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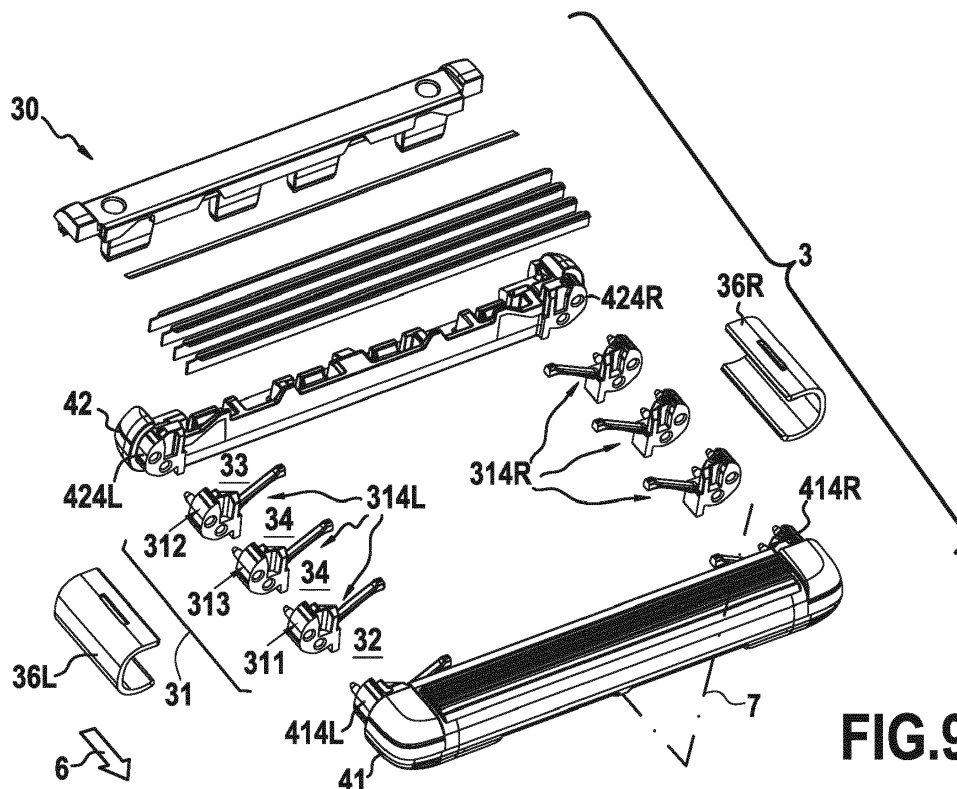
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KH MA MD TN(71) Applicant: **BIC Violex S.A.****145 69 Anoixi (GR)**(72) Inventor: **MOUSTAKAS, Panagiotis****14569 Anoixi (GR)**(74) Representative: **Cabinet Beau de Loménie****158, rue de l'Université****75340 Paris Cedex 07 (FR)****(54) MODULAR FRAME FOR SHAVING HEAD**

(57) A frame (30) for a shaving head (3), including a first end piece (41), a second end piece (42), and a first blade positioner (32-34), the first and second end pieces being connectable to each other, via a connector (414L/R) of the first end piece and a connector (424L/R) of the second end piece, such that an outer extremity of the first end piece (41) and an outer extremity of the second end piece (42) are arranged away from each other,

the first blade positioner (32-34) being located between said outer extremities when the first and second end pieces are connected to each other. A shaving head (3) including such a frame (30) and one or more razor blades arranged in the one or more blade positioners (32-34) thereof. A shaver including such a frame (30) or such a shaving head (3).

**FIG.9****EP 3 858 565 A1**

Description

FIELD

[0001] The present disclosure relates to the field of shaving and in particular to shaving heads.

BACKGROUND ART

[0002] It is known to provide a shaver with a shaving head that includes one or more razor blades for shaving skin. For example, the BIC Classic Sensitive and Classic Lady shavers each include a shaving head with a single razor blade, whereas the BIC Twin Select and Comfort Twin Lady shavers each include a shaving head with two razor blades, the BIC Soleil includes a shaving head with three razor blades, the BIC Soleil Bella and Flex 4 shavers each include a shaving head with four blades, and the BIC Flex 5 shaver includes a shaving head with five razor blades. Each of these shaving heads requires its own dedicated assembly line, which may be incompatible with fabrication of other kinds of shaving heads.

SUMMARY

[0003] According to examples of the present disclosure, a frame may be provided for a shaving head. The frame may include a first end piece, a second end piece, and a first blade positioner. The first and second end pieces may be connectable to each other, via a connector of the first end piece and a connector of the second end piece, such that an outer extremity of the first end piece and an outer extremity of the second end piece are arranged away from each other. A first blade positioner may be located between said outer extremities when the first and second end pieces are connected to each other.

[0004] Such a frame may allow for components which are suitable for use in a relatively small head (in which none or relatively few components separate the connectors of the first and second end pieces from each other) to be used in a relatively large head (in which the connectors of the first and second end pieces are separated from each other by at least one or relatively many components therebetween).

[0005] The connector of the first end piece may present a first shape, and the connector of the second end piece may present a second shape.

[0006] A given connector presenting the first shape may be connectable to a given connector presenting the second shape.

[0007] A given connector presenting a first shape may be connectable to a given connector presenting the second shape to form a dovetail joint, or a mortise and tenon joint.

[0008] The frame may include one or more second blade positioners. The one or more second blade positioners may be located between the outer extremity of the first end piece and the outer extremity of the second

end piece when the first and second end pieces are connected to each other.

[0009] The connector of the first end piece may be directly connectable to the connector of the second end piece.

[0010] The frame may include an interconnect portion. The interconnect portion may be directly connectable to the first and second end pieces such that the interconnect portion is between the outer extremity of the first end piece and the outer extremity of the second end piece when the first and second end pieces are connected to each other.

[0011] Providing an interconnect portion may allow space between the first and second end pieces to be increased, without having to redesign the first and second end pieces accordingly.

[0012] The interconnect portion may be formed distinctly from each of the first and second end pieces.

[0013] The interconnect portion may include at least one segment.

[0014] The interconnect portion may include two or more segments which are directly connectable to the each other. A first of the two or more segments and a second of the two or more segments may respectively be directly connectable to the first and second end pieces such that the first and second segments are between the outer extremity of the first end piece and the outer extremity of the second end piece when the first and second end pieces are connected to each other.

[0015] Providing multiple segments may allow space between the first and second end pieces to be varied by adding or removing segments of the interconnect portion.

[0016] The first segment may be formed distinctly from the second segment.

[0017] Each segment may include a first connector and a second connector. The first connector may be connectable to the first end piece. Additionally, or alternatively, the second connector may be connectable to the second end piece.

[0018] The first connector may be directly connectable to the first end piece. Additionally or alternatively, the second connector may be directly connectable to the second end piece.

[0019] The first connector may be directly connectable to the connector of the first end piece. Additionally or alternatively, the second connector may be directly connectable to the connector of the second end piece.

[0020] The first connector may present the second shape. The second connector may present the first shape.

[0021] An engagement direction for connecting the second end piece to the interconnect portion may be identical to an engagement direction for connecting the interconnect portion to the first end piece.

[0022] At least one of the first blade positioner and the one or more second blade positioners may be configured to connect to one or more razor blades.

[0023] At least one blade positioner of the frame may

be provided as a slot into which a razor blade may be fitted for connection to the frame.

[0024] At least one blade positioner may be at least partially formed on the interconnect portion.

[0025] At least one segment of the interconnect portion may include at least one blade positioner.

[0026] At least one blade positioner may be at least partially formed on the first end piece and/or at least partially formed on the second end piece.

[0027] At least one blade positioner may be located on the first end piece. Additionally or alternatively, at least one blade positioner may be located on the second end piece.

[0028] The frame may include a retainer between the first and second end pieces.

[0029] According to examples of the present disclosure, a frame as disclosed earlier herein may be fabricated according to a method including providing a first end piece, providing a second end piece, and assembling the first and second end pieces together to arrange a first blade positioner between the outer extremities of the first and second end pieces.

[0030] The method may include providing an interconnect portion. Assembling the first and second end pieces together may include assembling the first end piece to the interconnect portion and assembling the interconnect portion to the second end piece.

[0031] An engagement direction for connecting the first end piece to the interconnect portion may be identical to an engagement direction for connecting the interconnect portion to the second end piece.

[0032] Providing the interconnect portion may include providing a first segment, providing at least a second segment, and connecting the first and at least a second segments of the interconnect portion together.

[0033] An engagement direction for connecting the two or more segments of the interconnect portion together may be identical to the engagement direction for connecting the first and end piece to the interconnect portion.

[0034] According to examples of the present disclosure, a shaving head may be provided. The shaving head may include a frame as described earlier herein, and one or more razor blades arranged in the one or more blade positioners thereof.

[0035] At least one of the one or more razor blades may be provided as a blade assembly including a blade support and a cutting element mounted thereon. The blade support may include a mounting portion on which the cutting element is mounted, and a base portion arranged between the mounting portion and the frame. The base portion may extend obliquely or perpendicularly from the mounting portion.

[0036] The cutting element may be mounted on a surface of the mounting portion which is arranged towards skin during shaving, or on a surface of the mounting portion which is arranged away from skin during shaving.

[0037] At least one of the one or more razor blades may be provided as a bent blade, including a cutting edge

portion integrally formed with a support portion that extends obliquely or perpendicularly with respect to the cutting edge portion.

[0038] According to examples of the present disclosure, a shaver may be provided. The shaver may include a frame as described earlier herein or a shaving head as described earlier herein. The shaver may include a manipulation portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] The disclosure may be more completely understood in consideration of the following detailed description of aspects of the disclosure in connection with the accompanying drawings, in which:

Fig. 1 shows an exemplary shaver;

Fig. 2 shows an enlarged view of a shaving head visible in Fig. 1;

Fig. 3 shows an exploded view of the shaving head of Fig. 2;

Fig. 4 shows an enlarged view of a front end piece visible in Fig. 2;

Fig. 5 shows an enlarged view of a left connector of the front end piece of Fig. 4;

Fig. 6 shows an enlarged view of a back end piece visible in Fig. 2;

Fig. 7A shows an enlarged view of a left connector of the back end piece of Fig. 6;

Fig. 7B shows a view of connectors of a frame visible in Fig. 2;

Fig. 8 shows a view of an exemplary shaving head whose frame includes an exemplary interconnect portion;

Fig. 9 shows an exploded view of the shaving head of Fig. 8;

Fig. 10 shows an exemplary left front connector of the interconnect portion visible in Fig. 8, as borne on an exemplary left piece of an exemplary segment of the interconnect portion;

Fig. 11A shows an exemplary left back connector of the interconnect portion visible in Fig. 8;

Fig. 11B shows a view of connectors of the frame visible in Fig. 8;

Fig. 12A shows the left back connector visible in Fig. 11A, as borne on an exemplary left piece of an exemplary segment of exemplary interconnect portion;

Fig. 12B shows the left front connector visible in Fig. 10, as borne on the left piece of Fig. 12A;

Fig. 13 shows an exploded view of an exemplary shaving head;

Fig. 14 shows an enlarged partial view of a frame visible in Fig. 13, with left connectors visible;

Fig. 15 shows an enlarged, exploded, partial view of the frame of Fig. 14;

Fig. 16A shows an enlarged view of an exemplary front end piece visible in Fig. 13, with surfaces that are arranged away from skin during shaving visible

to the viewer;

Fig. 16B shows an enlarged view of an exemplary left connector of the front end piece of Fig. 16A;

Fig. 17A shows an enlarged view of an exemplary back end piece visible in Fig. 13, with surfaces that are arranged towards skin during shaving visible to the viewer;

Fig. 17B shows an enlarged view of an exemplary left connector of the back end piece of Fig. 17A;

Fig. 18 shows an enlarged view of exemplary first and back connectors of exemplary an interconnect portion visible in Fig. 14, with surfaces of the interconnect portion that are arranged away from skin during shaving visible to the viewer;

Fig. 19 shows an enlarged view of the front connector of Fig. 18, with surfaces of the interconnect portion that are arranged towards skin during shaving visible to the viewer.

Fig. 20 shows a process flow diagram for an exemplary method of assembling a frame.

[0040] The term "exemplary" is used in the sense of "example," rather than "ideal." While aspects of the disclosure are amenable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit aspects of the disclosure to the particular embodiment(s) described. On the contrary, the intention of this disclosure is to cover all modifications, equivalents, and alternatives falling within the scope of the disclosure.

