



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.09.2021 Bulletin 2021/35

(51) Int Cl.:
B26B 21/56 (2006.01)
B26B 21/22 (2006.01)
B26B 21/40 (2006.01)

(21) Application number: **20159354.8**

(22) Date of filing: **25.02.2020**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **SHAVING-BLADE UNIT FOR A SAFETY RAZOR**

(57) A shaving-blade unit (5) for a safety razor (1) comprises a housing (7), a plurality of hair-cutting blades (9) and a supporting member (19) arranged in the housing for supporting the plurality of hair-cutting blades. The supporting member comprises a base member (23a, 23b) and, for each hair-cutting blade, a blade carrier (21). The base member and the blade carriers are integrally formed from a plate-shaped metal sheet. The base member extends as a continuous uninterrupted plate-shaped main portion (31a, 31b) of the supporting member which is common to all blade carriers. Each blade carrier is defined as a plate-shaped sub-portion (29) of the supporting member and is connected to said plate-shaped main portion via a bent portion (39, 43) of the plate-shaped metal sheet.

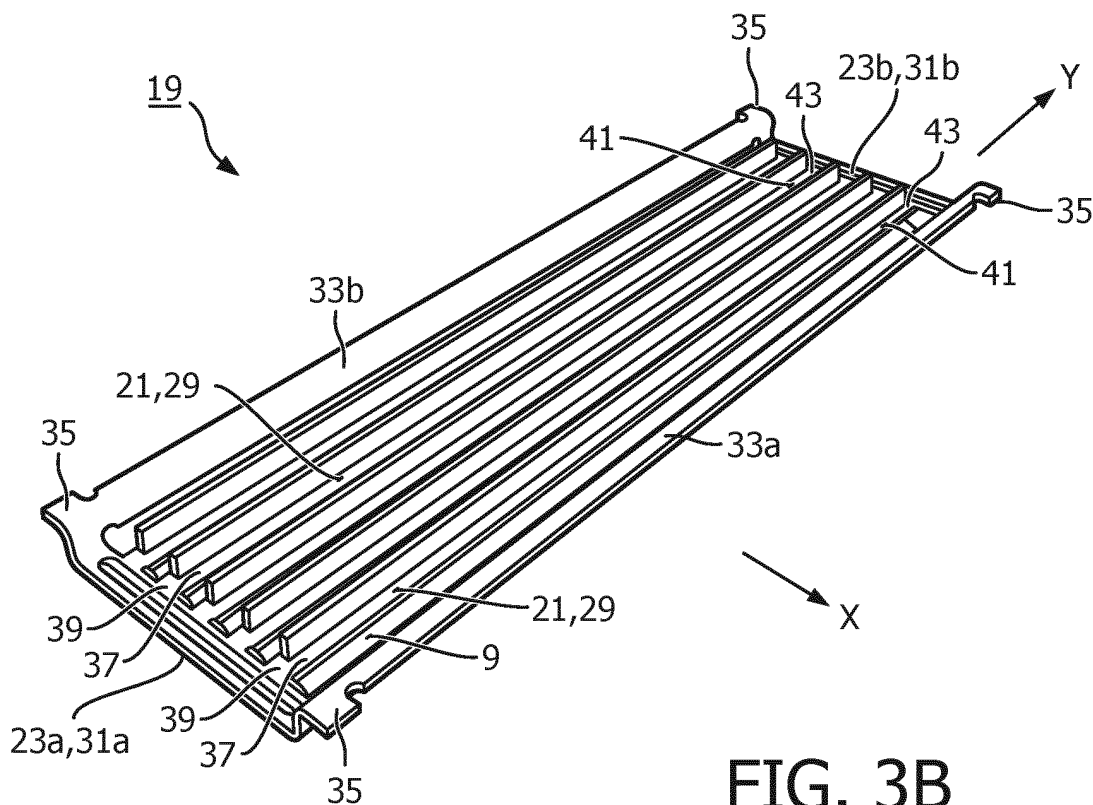


FIG. 3B

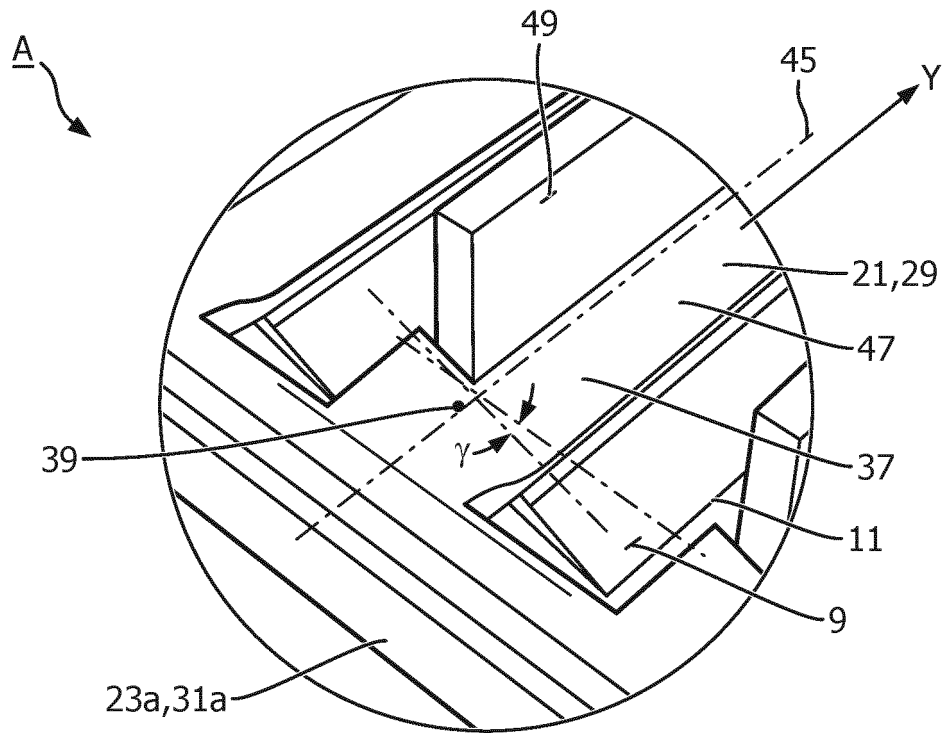


FIG. 4B

Description

FIELD OF THE INVENTION

[0001] The invention relates to a shaving-blade unit for a safety razor, comprising a housing, a plurality of hair-cutting blades each having a main direction of extension and each comprising a cutting edge arranged in an opening of the housing such that, during use, the cutting edge is exposed to skin of a user in contact with the housing, and a supporting member arranged in the housing and supporting the plurality of hair-cutting blades, wherein the supporting member comprises a base member and, for each respective hair-cutting blade, a blade carrier to which the respective hair-cutting blade is mounted, and wherein the base member and each blade carrier are integrally formed from a plate-shaped metal sheet.

[0002] The invention further relates to a safety razor comprising a handle and a shaving-blade unit as described here before coupled to the handle.

BACKGROUND OF THE INVENTION

[0003] A shaving-blade unit and a safety razor as described in the section "Field of the Invention" are well known. The housing of the known shaving-blade unit usually has a first skin-supporting member, which is arranged in front of the hair-cutting blades seen in a shaving direction of the shaving-blade unit, and a second skin-supporting member which is arranged behind the hair-cutting blades seen in the shaving direction. The first skin-supporting member may have a skin-stretching element and the second skin-supporting member may have a skin-lubricating element. The opening of the housing, via which the cutting edges of the hair-cutting blades are exposed to the user's skin during use, is present between the first and second skin-supporting members. The hair-cutting properties of the hair-cutting blades depend on the orientations of the hair-cutting blades relative to a reference plane tangent to the first and second skin-supporting members. In particular, the hair-cutting properties depend on a cutting angle of the hair-cutting blades, which is defined as the sharp angle enclosed by said reference plane and the angle bisector of the cutting-tip angle of the hair-cutting blades. To optimize the hair-cutting properties of the shaving-blade unit, the hair-cutting blades may have mutually different cutting-tip angles and cutting angles. To safeguard these optimized hair-cutting properties, the orientations of the hair-cutting blades relative to the reference plane must be accurate, which imposes particular requirements on the accuracy of the supporting member which supports the hair-cutting blades.

