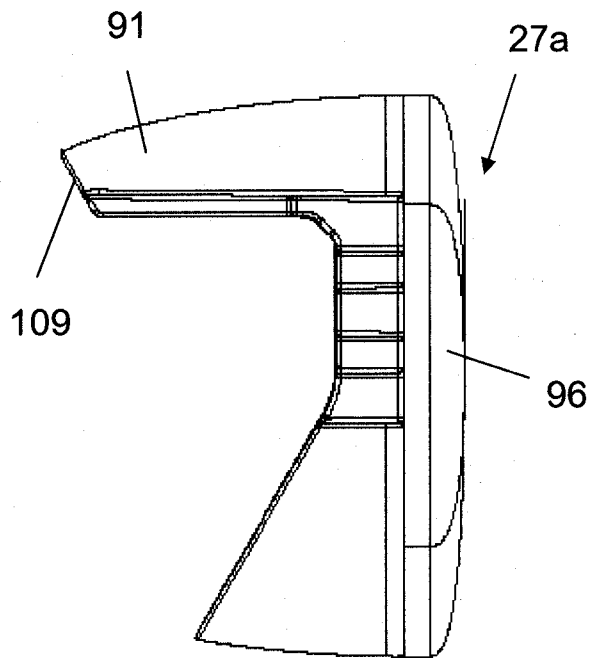


Fig. 12

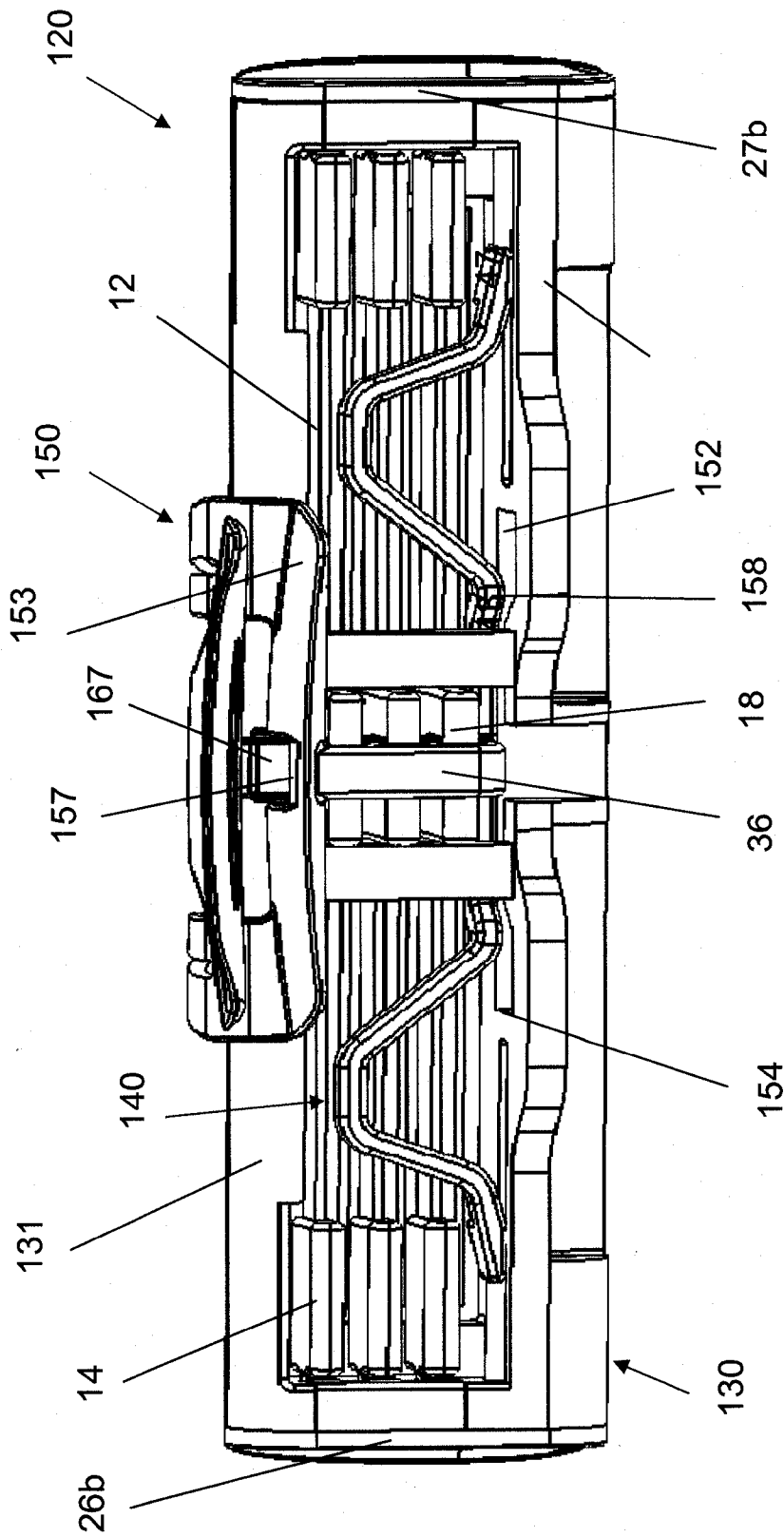


Fig. 13

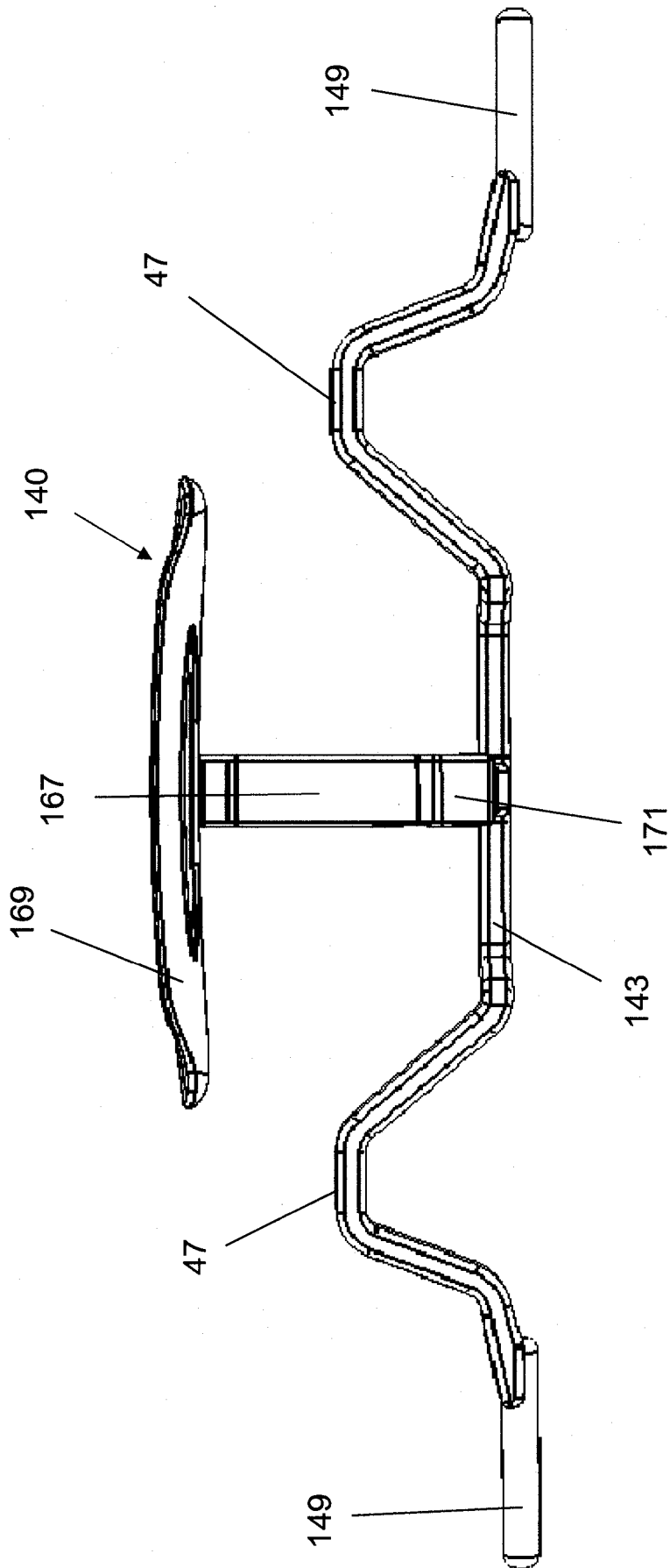


Fig. 14

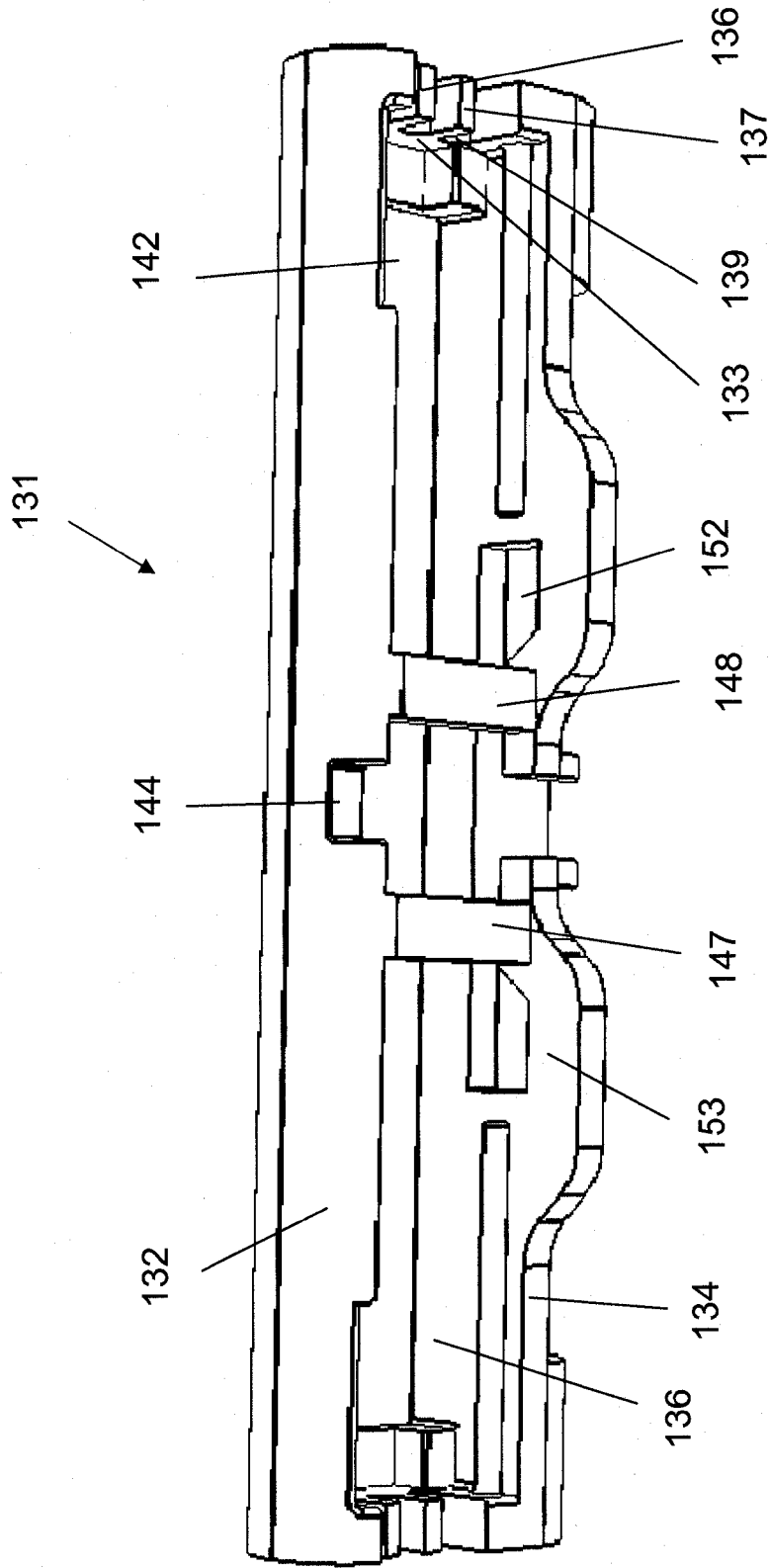


Fig. 15

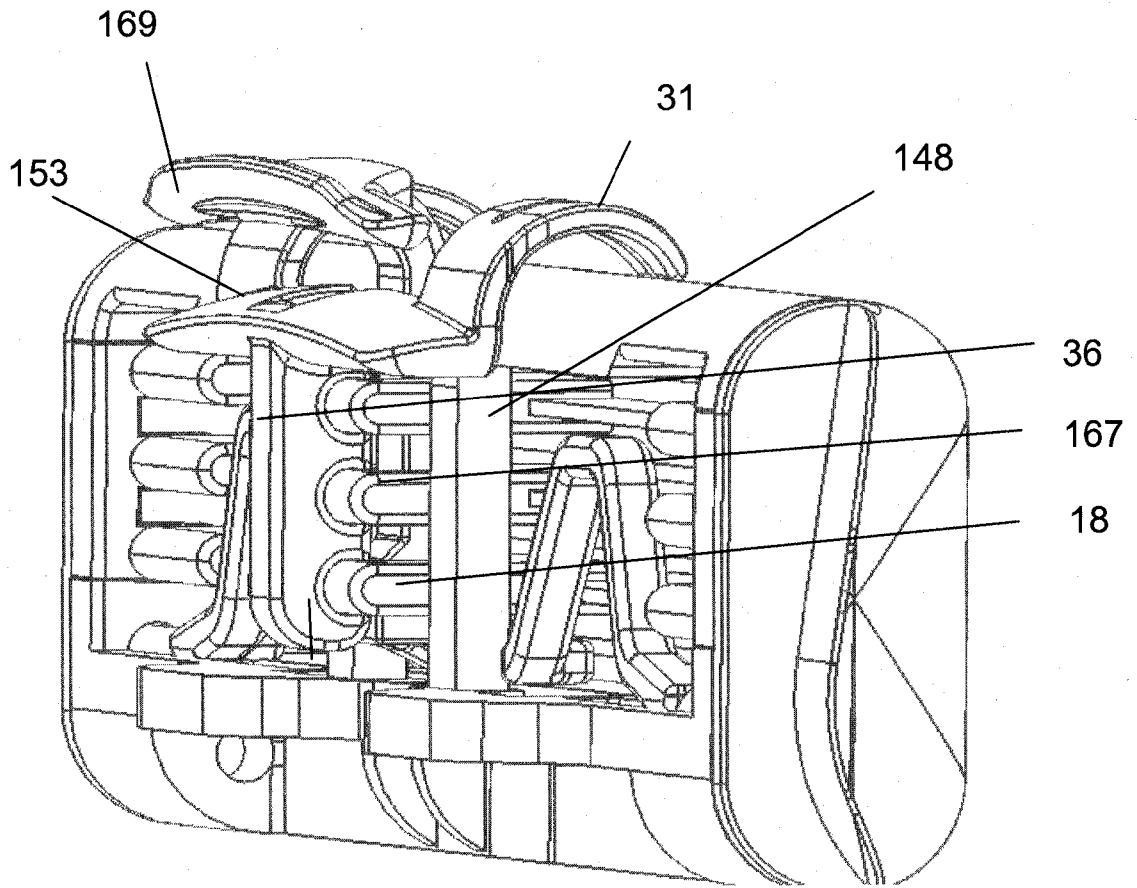


Fig. 16

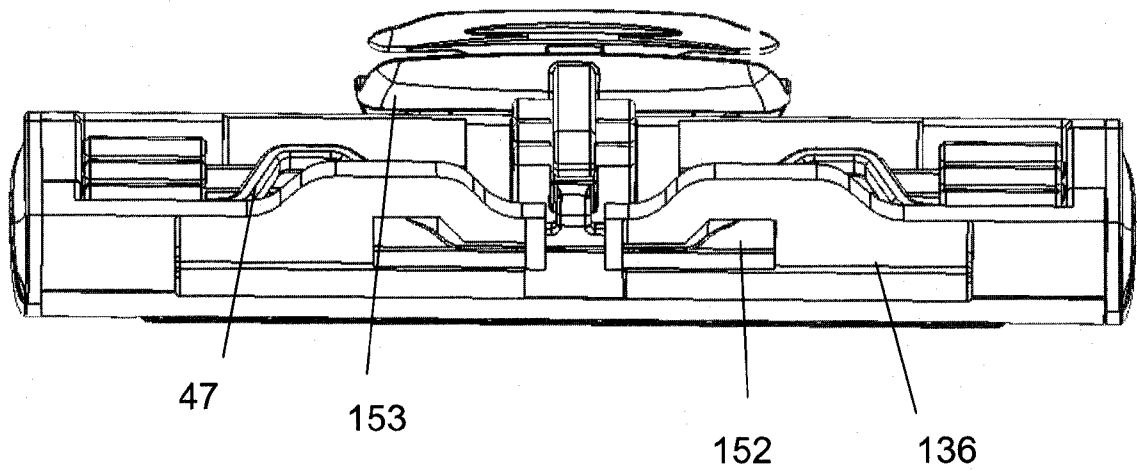


Fig. 17

13/13

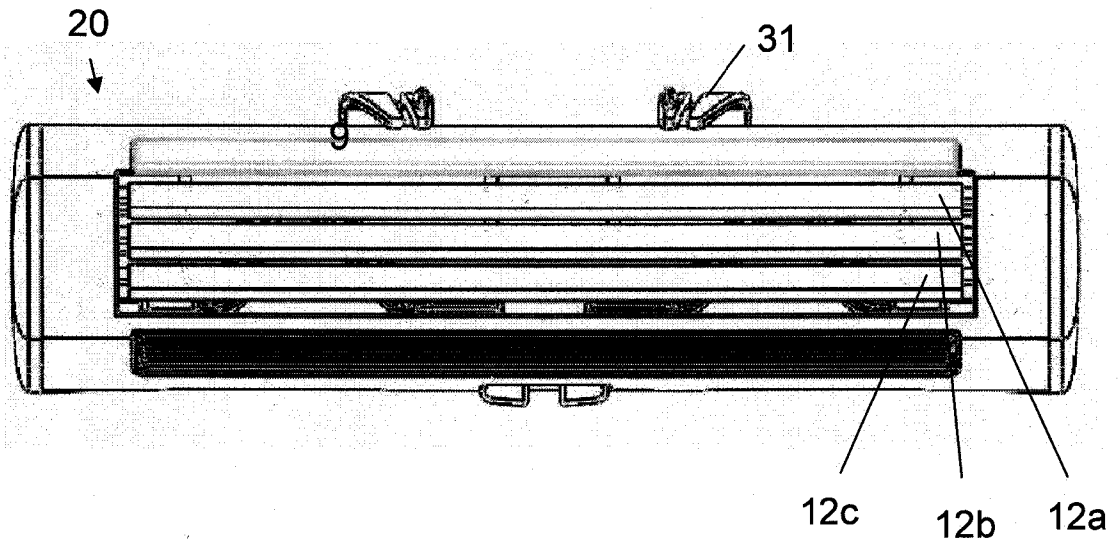