DETAILED DESCRIPTION

[0041] As used in this disclosure and the appended claims, the singular forms "a", "an", and "the" include plural referents unless the content clearly dictates otherwise. As used in this disclosure and the appended claims, the term "or" is generally employed in its sense including "and/or" unless the content clearly dictates otherwise.

[0042] The following detailed description should be read with reference to the drawings. The detailed description and the drawings, which are not necessarily to scale, depict illustrative aspects and are not intended to limit the scope of the disclosure. The illustrative aspects depicted are intended only as exemplary.

[0043] When an element or feature is referred to herein as being "on," "engaged to," "connected to," or "coupled to" another element or feature, it may be directly on, engaged, connected, or coupled to the other element or feature, or intervening elements or features may be present. In contrast, when an element or feature is referred to as being "directly on," "directly engaged to," "directly connected to," or "directly coupled to" another element or feature, there may be no intervening elements or features present. Other words used to describe the relationship between elements or features should be interpreted in a like fashion (for example, "between" versus

"directly between," "adjacent" versus "directly adjacent," etc.).

[0044] Although the terms "first," "second," etc. may be used herein to describe various elements, components, regions, layers, sections, and/or parameters, these elements, components, regions, layers, sections, and/or parameters should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer, or section from another region, layer, or section. Thus, a first element, component, region, layer, or section discussed herein could be termed a second element, component, region, layer, or section without departing from the teachings of the present inventive subject matter.

[0045] Fig. 1 shows an exemplary shaver 0. The shaver 0 includes a manipulation portion attached to a shaving head 1. The manipulation portion may be provided as a handle 2, for example. The shaving head 1 may be permanently attached to the manipulation portion, as with a so-called disposable shaver, in which the shaver's manipulation portion and shaving head 1 have identical lifetimes and are replaced simultaneously with one another, or the shaving head may be removably attached to the manipulation portion, as with a so-called refillable shaver, for example. A shaving head 1 which is removably attached to a manipulation portion, such as with a refillable shaver, may also be called a "cartridge".

The shaving head 1 includes a frame 4 (also called a "guard") and a blade set 5, which is arranged between front and back extremities of the frame. Although Fig. 1 shows the blade set 5 as including only a single razor blade 50, it is also contemplated for the blade set to include multiple razor blades. When multiple razor blades 50 are provided, they may be arranged to contact skin concurrently during shaving with the blade set 5.

[0046] During shaving with the blade set 5, the shaving head 1 is maneuvered across skin in a shaving direction 6 running from the back extremity of the shaving head to the front extremity of the shaving head. The razor blade(s) 50 of the blade set 5 are arranged such that its/their cutting edge(s) are arranged generally perpendicularly to the shaving direction 6, and extend between opposite lateral extremities of the frame 4.

[0047] As a non-limiting example, the shaving head 1 may be substantially symmetrical with respect to a mid-plane 7 arranged parallel to the shaving direction 6, half-way between the lateral extremities of the frame 4, and normal to the cutting edge(s) of the razor blade(s) 50. Such symmetry can be seen in Fig. 1. For simplicity of discussion, reference numbers differing by "L" and "R" designate items which are mirror images of each other (for example left 40L and right 40R lateral extremities of the frame 4).

[0048] Fig. 2 shows an enlarged view of the shaving head 1 visible in Fig. 1, as seen perpendicular to the shaving direction 6 and the cutting edge of the razor blade 50 of the blade set 5. Surfaces of the shaving head 1 for contacting skin during shaving with the blade set are ex-

posed to the viewer. The midplane 7 is shown for reference.

[0049] The frame 4 includes a front end piece 41, a back end piece 42, and at least one blade positioner 43 for positioning the razor blade(s) 50 of the blade set 5 in the shaving head 1. When the shaving head's blade set 5 includes multiple razor blades 50, the frame 4 may include at least a corresponding quantity of blade positioners 43. During shaving with the blade set 5, the front 41 and back 42 end pieces are arranged to contact the skin concurrently with the cutting edge(s) of the razor blade(s) 50 of the blade set.

[0050] As a non-limiting example, the front 41 and/or back 42 end piece(s) may be made from a material containing ABS (acrylonitrile butadiene styrene), MABS (methylmethacrylate acrylonitrile butadiene styrene), PP (polypropylene), PPO (polyphenyl oxide), PPE (polyphenyl ether), and/or PS (polystyrene). The front 41 and back 42 end pieces may be made of the same material as, or of different materials from one another, for example.

[0051] The front end piece 41 and back end piece 42 are directly connected to one another such that an outer extremity 410 of the front end piece 41 is located near the front extremity of the shaving head 1, and such that an outer extremity 420 of the back end piece 42 is located near the back extremity of the shaving head 1. The blade positioner 43 is located intermediate the outer extremity 410 of the front end piece 41 and the outer extremity 420 of the back end piece 42.

[0052] The front 41 and back 42 end pieces may be connected to each other by way of their respective left 411L, 421L and right 411R, 421R lateral extremities.

[0053] The frame 4 may further include one or more retainers 44L, 44R arranged between the front 41 and back 42 end pieces. As a non-limiting example, the retainer(s) may be made from a material containing ABS (acrylonitrile butadiene styrene), MABS (methylmethacrylate acrylonitrile butadiene styrene), PP (polypropylene), PPO (polyphenyl oxide), PPE (polyphenyl ether), and/or PS (polystyrene). The retainer(s) may be made of the same material as one or more of the front 41 and back 42 end pieces, or of a different material from the front and back end pieces, for example.

[0054] At least one retainer (in this case each of the left 44L and right 44R retainers) may be mounted to a respective lateral extremity 40L, 40R of the frame 4.

[0055] For example, a left retainer 44L is provided as substantially c-shaped - as seen perpendicular to a longitudinal axis of the left retainer - so as to present an inner surface and an outer surface disposed about the longitudinal axis. The left retainer may be mounted to the front 41 and back 42 end pieces near the left lateral extremity 40L of the frame 4. Although the longitudinal axis of the left retainer is straight, as with a conventional retainer, a curvilinear longitudinal axis is also contemplated.

[0056] The radii of the inner and outer surfaces of the left given retainer may be substantially constant, or var-

iable. A radial protrusion may be provided on the inner surface of the left retainer, for example to engage to corresponding retainer engagement features (for example through clipping) provided on other components of the frame 4.

[0057] Fig. 3 shows an exploded view of the shaving head 1 of Fig. 2.

[0058] As a non-limiting example, one or both of the front 41 and back 42 end pieces of the frame 4 may include a cover connector 412, 422 for connecting to a corresponding cover component 413, 423. When both front 41 and back 42 end pieces are provided with cover components 413, 423, said cover components may provide equivalent accessory features to the shaving head 1 as each other or different accessory features from one another. Lubricating elements, exfoliating elements, and skin-tensioning fins are all contemplated as non-limiting examples of accessory features.

[0059] Independently of the presence or absence of one or more cover connectors and/or cover components, as a non-limiting example, the shaving head 1 may include, in addition to the razor blade(s) 50 of the blade set 5, one or more so-called "precision blade(s)" (also called "trimming blade(s)") 8 which may be brought to bear on the skin non-concurrently with the razor blade(s) of the blade set.

[0060] Independently of the presence or absence of one or more cover connectors and/or cover components and/or precision blades, the front end piece 41 can be seen to include one or more connectors, and the back end piece 42 can be seen to include a corresponding number of corresponding connectors. Two connectors may be understood to correspond to one another when they are directly connectable to one another.

[0061] For example, the front end piece 41 includes left 414L and right 414R connectors, and the back end piece 42 may include left 424L and right 424R connectors. A given end piece's left 414L, 424L and right 414R, 424R connectors may, for example, be disposed respectively to left and right sides of the shaving head's midplane 7 (as considered with respect to the shaving direction 6), for example, respectively near the left 411L, 421L and right 411R, 421R lateral extremities of said end piece 41, 42.

[0062] The left 424L and right 424R connectors of the back end piece 42 correspond respectively to the left 414L and right 414R connectors of the front end piece 41, and the front and back end pieces' left connectors 414L, 424L may be directly connected to each other at the same time as the front and back end pieces' right connectors 414R, 424R are directly connected to each other.

[0063] The connector(s) 414L, 414R of the front end piece 41 may be oriented away from the outer extremity 410 of the front end piece, and the connector(s) 424L, 424R of the back end piece 42 may be oriented away from the outer extremity 420 of the back end piece.

[0064] When the frame 4 includes one or more retain-

ers 44L, 44R, the retainer(s) may be configured to clip around the connectors 414L, 414R, 424L, 424R of the front 41 and back 42 end pieces. For example, the left 44L and right 44R retainers can be seen to be clippable to the left 414L, 424L and right 414R, 424R connectors of the front 41 and back 42 end pieces, respectively.

[0065] When the front 41 and back 42 end pieces are connected together, a blade positioner 43 may be provided between their respective outer extremities 410, 420. This possibility will be discussed in greater detail with regard to Fig. 7B.

[0066] Fig. 4 shows an enlarged view of the front end piece 41 visible in Fig. 2, with its outer extremity 410 oriented away from the viewer. The midplane 7 and shaving direction 6 are shown for reference.

[0067] Although the left 414L and right 414R connectors of the front end piece 41 are shown as being mirror images of each other, it is also contemplated, when the front end piece includes multiple connectors, for said multiple connectors to be identical to each other, or even to differ from one another in type and/or gender.

[0068] Each connector of the front end piece 41 may include one or more connecting features, which are configured to be directly connectable to corresponding connecting features borne on a corresponding connector. The one or more connecting features may provide the connector with a first shape, and the corresponding connecting features may provide the corresponding connector with a second shape. This will be discussed in greater detail with regard to Fig. 5.

[0069] Independently of the quantity and/or similarity of connectors borne on the front end piece 41, it can be seen that at least one connector (in this case each of the left 414L and right 414R connectors) of the front end piece may include a cavity 430L, 430R, which may form part of a blade positioner. This possibility will be discussed in greater detail with regard to Fig. 7B.

[0070] At least one (in this case each) cavity 430L, 430R may be associated with a resilient element 434L, 434R.

[0071] Fig. 5 shows an enlarged view of the left connector 414L seen in Fig. 4. As a non-limiting example, the connecting features on a given connector may be one or more protrusions, which may be receivable in a corresponding number of recesses presented by a corresponding connector.

[0072] For example, the left connector 414L seen in Fig. 5 includes at least one (in this case two) peg(s) 415L (a peg being a non-limiting example of a protrusion). The peg(s) 415L may be received in a corresponding number of holes presented by a corresponding (left) connector. This will be discussed in greater detail with regard to Fig. 7A. Although Fig. 5 shows the pegs 415L as being tapered, non-tapered pegs are also contemplated.

[0073] The left connector 414L may also include a spacer portion 416L, located intermediate the connecting features and the outer extremity 410 of the front end piece, such that the connecting features of the left con-

nectors are borne on the spacer portion of the left connector.

[0074] The spacer portion 416L may include a peripheral surface that is configured to contact a retainer clipped to the left connector 414L, and may include a retainer engagement feature 417L practiced on the peripheral surface. As an example, in Fig. 5, the retainer engagement feature 417L is shown as a radial notch practiced on the peripheral surface, which extends along the spacer portion 416L, away from the outer extremity 410 of the front end piece, in a direction substantially parallel to the shaving direction 6.

[0075] The cavity 430L is oriented substantially away from the outer extremity 410 of the front end piece. It is shown as being associated with a resilient element 434L which extends obliquely or perpendicularly to the shaving direction 6. For example, the resilient element 434L in Fig. 5 can be seen to extend from the cavity 430L in a direction away from the left lateral extremity 411L of the front end piece 2, so as to be extend towards skin during shaving with the blade set.

[0076] The resilient element 434L is monolithically formed with the connector.

[0077] Fig. 6 shows an enlarged view of the back end piece 42 visible in Fig. 2, with its outer extremity 420 oriented away from the viewer. The midplane 7 and shaving direction 6 are shown for reference. The back end piece 42 includes a corresponding number of corresponding connectors to the front end piece 41 visible in Fig. 4. The back end piece 42 seen in Fig. 6 includes a left connector 424L and a right connector 424R which correspond respectively to the left 414L and right 414R connectors seen in Fig. 4.

[0078] Independently of the quantity and/or similarity of connectors borne on the front end piece, it can be seen that at least one connector (in this case each connector) of the back end piece 42 may include a cavity 431L, 431R, which may form part of a blade positioner. This possibility will be discussed in greater detail with regard to Fig. 7B.

[0079] Fig. 7A shows an enlarged view of the left connector 424L seen in Fig. 6.

[0080] The cavity (when present) 431L may be oriented substantially away from the outer extremity 420 of the back end piece.

[0081] The left connector 424L may include one or more connecting features (in this case recesses, which may be configured to receive therein a corresponding number of protrusions presented by a corresponding connector). The left connector 424L may also include a spacer portion 426L, located intermediate the connecting features and the outer extremity 420 of the back end piece, such that the connecting features are borne on the spacer portion of the left connector.

[0082] For example, in Fig. 7A, the left connector 424L includes at least one (in this case two) hole(s) 425L. The hole(s) 425L may be configured to receive a corresponding number of peg(s) presented by a corresponding connector (for example the pegs 415L discussed with regard

to Fig. 5). When the peg(s) are arranged in the hole(s) 425L (for example by inserting the peg/s into the hole/s along an engagement direction running between the outer extremity 420 of the front end piece and the outer extremity 420 of the back end piece), they may be considered to form one or more mortise and tenon joints.

[0083] Although Fig. 5-7A show the connectors 414L, 414R of the front end piece 41 as lacking recesses, and the connectors 424L, 424R of the back end piece 42 as lacking protrusions, it is also contemplated to provide one or more recesses on a given connector of the front end piece, and for a corresponding connector of the back end piece to be provided with a corresponding number of protrusions. Moreover, it is also contemplated for a given connector of the front end piece to be provided with a combination of at least one protrusion and at least one recess, and for a corresponding connector of the back end piece to be provided with a corresponding combination.

[0084] The spacer portion 426L may include a peripheral surface that is configured to contact a retainer clipped to the left connector 424L, and may include a retainer engagement feature 427L practiced on the peripheral surface. As an example, in Fig. 7A, the retainer engagement feature 427L is shown as a radial notch practiced on the peripheral surface, which extends along the spacer portion 426L, away from the outer extremity 420 of the back end piece, in a direction substantially parallel to the shaving direction.

[0085] Fig. 7B shows the front 41 and back 42 end pieces visible in Fig. 2 directly connected to each other. In such a configuration, a retainer may be able to engage with the retainer engagement feature(s) 417L, 417R of the front end piece 41 and the retainer engagement feature(s) 427L, 427R of the back end piece 42 simultaneously. The shaving direction 6 and midplane 7 are shown for reference.

[0086] When the front 41 and back 42 end pieces' connectors include retainer engagement features, directly connecting said end pieces together may cause retainer engagement features from corresponding connectors to adjoin one another. For example, the retainer engagement features of the front 41 and back 42 end pieces' respective left connectors adjoin one another, in this case forming a substantially continuous radial notch extending along the shaving direction.

[0087] Independently of whether the connectors of the front and back end pieces include retainer engagement features, when the front 41 and back 42 end pieces are directly connected together, they may form a blade positioner 43 between them. For example, directly connecting the end pieces together causes the cavities 430L, 431L on the left connectors 414L, 424L and the cavities 430R, 431R on the right connectors 414R, 424R to adjoin one another and form a receptacle on the left and a receptacle on the right of the shaving head. It is also contemplated, however to provide one or more blade positioners which are formed entirely on the front end piece

41 and/or one or more blade positioners which are formed entirely on the back end piece 42 (for example entirely on the connector/s of the front end piece 41 and/or entirely on the connector/s of the back end piece 42).

[0088] As a non-limiting example, as seen in Fig. 7B, the cavities provided on the left connectors of the front 41 and back 42 end pieces define a left slot 435L into which a left extremity of the razor blade is receivable, and the cavities provided on the right connectors of the front 41 and back 42 end pieces define a right slot 435R into which a right extremity of the razor blade is receivable.

[0089] A razor blade may be connected to a frame via the blade positioner of the frame such that the razor blade is fixed with respect thereto, or such that the razor blade is movable with respect thereto. As seen in Fig. 7B, when the razor blade is movable with respect to the frame, the blade positioner corresponding to said razor blade may include resilient elements 434L, 434R for elastically biasing the blade(s) towards a rest position within the slots. The resilient elements may be provided as so-called "spring fingers," for example. Cooperation of a given blade, slot, and one or more spring fingers may be the same as presented in WO 2007/147420, incorporated herein by reference in its entirety, including notably pages 11 and 12 of the description.

[0090] Fig. 8-11B show an exemplary shaving head 3 and details thereof, and will be described in terms of their differences with respect to the shaving head 1 and details thereof presented in Fig. 1-7B. Reference numbers common to any of Fig. 1-7B and any of Fig. 8-11B may be understood to refer to identical items.

[0091] Fig. 8 shows a view of an exemplary shaving head 3 whose frame 30 includes an exemplary interconnect portion 31. The midplane 7 is shown for reference. The interconnect portion 31 will be discussed in greater detail with regard to Fig. 9-11B.

[0092] The shaving head 3 in Fig. 8 is bigger in its shaving direction 6 than the shaving head 1 seen in Fig. 1, for example in order to accommodate a larger number of number of blade positioners for its blade set. For example, the shaving head 3 visible in Fig. 8 includes multiple (in this case four) blade positioners 32-34 between the front and back extremities of the shaving head, and four razor blades 50 in its blade set. However, it is also contemplated that a shaving head 3 whose frame 30 includes an interconnect portion 31 include as few as at least one, or as many as at least five blade positioners between its front and back extremities (or that the shaving head 3 include as few as at least one or as many as at least five razor blades 50 in its blade set).

[0093] The retainer(s) 36L, 36R (when present) of the shaving head 3 of Fig. 8 may also be longer in the shaving direction 6 than the retainer(s) 44L, 44R visible in Fig. 2, in order to extend from the front end piece 41 to the back end piece 42 of the frame 30 of the shaving head. However, it is also contemplated for the frame 30 to include multiple retainers in series (for example on each lateral

side of the frame) to extend collectively from the front end piece 41 to the back end piece 42, in which case the total length in the shaving direction 6 of such a series of multiple retainers may be longer in the shaving direction than the retainer(s) 44L, 44R visible in Fig. 2.

[0094] Fig. 9 shows an exploded view of the shaving head 3 of Fig. 8. The midplane 7 is shown for reference. The length of the interconnect portion 31, as measured in the shaving direction 6, may be understood to determine how much larger the frame 30 is in the shaving direction than the frame 4 shown in Fig. 2.

[0095] The interconnect portion 31 of the frame 30 is formed distinctly from the frame's front 41 and back 42 end pieces. When a first item is said to be "formed distinctly" from a second item, it may be understood that the first item is fabricated as being physically unconnected to the second item. If, subsequent to fabrication of the first item, the first and second items are joined or fused together, for example through bonding or welding, they nevertheless may be understood to remain as having been formed distinctly from one another.

[0096] When the front 41 and back 42 end pieces of the frame 30 are connected together, they connect to one another via the interconnect portion 31. The interconnect portion 31 is arranged between the front 41 and back 42 end pieces. The interconnect portion 31 is directly connected to each of the front 41 and back 42 end pieces. The connection between the front 41 and back 42 end pieces of the frame 30 may be understood to be indirect.

[0097] The interconnect portion 31 includes at least one segment. When an interconnect portion 31 includes multiple segments, said segments may be formed distinctly from each other.

[0098] When multiple segments are provided, at least two of the segments may be identical to one another. For example, three segments 311-313 are shown in Fig. 9, which are all identical to one another. However, it is also contemplated for an interconnect portion 31 with multiple segments to have no segments which are identical to one another, or at least one of a plurality of segments which is non-identical to the remaining segments in the plurality.

[0099] The size of shaving head 3 in its shaving direction 6 may be varied by adding and/or removing segments (possibly of differing geometries from one another) of the interconnect portion 31 of the frame 30. Similarly, adding or removing segments may allow for the number of blade positioners 32-34 provided in the frame 30 to be varied. This possibility will be discussed in greater detail with regard to Fig. 11B. As a result of one or both of these benefits, it may be possible to obtain a relatively large variety of frames and/or shaving heads from a relatively small number of unique components therefor. Consequently, it may be possible to fabricate a relatively large variety frames and/or shaving heads from a relatively small number of dedicated manufacturing systems.

[0100] As a non-limiting example, each interconnect

portion 31 (or segment 311-313 thereof) may be made from a material containing ABS (acrylonitrile butadiene styrene), MABS (methylmethacrylate acrylonitrile butadiene styrene), PP (polypropylene), PPO (polyphenyl oxide), PPE (polyphenyl ether), and/or PS (polystyrene). Each interconnect portion 31 (or segment 311-313 thereof) may be made of the same material as one or more of the front 41 and back 42 end pieces, or of a different material from the front and back end pieces, for example.

[0101] Each segment 311-313 of the interconnect portion 31 may include one or more pieces. For example, in Fig. 9, each segment 311-313 of the interconnect portion 31 includes a left piece 314L and a right piece 314R, for connecting respectively to the left 414L, 424L and right 414R, 424R connectors of the front 41 and back 42 end pieces. The left 314L and right 314R pieces of the segments 311-313 may be mirror images of each other. The left 314L and right 314R pieces of a given segment may be formed distinctly from one another. Moreover, it is contemplated that left 314L and right 314R pieces of a given segment be connectable to each other only indirectly, for example via the front 41 and/or back 42 end piece(s) of the frame 30, and/or via the razor blade(s) of the shaving head 3.

[0102] Each segment 311-313 (or piece thereof) includes a front connector and a back connector. When a given segment includes multiple pieces, each piece of the segment may include front and back connectors. For example, in Fig. 9, each left piece 314L of each segment 311-313 includes front and back connectors, and each right piece 314R of each segment includes front and back connectors. The front and back connectors of left pieces 314L may be known respectively as left front connectors and left back connectors; those of right pieces 314R may be known respectively as right front and back connectors.

[0103] The retainer(s) 36L, 36R (when present) can be seen to be clippable around the interconnect connectors of the front 41 and back 42 end pieces, and/or around the left and right pieces of the interconnect portion 31.

[0104] Fig. 10 shows an exemplary left front connector 315L of an interconnect portion. Although the left front connector 315L is shown in Fig. 10 as being borne on an exemplary left piece 314L of an exemplary segment of the interconnect portion 31 seen in Fig. 9, it may be understood that the left front connector 315L is suitable for use in an interconnect portion with any number of segments.

[0105] Comparison of Fig. 10 & 7A reveals that the left front connector 315L may have the same shape as the left connector 424L of the back end piece 42 seen in Fig. 6. For example, the left front connector 315L seen in Fig. 10 has identical holes 425L to the left connector 424L visible in Fig. 7A of the back end piece 42 visible in Fig. 6. The holes 425L of the left front connector 315L visible in Fig. 10 may be configured to receive the pegs 415L of the left connector 414L of the front end piece visible in Fig. 5. The left front connector 315L may be directly connectable to the front end piece 41 visible in Fig. 4. The

left front connector 315L can be said to correspond with the left connector 414L of the front end piece 41 visible in Fig. 4.

[0106] Also independently of the number of segments provided in a given interconnect portion, when a segment is directly connected to the front end piece, the front end piece and said segment may form a blade positioner between them. This possibility will be discussed in greater detail with regard to Fig. 11B.

[0107] The left piece 314L may include a cavity 431L that is arranged towards the left front connector 315L. Comparison of Fig. 10 & 7A reveals that the cavity 431L that is arranged towards the left front connector 315L may have the same geometry as the cavity 431L of the left connector 424L of the back end piece 42 seen in Fig. 6. When the left front connector 315L is directly connected to the left connector 414L of the front end piece 41 seen in Fig. 4, the cavity on the left connector 414L of the front end piece 41 and the cavity of the left front connector 315L may adjoin one another and form a receptacle.

[0108] The segment may include at least one resilient element. For example, the left piece 314L visible in Fig. 10 includes a resilient element 434L. The direction in which the cantilever extends will be discussed in greater detail with regard to Fig. 11B.

[0109] At least one segment may include one or more retainer engagement features. For example, the left piece 314L visible in Fig. 10 can be seen to include a retainer engagement feature 318L that is similar to the retainer engagement features 417L, 427L seen on the front and back end pieces in Fig. 5 & 7A - a radial notch practiced in a peripheral surface of the left piece 314L, extending parallel to the shaving direction 6.

[0110] Fig. 11A shows an exemplary back connector of an interconnect portion, in this case an exemplary left back connector 316L as borne on the left piece 314L visible in Fig. 10. The shaving direction 6 is shown for reference. Comparison of Fig. 11A & 5 reveals that the left back connector 316L may have the same shape as the left connector 414L of the front end piece 41 visible in Fig. 4. The pegs 415L of the left back connector 316L visible in Fig. 11A may be receivable in the holes 425L visible in Fig. 7A of the left connector 424L of the back end piece 42 visible in Fig. 6. The left back connector 316L may be directly connectable to the back end piece 42 visible in Fig. 6. The left back connector 316L can be said to correspond with the left connector 424L of the back end piece 42 visible in Fig. 6.