Fig. 18

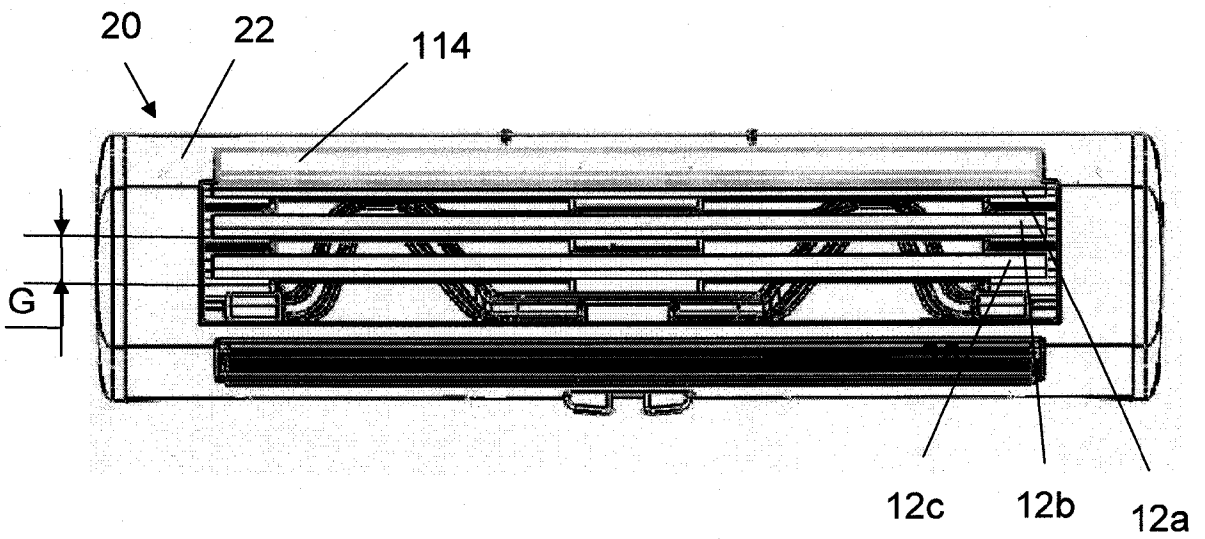


Fig. 19

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 11/00893

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B26B 21/38 (2012.01)

USPC - 30/41

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - B26B 21/38 (2012.01)

USPC - 30/41

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8) - B26B21/38, 21/00, 21/08, 21/14, 21/22 (2012.01)