[0111] Additionally or alternatively, as revealed by comparison of Fig. 10 & 11A, the front connector(s) of one segment (or piece thereof) may be directly connectable to the back connector(s) of another segment (or piece thereof). As explained with regard to Figures 5-7A, it is contemplated to swap and/or combine the connecting features of the front connector(s) with those of the back connector(s), so as to preserve correspondence of the front connector(s) to the connector(s) of the front end

piece and correspondence of the back connector(s) to the connector(s) of the back end piece, should the connecting features of the connectors of the front and back end pieces be swapped and/or combined with one another.

[0112] When two segments are directly connected to one another, they may form a blade positioner between them. This possibility will be discussed in greater detail with regard to Fig. 11B.

[0113] The left piece 314L of the segment may include a cavity 430L that is arranged towards the left back connector 316L. Comparison of Fig. 11A & 5 reveals that the cavity 430L that is arranged towards the left back connector 316L may have the same geometry as the cavity 430L of the left connector 414L of the front end piece 41 visible in Fig. 4. When the left back connector 316L is directly connected to the left connector of the back end piece, the cavity on the left connector of the back end piece and the cavity of the left back connector of the left piece 314L may adjoin one another and form a receptacle.

[0114] Fig. 11B shows a view of connectors of the frame 30 visible in Fig. 8, when the front 41 and back 42 end pieces are connected to one another by each being directly connected to the interconnect portion 31. The midplane 7 is shown for reference.

[0115] The front end piece 41 is directly connected to a first segment 311 of the interconnect portion 31, the back end piece 42 is directly connected to a second segment 312 of the interconnect portion, and a third segment 313 of the interconnect portion is connected directly to the first 311 and second 312 segments.

[0116] When the front end piece 41 and a segment of an interconnect portion 31 are directly connected to one another, they may form a blade positioner 32 between them. In contrast with the blade positioner 43 visible in Fig. 7B, the blade positioner 32 (visible in Fig. 11B) formed between the front end piece 41 and the interconnect portion 31 may be partially formed on the interconnect portion, instead of being partially formed on the (connector/s 424L, 424R of) the back end piece 42.

[0117] For example, the blade positioner 32 may be provided on regions of the connector(s) of the front end piece 41 and regions of front connector(s) of the interconnect portion 31 that adjoin each other when the front end piece 41 and the interconnect portion are directly connected to each other. For example, the blade positioner 32 may be provided when the cavities 430L, 430R, on the connectors 414L, 414R of the front end piece 41 adjoin the cavities 431L, 431R provided on the front connectors of the first segment 311 of the interconnect portion 31.

[0118] When the back end piece 42 and a segment of an interconnect portion 31 are directly connected to one another, they may form a blade positioner 33 between them. In contrast with the blade positioner 43 visible in Fig. 7B, the blade positioner 33 (visible in Fig. 11B) formed between the back end piece 42 and the intercon-

nect portion 31 may be partially formed on the interconnect portion, instead of being partially formed on the (connector/s 414L, 414R of) the front end piece 41.

[0119] For example, the blade positioner 33 may be provided on regions of the connector(s) of the back end piece 42 and the back connector(s) of the interconnect portion 31 that adjoin each other when the back end piece 42 and the interconnect portion 31 are directly connected to each other. For example, the blade positioner 33 may be provided when the cavities 431L, 431R on the connectors 424L, 424R of the back end piece 42 adjoin the cavities 430L, 430R provided on the back connectors of the second segment 312 of the interconnect portion 31.

[0120] When the interconnect portion 31 includes multiple segments 311-313 which are directly connected to each other, they may form a blade positioner 34 between them. In contrast with the blade positioner 43 visible in Fig. 7B, the blade positioner 34 (visible in Fig. 11B) is partially formed between two segments which are directly connected to one another, instead of partially formed on the connectors 414L, 414R, 424L, 424R of the front 41 and back 42 end pieces.

[0121] For example, the blade positioner 34 may, as seen in Fig. 10 & 11A, be provided on regions of the front and back connectors of the respective segments that adjoin each other when said front and back connectors are directly connected to each other. For example, the blade positioner 34 may be provided when the cavities 431L, 431R on the front connectors of one segment (for example the third segment 313 seen in Fig. 11B) adjoin the cavities 430L, 430R on the back connectors of another segment to which it is directly connected (for example the first segment 311 seen in Fig. 11B). In Fig. 11B, such a blade positioner 34 is also formed between the back connectors of the third segment 313 and the front connectors of the second segment 312.

[0122] Resilient elements 434L, 434R, can be seen to be provided for each of the blade positioners 32-34, and to extend laterally inwardly therefrom. When the front and back end pieces are in contact with the skin during shaving, the resilient elements 434L, 434R extend towards the skin from the blade positioners 32-34.

[0123] When the interconnect portion 31 includes one or more retainer engagement features 318L, 318R, these may be provided on at least one, or even all of the segments 311-313 of the interconnect portion. When multiple segments 311-313 include retainer engagement features 318L, 318R, the retainer may be configured to engage these segments' retainer engagement features simultaneously with one another.

[0124] When the front 41 and/or back 42 end pieces include one or more retainer engagement features 417L, 417R, 427L, 427R, directly connecting the interconnect portion 31 to the(se) end piece(s) may cause their respective retainer engagement features 417L, 417R, 427L, 427R, 318L 318R to align such that the retainer may engage them all simultaneously.

[0125] Fig. 12A-12B show an exemplary left piece

310L of an exemplary segment of an exemplary interconnect portion, which is an alternative variant of the left piece 314L visible in Fig. 10-11A. As such, the content of Fig. 12A-12B will be described in terms of their differences with respect to the left piece 314L visible in Fig. 10-11A. Reference numbers common to any of Fig. 12A-12B and any of Fig. 1-11B may be understood to refer to identical components.

[0126] The left piece 310L may be used with an analogous right piece (which may be referred to as "right piece 310R") to form a segment whose left and right pieces are mirror images of one another. The left piece 310L visible in Fig. 12A may be bigger in the shaving direction 6 than the left piece 314L visible in Fig. 10-11A.

[0127] Although such a segment may be used as an alternative to a segment as described with regard to Fig. 9-11B, it is also contemplated to use such a segment in combination with a segment as described with regard to Fig. 9-11B, such that two segments of the interconnect portion have different lengths from one another, as measured along the shaving direction 6.

[0128] It is also contemplated, however, to use the left piece 310L seen in Fig. 12A-12B in combination with a right piece 314R (which may be seen in Fig. 9), and/or to use the right piece 310R (which is a mirror image of the left piece 310L seen Fig. 12A-12B) in combination with the left piece 314L of Fig. 10-11A, to obtain segments which are uneven in length. By alternating segments of uneven length, it may be possible obtain an interconnect portion whose segments are staggered, for example.

[0129] Fig. 12A shows the left piece 310L, with its left back connector 316L visible. The shaving direction 6 is shown for reference.

[0130] In contrast with segment whose left piece 314L is visible in Fig. 10-11A, the segment whose piece 310L is visible Fig. 12A includes at least one receptacle 432L formed entirely thereon. The receptacle 432L defines a left slot 433L that is formed entirely on the left piece 310L. The left slot 433L may be identical in geometry to the left slot(s) 435L described with regard to Fig. 7B, but the left slot 433L visible in Fig. 12A may differ therefrom insofar as it is practiced in a single distinctly formed piece rather, than in multiple distinctly formed pieces as with the slot 435L. The left slot 433L may be used in combination with a right slot to hold respective extremities of a razor blade as a blade positioner. When the right slot is, like the left slot 433L formed entirely on a single distinctly formed (right) piece of an interconnect portion segment, the blade positioner may be considered to be supported entirely on the interconnect portion segment.

[0131] Although Fig. 12A shows two such receptacles 432L defining two such left slots 433L, it is also contemplated to provide as few as one receptacle to define one left slot 433L, or more than two receptacles to define more than two left slots 433L.

[0132] At least one (in this case each left) slot 433L may be associated with a resilient element 434L. When a cavity 430L is also provided that is arranged towards

the back connector, a resilient element may also be provided therewith.

[0133] Fig. 12B shows the left piece 310L of Fig. 12A with its left front connector 315L, and optional cavity 431L oriented theretowards, visible.

[0134] When the interconnect portion includes one or more retainer engagement features, the left piece 310L may include a retainer engagement feature 317L which extends along the entire length of the left piece (in the shaving direction 6). The geometry of the retainer engagement feature 317L, as taken perpendicular to the shaving direction 6, may be identical to that of the retainer engagement feature 318L described with regard to Fig. 10.

[0135] Fig. 13-19 show an exemplary shaving head 9 and details thereof. Reference numbers common to any of Fig. 1-12B and any of Fig. 13-19 may be understood to refer to identical components.

[0136] Fig. 13 shows an exploded view of the shaving head 9. The shaving direction 6 and midplane 7 are shown for reference. Except as regards its frame 90, the shaving head 9 of Fig. 13 may be identical to the shaving head 3 visible in Fig. 8-9.

[0137] The frame 90 visible in Fig. 13 includes a front end piece 92 and a back end piece 93 which, respectively, may be identical to the front 41 and back 42 end pieces visible in Fig. 8-9, except as regards their respective connectors 920L, 920R, 930L, 930R.

[0138] As with the front 41 and back 42 end pieces visible in Fig. 8, it is contemplated that the front 92 and back 93 end pieces visible in Fig. 13 may be directly connectable to one another. This possibility will be discussed in greater detail with regard to Fig. 15. In Fig. 13 however, the front 92 and back 93 end pieces are shown as being connectable to each other indirectly, by way of an interconnect portion 91 directly connected to the front 92 and back 93 end pieces so as to be arranged between the outer extremities 410, 420 of the front and back end pieces when the front and back end pieces are connected together.

[0139] The interconnect portion 91 seen in Fig. 13 may be identical to the interconnect portion 31 visible in Fig. 8-9, except as regards its front and back connectors. The front and back connectors will be described in greater detail with regard to Fig. 15-19.

[0140] Although the interconnect portion 91 visible in Fig. 13 is shown to include three segments 911-913 (each including a left piece 914L and a right piece 914R), it is also contemplated to provide as few as one segment or two segments, or as many as at least four segments.

[0141] The frame 90 of Fig. 13 may include one or more retainers 94L, 94R (possibly in series) between the front 92 and back 93 end pieces. Although they may be identical in form to one or more of the retainers 44L, 44R, 36L, 36R described with respect to Fig. 1-12B, they may have a different effect when present in combination with the connectors of the end pieces and interconnect portion 91 present in the frame 90 of Fig. 13.

[0142] Fig. 14 shows an enlarged partial view of the frame 90 visible in Fig. 13, with left pieces 914L of the interconnect portion visible. Surfaces of the front 92 and back 93 end pieces which are arranged towards skin during shaving are arranged away from the viewer. The shaving direction 6 is shown for reference.

[0143] In a manner similar to Fig. 11B, in Fig. 14, the left connector 920L of the front end piece 92 can be seen to be directly connected to a left piece 914L of a first segment 911 of the interconnect portion (forming a blade positioner 32 therebetween), the left connector 930L of the back end piece 93 is directly connected to a second segment 912 of the interconnect portion (forming a blade positioner 33 therebetween), and a third segment 913 of the interconnect portion is directly connected to the first 911 and second 912 segments (forming a blade positioner 34 therebetween with each). However, in contrast with Fig. 1-7B, in Fig. 13, directly connecting two corresponding connectors together forms a dovetail joint instead of a mortise and tenon joint.

[0144] Fig. 15 shows an exploded view of the contents of Fig. 14. The shaving direction 6 is shown for reference.

[0145] Because corresponding connectors form a dovetail joint, the engagement direction for directly connecting them together runs oblique or perpendicular to corresponding protrusions and recesses of the connectors. For example, in Fig. 15, the left connector 930L of the back end piece 93 includes a protrusion which is arranged to extend towards the front end piece 92, but the engagement direction of the protrusion within its corresponding recess is oblique or perpendicular to an axis running between the outer extremity 410 of the front end piece 92 and an outer extremity 420 of the back end piece 93. With such a configuration, the retainer(s) (when present) may prevent movement of a given protrusion with respect to a recess in which it is received in a direction opposite to the engagement direction (see for example Fig. 13, where the retainers can be seen to be configured to overlay the protrusion/s and recess/es when clipped to the interconnect portion).

[0146] As such, it may be understood that the various connectors of the frame 90 visible in Fig. 13 may be identical to the various connectors 414L, 414R, 424L, 424R, 315L, 315R, 316L, 316R of the frame 30 visible in Fig. 9, except as regards their protrusions and recesses. Accordingly, although Fig. 13-15 show the connectors 920L, 920R of the front end piece 92 as lacking protrusions, and the connectors 930L, 930R of the back end piece 93 as lacking recesses, it is also contemplated to provide one or more protrusions on a given connector 920L, 920R of the front end piece 92, and for a corresponding connector 930L, 930R of the back end piece 93 to be provided with a corresponding number of recesses. Moreover, it is also contemplated for a given connector 920L, 920R of the front end piece 92 to be provided with a combination of at least one protrusion and at least one recess, and for a corresponding connector 930L, 930R of the back end piece 93 to be provided with a corre-

sponding combination.

[0147] As with the frame 30 visible in Fig. 9, in the frame 90 visible in Fig. 13, the engagement direction for directly connecting a back connector of the interconnect portion 91 to a connector of the back end piece 93 (for example the left back connector 916L of the interconnect portion to the left connector 930L of the back end piece 93) may be identical to the engagement direction for directly connecting a connector of the front end piece 92 to a front connector of the interconnect portion 91 (for example the left connector 920L of the front end piece 92 to the left front connector 915L of the interconnect portion). However, it may be understood that the engagement directions for the frame 30 visible in Fig. 9 are oblique or perpendicular to the engagement directions for the frame 90 visible in Fig. 13.

[0148] Fig. 16A shows an enlarged view of an exemplary front end piece 92 visible in Fig. 13, with surfaces that are arranged away from skin during shaving visible to the viewer. The shaving direction 6 and midplane 7 are shown for reference.

[0149] A pocket 921L, 921R (a type of recess) is visible on each connector 920L, 920R of the front end piece 92. Each pocket 921L, 921R is provided on a peripheral surface of the connector 920L, 920R, and extends in a direction towards the outer extremity 410 of the front end piece 92 from an extremity 922L, 922R of the connector 920L, 920R which is remote from the outer extremity 410 of the front end piece 92. Such a direction may be called an "extension direction" of the pocket 921L, 921R. As such, a corresponding boss from a corresponding connector may be insertable therein along an engagement direction which is oblique or perpendicular to the peripheral surface in a vicinity of the pocket 921L, 921R.

[0150] Fig. 16B shows an enlarged view the left connector 920L visible in Fig. 16A. The shaving direction 6 is shown for reference.

[0151] The pocket 921L is provided as a groove in the peripheral surface of the connector and extends towards the outer extremity 410 of the front end piece from the extremity 922L of the connector which is remote therefrom. Nearest said extremity 922L of the connector, the groove includes a relatively small section 923L. At a location on the connector which is nearer to the outer extremity 410 of the front end piece than the relatively small section 923L, the groove includes a relatively large section 924L. The relatively large section 924L of the groove differs from the relatively small section 923L of the groove in that it is larger than the relatively small section 923L of the groove in a direction perpendicular to the extension direction of the pocket 921L. Such an arrangement may reduce or prevent movement of a correspondingly-shaped boss received in the groove relative to said groove in a direction opposite the extension direction of the pocket 921L.

[0152] The pocket 921L may have a substantially uniform cross-section, as taken along the engagement direction of the connector. As can be seen in Fig. 16B,

however, such uniformity does not necessarily preclude the presence of at least one rounded edge and/or rounded corner of the pocket.

[0153] Alternatively, the groove may have a (substantially) constant or variable taper along the engagement direction of the connector. It may be understood that neither kind of taper necessarily precludes the presence of at least one rounded edge and/or rounded corner of the pocket 921L.

[0154] Fig. 17A shows an enlarged view of the back end piece 93 visible in Fig. 13, with surfaces that are arranged towards skin during shaving visible to the viewer. The shaving direction 6 and midplane 7 are shown for reference.

[0155] A boss 931L, 931R (a type of protrusion) is visible on each connector 930L, 930R of the back end piece 93. Each boss 931L, 931R is provided on an extremity 932L, 932R of the connector 930L, 930R which is remote from the outer extremity 420 of the back end piece 93. Each boss 931L, 931R extends in a direction away from the outer extremity 420 of the back end piece 93. Such a direction may be called an "extension direction" of the boss 931L, 931R. Each boss 931L, 931R is located in a vicinity of a peripheral surface of its respective connector 930L, 930R.

[0156] Fig. 17B shows an enlarged view of an exemplary connector (in this case the left connector 930L) of the back end piece 93 visible in Fig. 17A. The shaving direction 6 is shown for reference.

[0157] The boss 931L is provided as an extension of the peripheral surface of the connector, and extends from the extremity 932L of the connector, which is remote from the outer extremity 420 of the back end piece, in a direction away from the outer extremity. Nearest the outer extremity 420 of the back end piece, the extension includes a relatively small section 933L. At a location farther from the outer extremity 420 of the back end piece than the relatively small section 933L, the extension includes a relatively large section 934L. The relatively large section 934L of the extension differs from the relatively small section 933L of the extension in that it is larger than the relatively small section 933L of the extension in a direction perpendicular to the extension direction of the boss 931L. Such an arrangement may reduce or prevent movement of a correspondingly-shaped pocket (for example the pocket 921L seen in Fig. 16B), in which the boss 931L is received, relative to said boss in the extension direction of the boss.

[0158] Fig. 18 shows an enlarged view of exemplary front and back connectors (in this case left front 915L and left back 916L connectors, as borne on an exemplary left piece 914L of an exemplary segment) of the interconnect portion visible in Fig. 14. Surfaces of the left piece 914L that are arranged away from skin during shaving are visible to the viewer. The shaving direction 6 is shown for reference.

[0159] Comparison of Fig. 18 & 16B reveals that the left back connector 916L may have the same shape as

the left connector 920L of the front end piece 92 seen in Fig. 16A. Accordingly, the boss 931L visible in Fig. 17B of the left connector 930L of the back end piece 93 visible in Fig. 17A may be receivable in the pocket 921L of the left back connector 916 visible in Fig. 18. The pocket 921L is provided in the peripheral surface of the left back connector 916L.

[0160] The left front connector 915L includes a boss 931L provided as an extension of a peripheral surface of the left front connector.

[0161] Fig. 19 shows an enlarged view of the left front connector 915L of Fig. 18, with surfaces of the left piece 914L that are arranged towards skin during shaving visible to the viewer and the left back connector 916L seen in Fig. 18 arranged away from the viewer. The shaving direction 6 is shown for reference.

[0162] Comparison of Fig. 19 & 17B reveals that the left front connector 915L may have the same shape as the left connector 930L of the back end piece 93 seen in Fig. 17A. Accordingly, the boss 931L provided on the left front connector 915L may be receivable in the pocket 921L visible in Fig. 16B of the left connector 920L of the front end piece 92 visible in Fig. 16A.

[0163] Fig. 20 shows a process flow diagram for an exemplary method of assembling a frame.

[0164] The method S100 may include providing S10 the front end piece, providing S20 the back end piece, and assembling S40 the front and back end pieces together to arrange a blade positioner between the front and back end pieces' outer extremities.

[0165] When the frame is to include an interconnect portion, the method S100 may also include providing S30 the interconnect portion. When the interconnect portion is to include multiple segments, providing S30 the interconnect portion may include providing S31 at least a first segment and providing S32 at least a second segment and directly connecting S33 the first and second segments together.

[0166] Assembling S40 the front and back end pieces together may include directly connecting S41 a first of the front and back end pieces to the interconnect portion, and directly connecting S42 the interconnect portion, with the first of the front and back end pieces connected thereto, to the second of the front and back end pieces. Alternatively, assembling the front and back end pieces together may include directly connecting S43 the interconnect portion to the front and end pieces together simultaneously.

[0167] Regardless of whether the front and back end pieces are connected to the interconnect portion sequentially or simultaneously, an engagement direction for connecting the front end piece to the interconnect portion may be identical to an engagement direction for connecting the interconnect portion to the back end piece. For example, in the case of the frame 90 seen in Fig. 13, moving the back end piece 93 towards its surfaces that are arranged towards skin during shaving causes it to engage the interconnect portion 91, and moving the in-

terconnect portion 91 towards its surfaces that are arranged towards skin during shaving causes it to engage the front end piece 92. Similarly, in the case of the frame 30 seen in Fig. 9, moving the back end piece 42 towards the front end piece 41 causes it to engage the interconnect portion 31, and moving the interconnect portion 31 towards the front end piece 41 causes it to engage the front end piece 41.

[0168] An engagement direction for connecting S33 first and second segments together may be identical to the engagement direction for connecting the interconnect portion to the first end piece and/or identical to the engagement direction for connecting the second end piece to the interconnect portion. For example, in the case of the frame 90 seen in Fig. 13, moving the back end piece 93 towards its surfaces that are arranged towards skin during shaving causes it to engage the second segment 912 of the interconnect portion 91, and moving the second segment 912 of the interconnect portion 91 towards its surfaces that are arranged towards skin during shaving causes it to engage the third segment 913 of the interconnect portion. Similarly, in the case of the frame 30 seen in Fig. 9, moving the back end piece 42 towards the front end piece 41 causes it to engage the second segment 312 of the interconnect portion 31, and moving the second segment 312 of the interconnect portion 31 towards the front end piece 41 causes it to engage the third segment 313 of the interconnect portion.

[0169] Subsequent to assembling S40 the front and back end pieces together, the process S100 may include a step of permanently joining S50 the front and back end pieces together. When the frame includes an interconnect portion, this may be performed by permanently joining the interconnect portion to each of the front and back end pieces. When the interconnect portion includes multiple segments, said multiple segments may undergo permanent joining to each other. Permanent joining of two distinctly formed components to one another may be performed through bonding, for example through gluing, and/or through welding, for example ultrasonic welding.

[0170] Although the described embodiments were provided as different exemplary embodiments, it is envisioned that these embodiments are combinable or, when not conflicting, the features recited in the described embodiments may be interchangeable. Moreover, the features recited in the described embodiments are not inextricably linked to one another, unless such a linkage is clearly indicated between two given features.

[0171] Throughout the description, including the claims, the term "comprising a" should be understood as being synonymous with "comprising at least one" unless otherwise stated. In addition, any range set forth herein, including the claims should be understood as including its end value(s) unless otherwise stated. Specific values for described elements should be understood to be within accepted manufacturing or industry tolerances known to one of skill in the art, and any use of the terms "substantially" and/or "approximately" and/or "generally" should

be understood to mean falling within such accepted tolerances.

[0172] Although the present disclosure herein has been described with reference to particular embodiments, it is to be understood that these embodiments are merely illustrative of the principles and applications of the present disclosure.

[0173] It is intended that the specification and examples be considered as exemplary only, with a true scope of the disclosure being indicated by the following claims.