USPC - 30/41, 32, 34.05, 34.2, 35, 38, 42, 50

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST (); Google (Patents, Scholar, Web)

Search Terms: shave, razor, hair, remove, blade, cut, cutting, plural, multiple, many, more than, at least one, rotate, turn, adjust angle, pivot, swivel, actuator, lever, gap, space, opening, increase, greater, expand, open, axle, rod, pin, groove, recess, holder, arm, grasp, pre

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,251,376 A (ALTHAUS et al.) 12 October 1993 (12.10.1993) Fig. 1-5; col 4, ln 21 to col 5, ln 24	1-15
Y	US 4,501,067 A (DUNCAN) 26 February 1985 (26.02.1985) Fig. 4-5, 7-9; col 3, ln 12-23	1-15
Y	US 6,385,850 B1 (COULTHARD Jr) 14 May 2002 (14.05.2002) Abstract; Fig. 1b-2c; col 2, ln 36 to col 3, ln 34	2-15
Y	US 5,377,409 A (CHEN) 03 January 1995 (03.01.1995) Abstract; Fig. 4-5; col 4, ln 42-54, col 5, ln 11-20	12
Y	US 5,416,974 A (WAIN) 23 May 1995 (23.05.1995) Abstract; Fig. 3-6; col 2, ln 42-55, col 3, ln 35-38	15
A	US 4,265,015 A (ASANO) 05 May 1981 (05.05.1981) Abstract; col 4, ln 56-68	1-15
A	US 2004/0168323 A1 (LEMBKE) 02 September 2004 (02.09.2004) Abstract; Fig. 3-5; Para [0034]-[0036]	1-15

 Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

04 April 2012 (04.04.2012)

Date of mailing of the international search report

13 APR 2012

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774