Claims

1. A frame (4, 30, 90) for a shaving head (1, 3, 9), comprising a first end piece (41, 92), a second end piece (42, 93), and a first blade positioner (32, 43), the first and second end pieces being connectable to each other, via a connector (414L/R) of the first end piece and a connector (424L/R) of the second end piece, such that an outer extremity (410) of the first end piece and an outer extremity (420) of the second end piece are arranged away from each other, the first blade positioner being located between said outer extremities when the first and second end pieces are connected to each other.
2. The frame (4, 30, 90) of claim 1, comprising one or more second blade positioners (33, 34) located between the outer extremity (410) of the first end piece (41, 92) and the outer extremity (420) of the second end piece (42, 93) when the first and second end pieces are connected to each other.
3. The frame (4, 30, 90) of any of claims 1-2, the connector (414L/R) of the first end piece (41, 92) being directly connectable to the connector (424L/R) of the second end piece (42, 93).
4. The frame (30, 90) of any of claims 1-3, comprising an interconnect portion (31, 91) directly connectable to the first (41, 92) and second (42, 93) end pieces such that the interconnect portion is between the outer extremity (410) of the first end piece and the outer extremity (420) of the second end piece when the first and second end pieces are connected to each other.
5. The frame (30, 90) of claim 4, the interconnect portion (31, 91) comprising two or more segments (311-313, 911-913) which are directly connectable to each other, a first (311, 911) and a second (312, 912) of the two or more segments being respectively directly connectable to the first (41, 92) and second (42, 93) end pieces such that the first and second segments are between the outer extremity (410) of the first end piece and the outer extremity (420) of the second end piece when the first and second end pieces are connected to each other.
6. The frame (30, 90) of claim 5, each segment (311-313, 911-913) of the interconnect portion (31, 91) comprising a first connector (315L/R, 915L/R) and a second connector (316L/R, 916L/R), wherein the first connector is directly connectable to the first end piece (41, 92), and/or wherein the second connector is directly connectable to the second end piece (42, 93).
7. The frame (30, 90) of claim 6, wherein the first connector (315L/R, 915L/R) is directly connectable to the connector (414L/R, 920L/R) of the first end piece (41, 92) and/or wherein the second connector (316L/R, 916L/R) is directly connectable to the connector (424L/R, 930L/R) of the second end piece (42, 93).
8. The frame (30, 90) of any of claims 4-7, at least one blade positioner (32-34) of the frame being at least partially formed on the interconnect portion (31, 91).
9. The frame (30, 90) of claim 2 in combination with any of claims 1-8, at least one of the first blade positioner (32, 43) and the one or more second blade positioners (33, 34) being at least partially formed on the first end piece (41, 92) and/or at least partially formed on the second end piece (42, 93).
10. The frame (4, 30, 90) of any of claims 1-9, comprising a retainer (36L/R, 44L/R, 94L/R) between the first (41, 92) and second (42, 93) end pieces of the frame.
11. A shaving head (1, 3, 9) comprising a frame (4, 30, 90) according to any of claims 1-10 and one or more razor blades (50) arranged in the one or more blade positioners (32-34, 43) thereof.
12. A shaver (0) comprising a shaving head (1, 3, 9) according to claim 11 and a manipulation portion.
13. A method (S100) of fabricating a frame (4, 30, 90) according to any of claims 1-10, comprising providing (S10) a first end piece (41, 92), providing (S20) a second end piece (42, 93), and assembling (S40) the first and second end pieces together to arrange a first blade positioner (32-34, 43) between outer extremities (410, 420) of the first and second end pieces.
14. The method (S100) of claim 13, comprising providing (S30) an interconnect portion (31, 91), and wherein assembling (S40) the first and second end pieces together includes connecting (S41) the first end piece (41, 92) to the interconnect portion and connecting (S42) the interconnect portion to the second end piece (42, 93).

15. The method (S100) of claim 14, wherein an engagement direction for connecting (S41) the first end piece (41, 92) to the interconnect portion (31, 91) is identical to an engagement direction for connecting (S42) the interconnect portion to the second end piece (42, 93). 5

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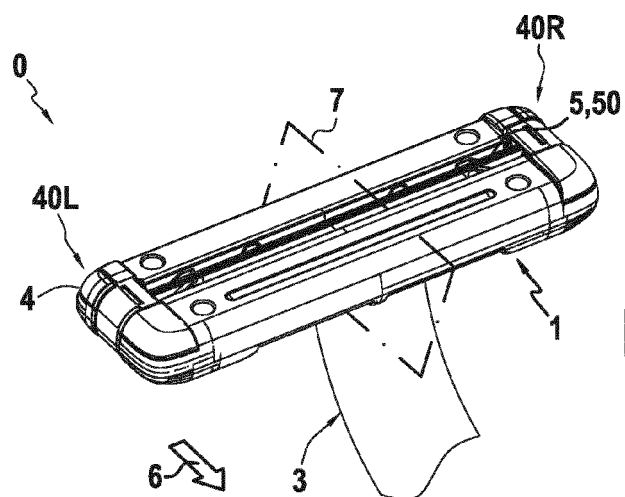


FIG.1

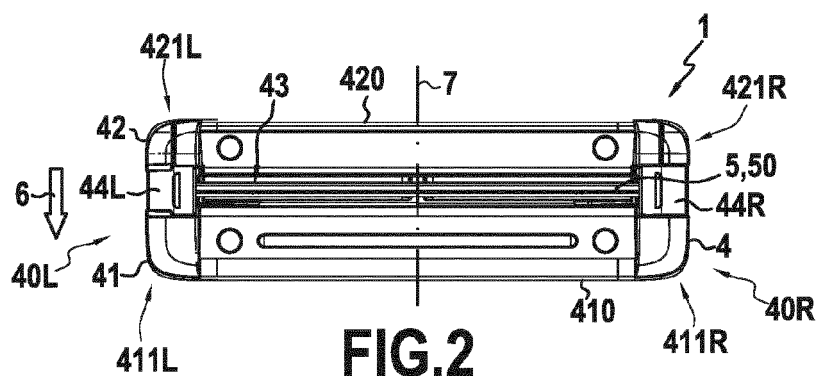


FIG.2

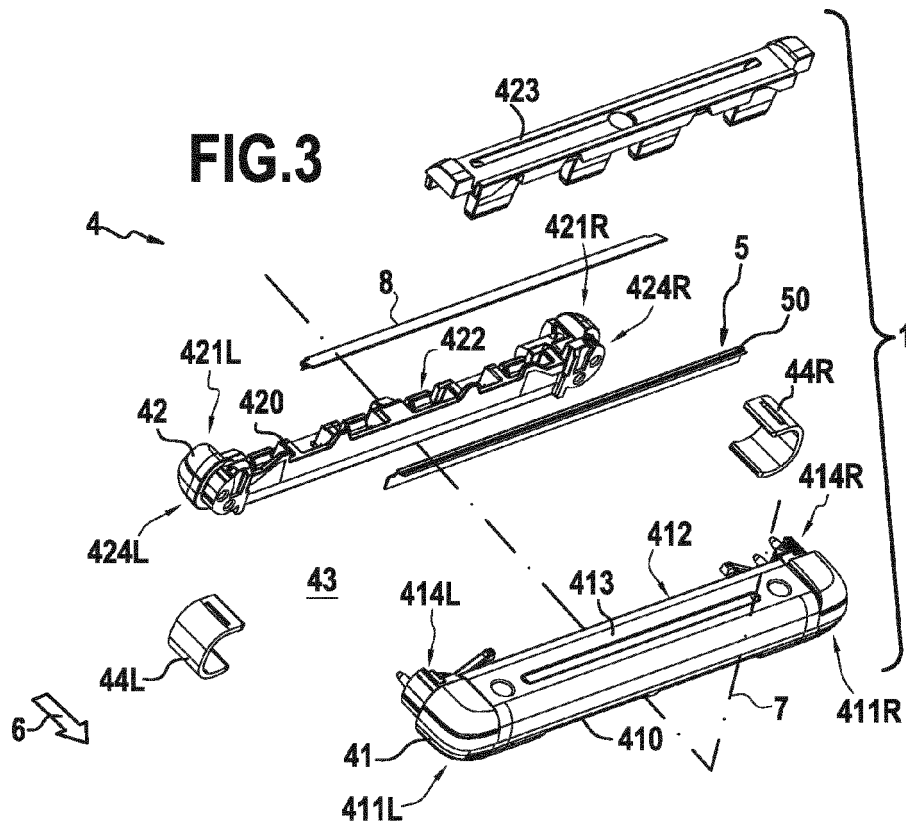
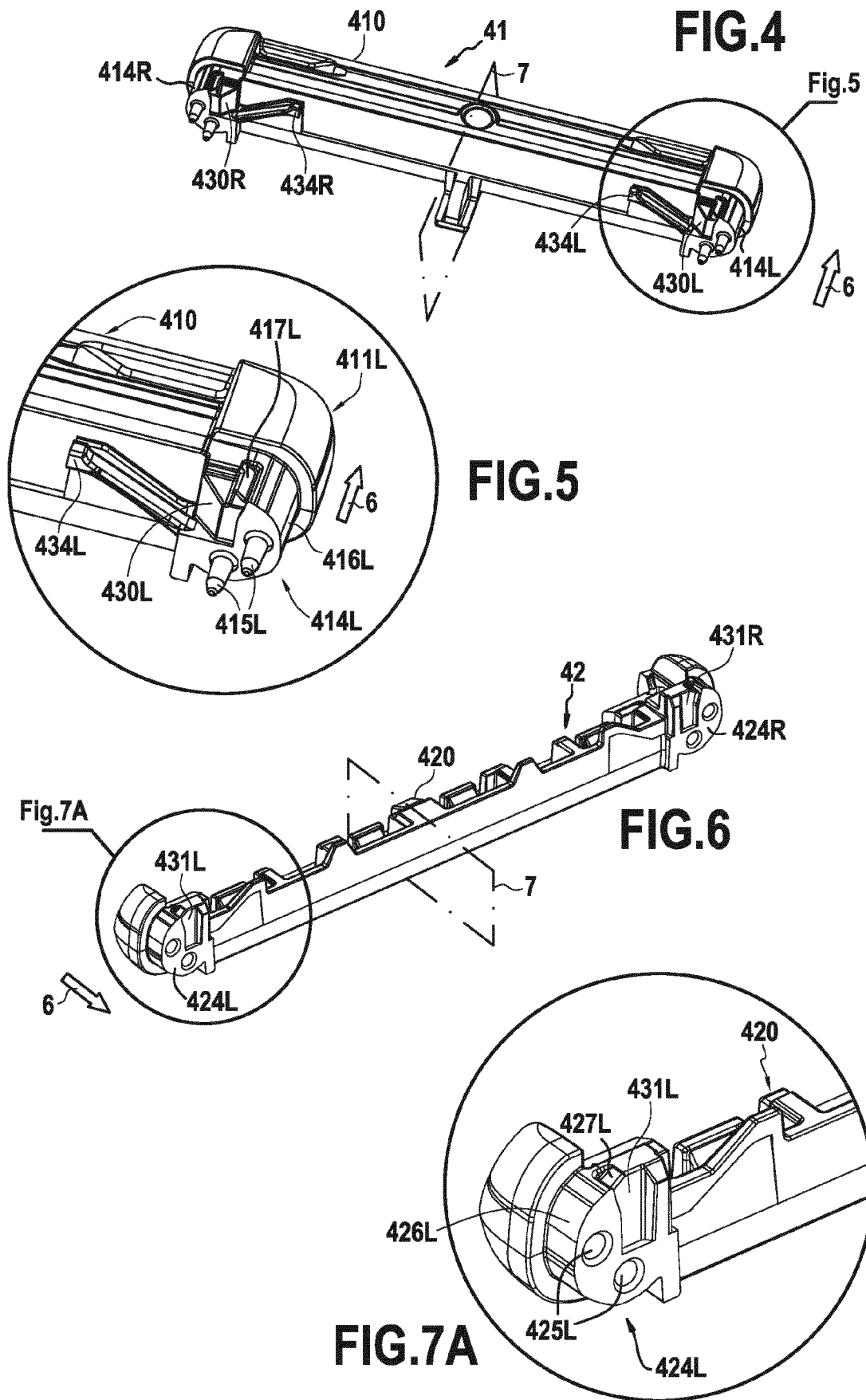


FIG.3



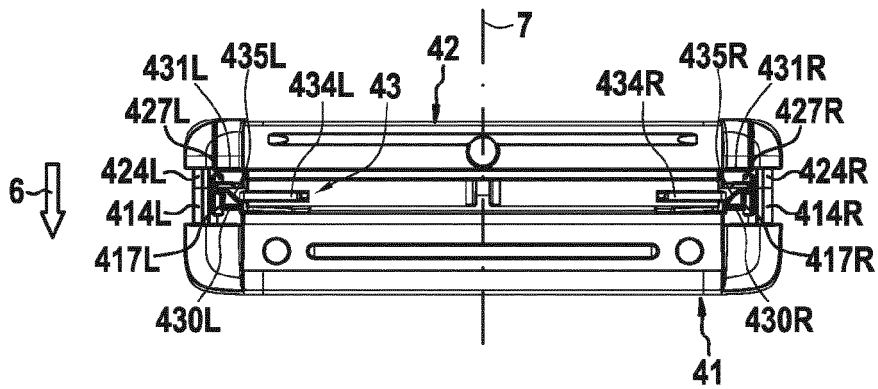


FIG. 7B

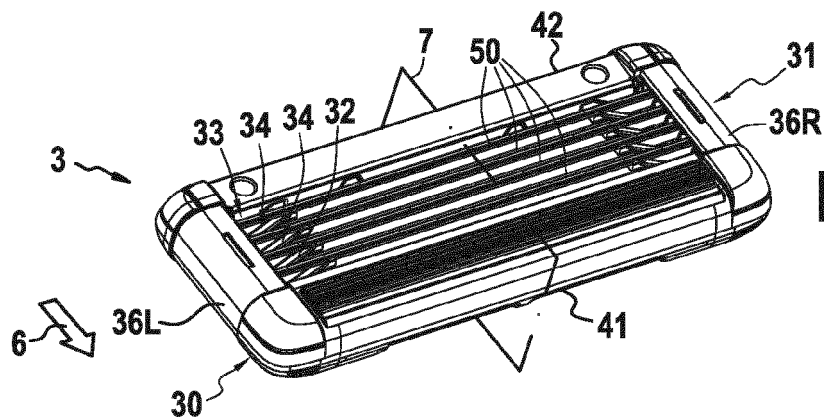


FIG. 8

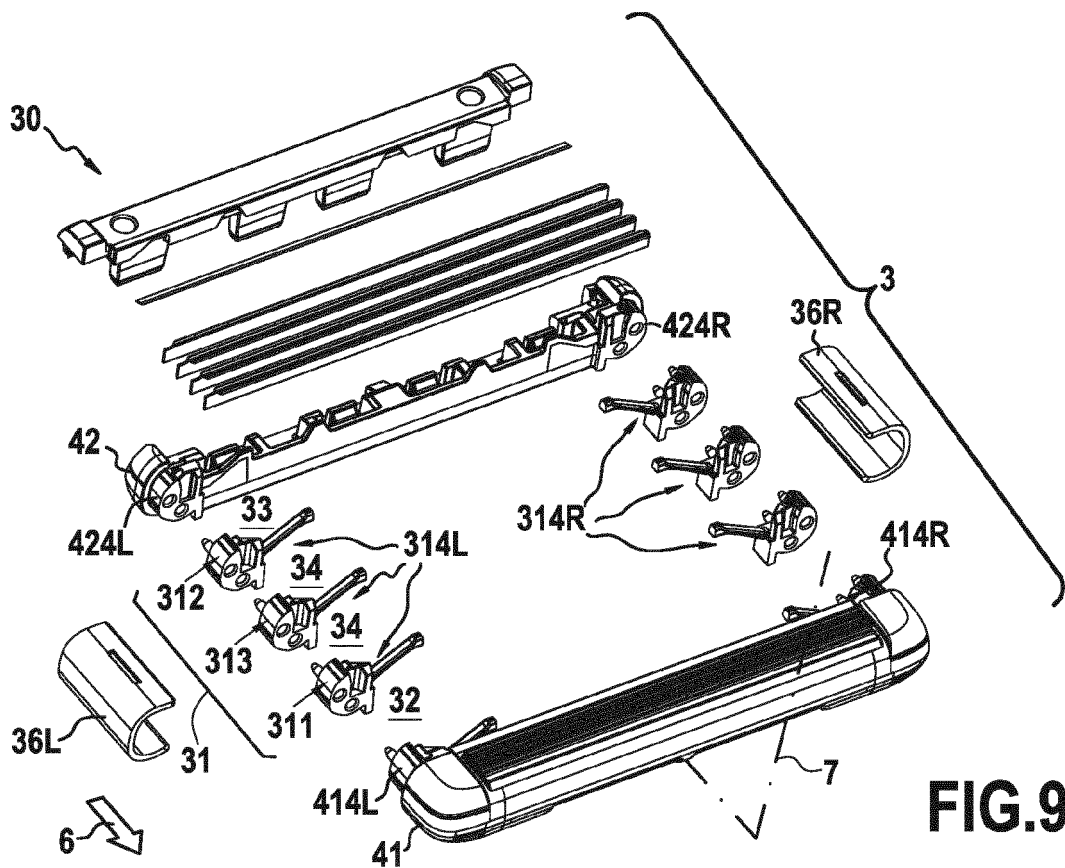
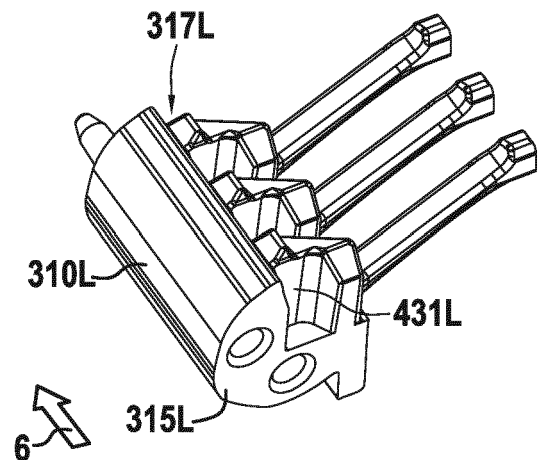
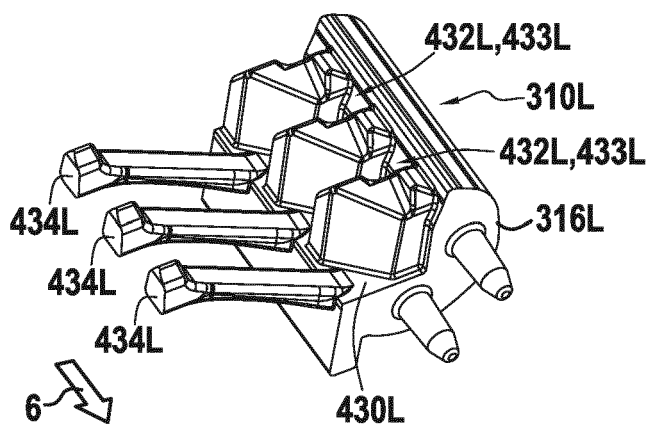
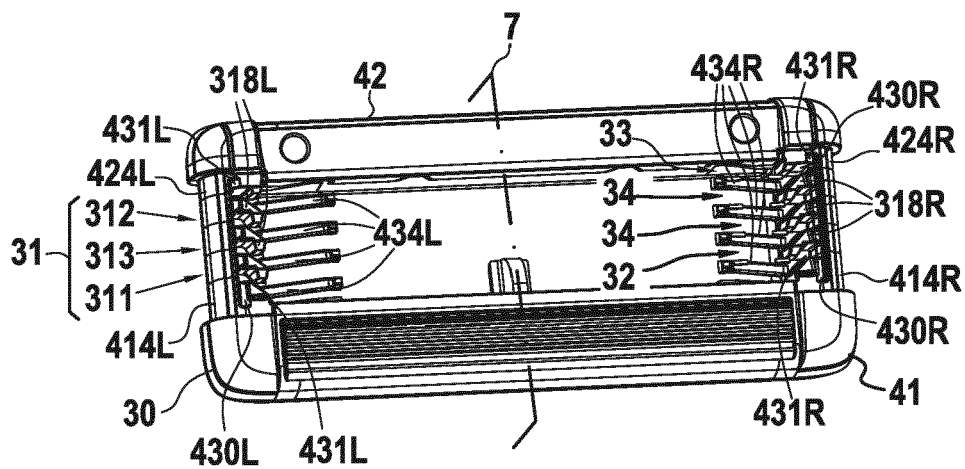
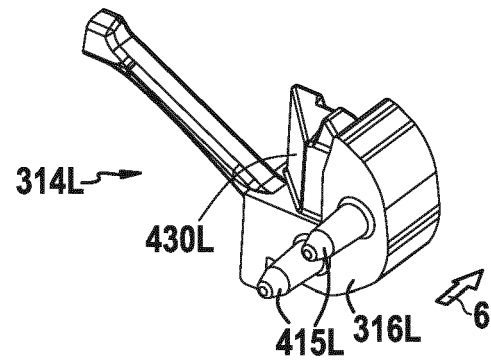
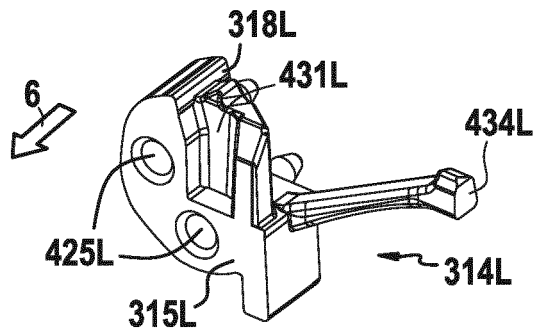
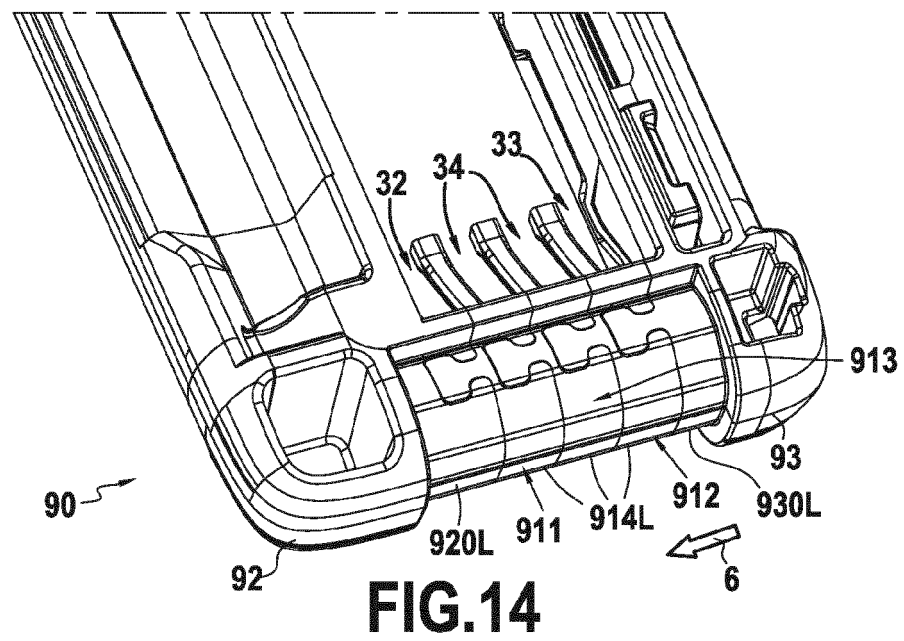
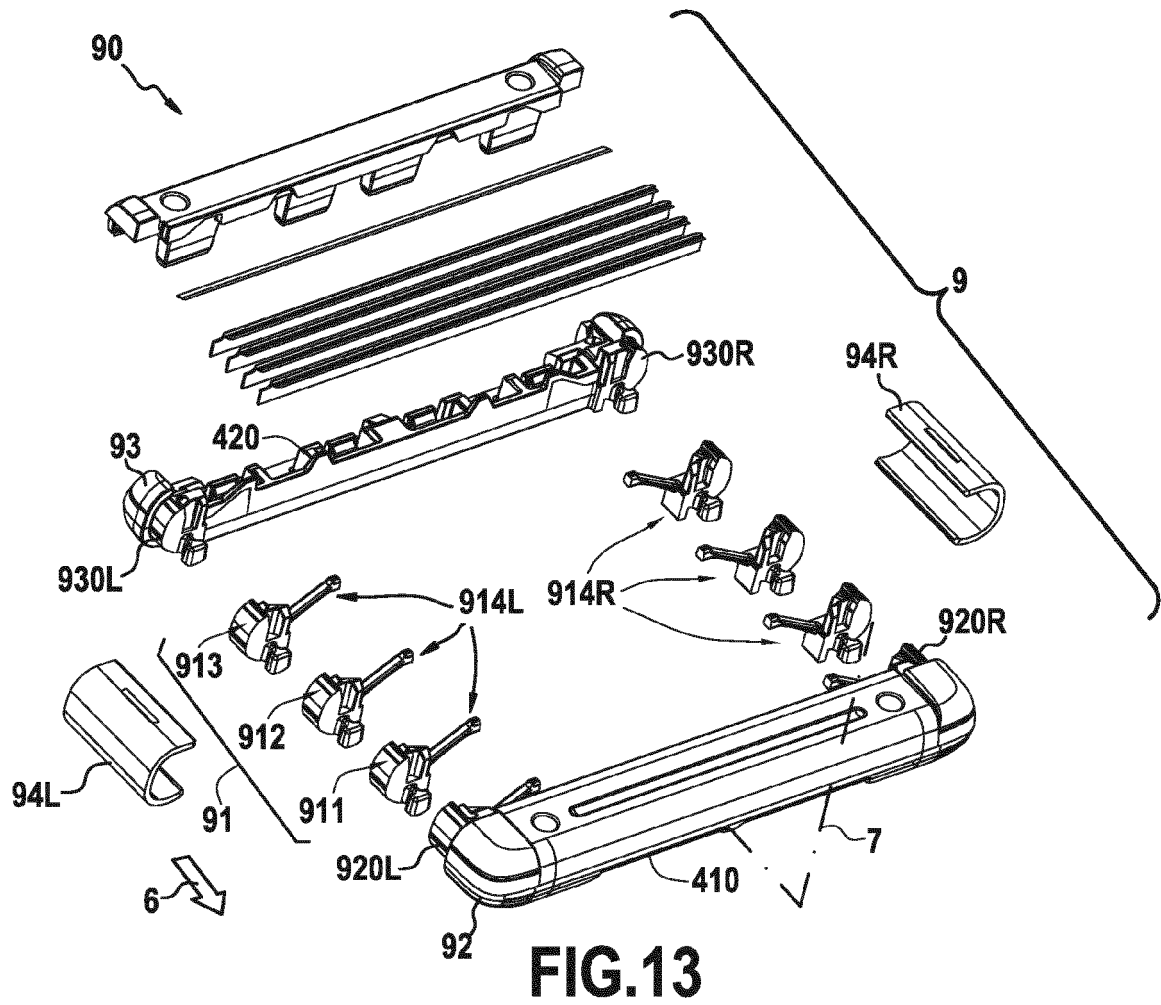
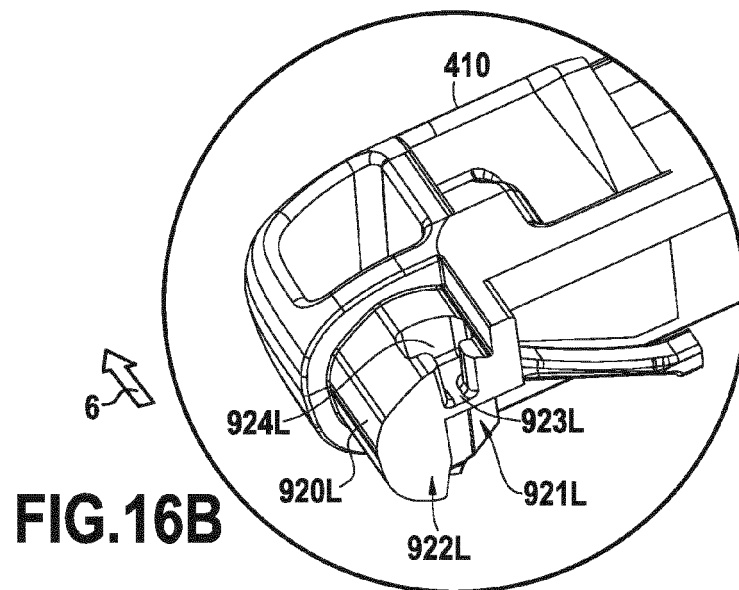
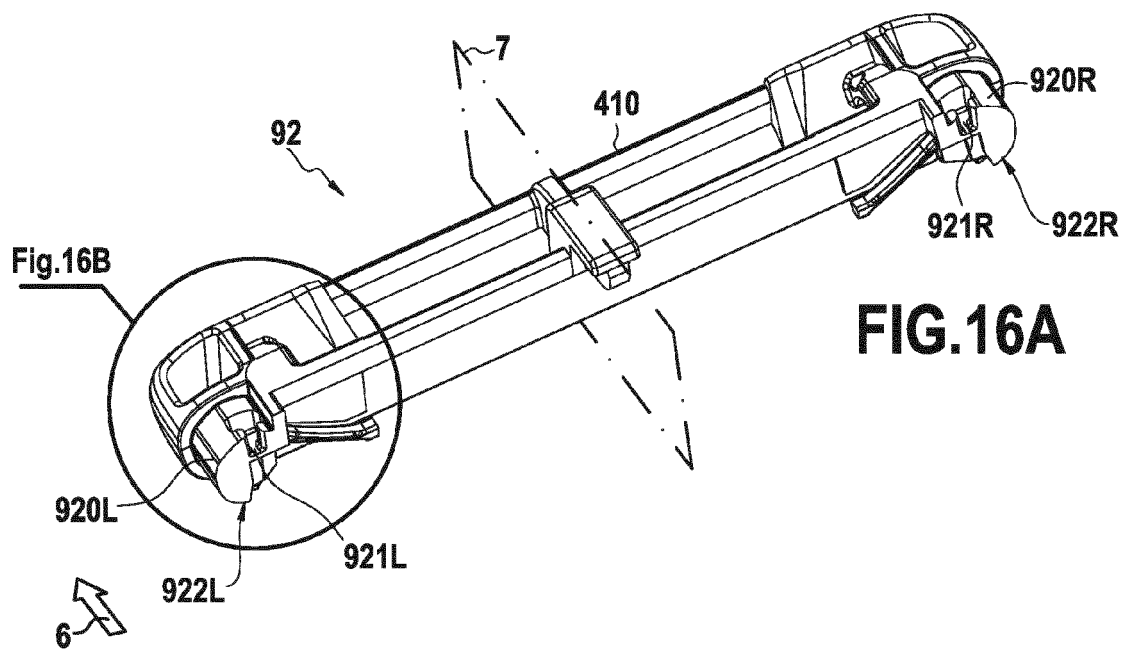
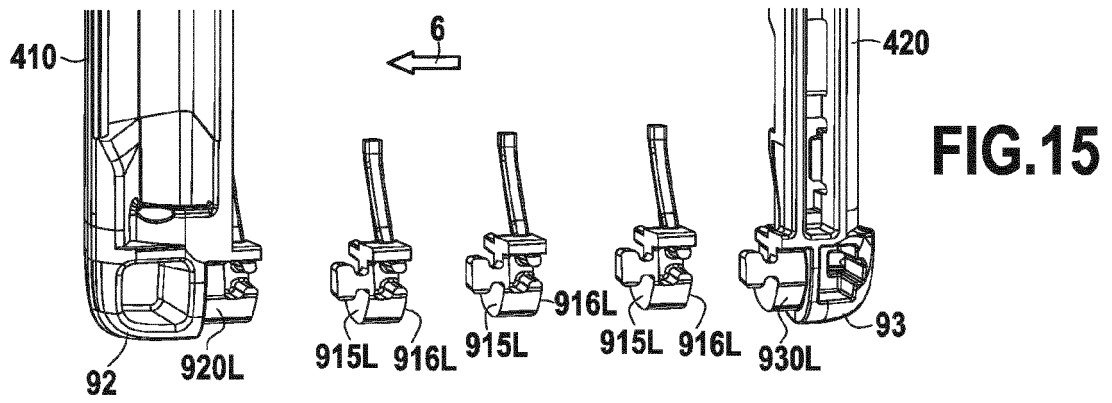


FIG. 9







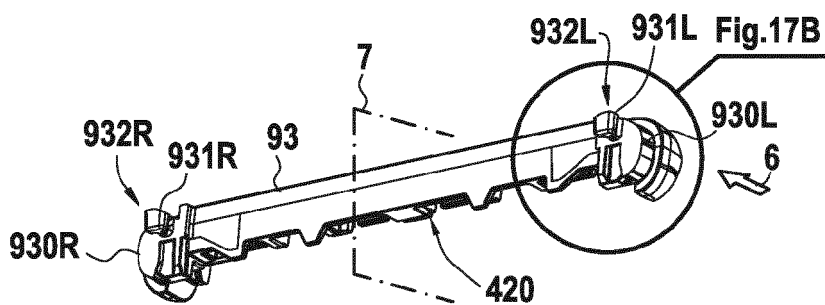


FIG. 17A

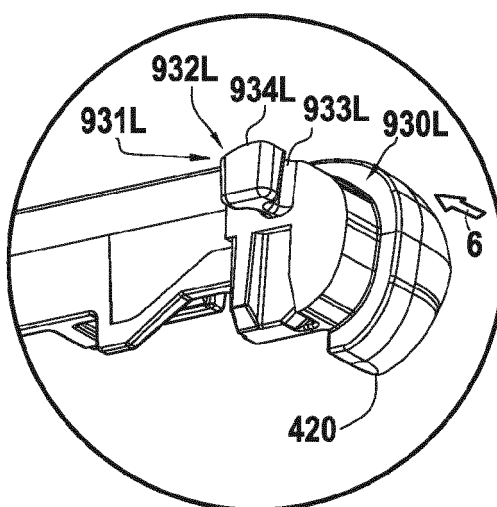


FIG. 17B

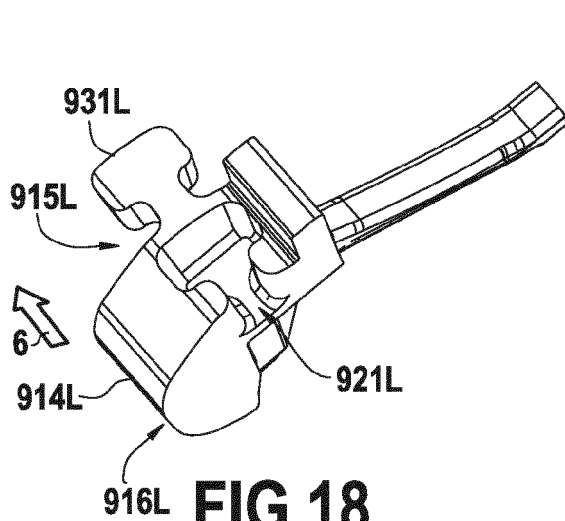


FIG. 18

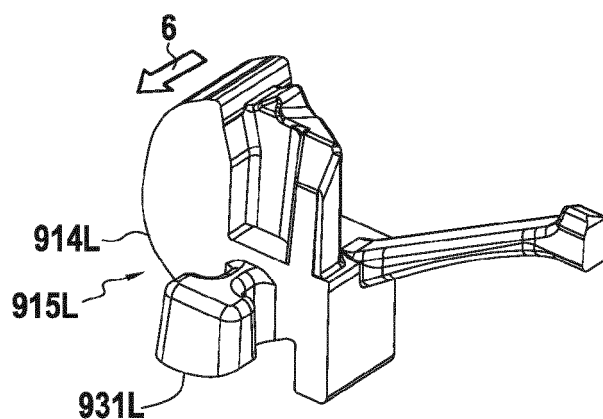


FIG. 19

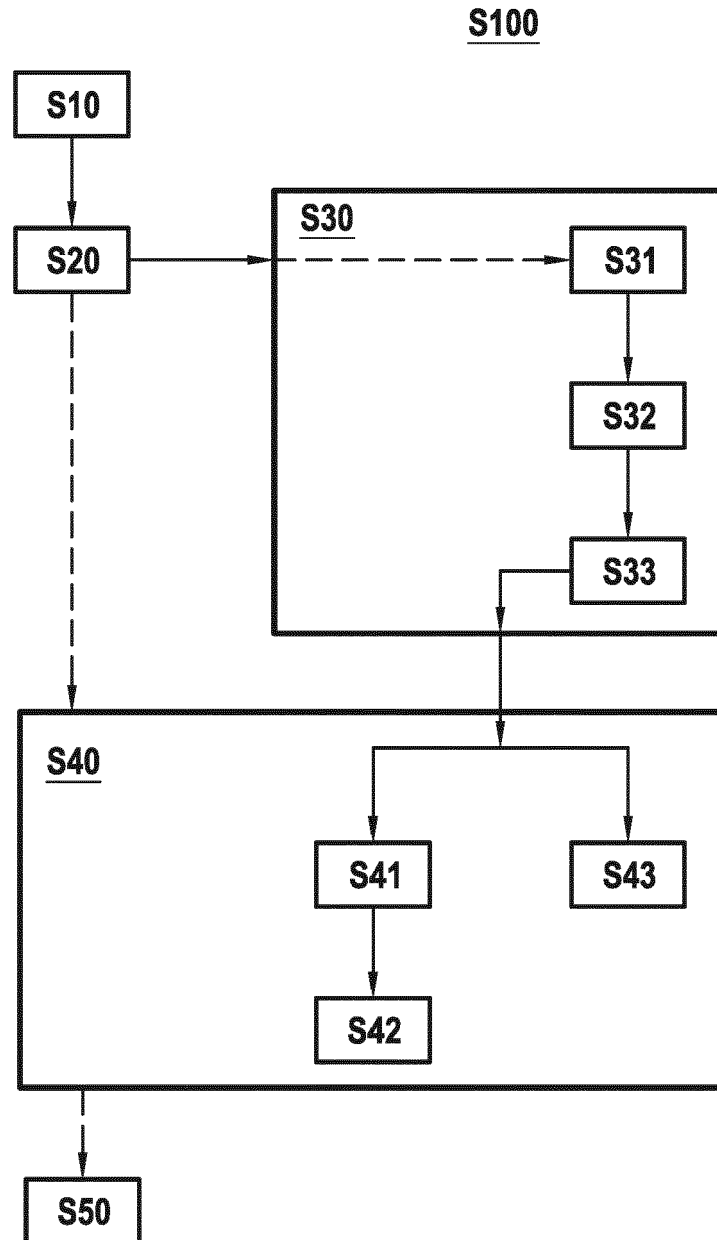


FIG.20



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Place of search Munich		Date of completion of the search 30 June 2020	Examiner Rattenberger, B
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