[0004] A shaving-blade unit and a safety razor having all features as described in the section "Field of the Invention" is disclosed in WO 2017/041845 A1. As shown in Figs. 6 and 10(a) of WO 2017/041845 A1, the supporting member (blade carrier 50) of this known shaving-

blade unit comprises a rack 52 which is formed of runners 72 on which the hair-cutting blades 18 are mounted and which extend in the same direction as the hair-cutting blades 18. Each pair of adjacent runners 72 is mutually connected by cross pieces 73. The runners 72 have downwardly extending fins 74 that provide additional stiffness to the runners 72. The blade carrier 50, including the runners 72, the cross pieces 73 and the fins 74, is suitable to be integrally formed from a single plate-shaped metal sheet by a manufacturing method involving suitable metal cutting and bending steps. The orientations of the hair-cutting blades 18 relative to the housing, in particular the cutting angles of the hair-cutting blades 18 as defined here before, are determined by bending angles provided in the cross pieces 73. Each cross piece 73 has two bent portions which each define a bending angle. A disadvantage of this known shaving-blade unit is that the runners 72 supporting the hair-cutting blades 18 are mutually connected by the cross pieces 73 in a serial configuration, i.e. each pair of adjacent runners 72 is mutually connected by one or more cross pieces 73. Because the bending process of each respective cross piece 73 implies a particular tolerance as regards the accuracy of the bending angles provided in the respective cross piece 73, the orientation of each respective hair-cutting blade 18 depends on the accuracies of the bending angles in all cross pieces 73 that are provided in the blade carrier 50 between said respective hair-cutting blade 18 and the housing. As a result of this so-called concatenation of the bent portions of the cross pieces 73, the inaccuracy of the orientation of each respective hair-cutting blade 18 is the sum of the inaccuracies of the bent portions in all cross pieces 73 provided in the blade carrier 50 between the respective hair-cutting blade 18 and the housing. Thus, the inaccuracies of the orientations of the hair-cutting blades 18 of the known shaving-blade unit may be relatively high.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide a shaving-blade unit and a safety razor of the types as described here before in the section "Field of the Invention" which do not have the disadvantage of the shaving-blade unit and the safety razor as disclosed by WO 2017/041845 A1 and wherein, accordingly, the accuracy of the orientations of the hair-cutting blades in the opening of the housing is improved.

[0006] To achieve this object, according to the invention a shaving-blade unit of the type as described in the section "Field of the Invention" is characterized in that the base member extends as a continuous uninterrupted plate-shaped main portion of the supporting member which is common to all blade carriers, and in that each blade carrier is defined as a plate-shaped sub-portion of the supporting member which does not form part of said plate-shaped main portion and is connected to said plate-shaped main portion via a bent portion of the plate-

shaped metal sheet.

[0007] To achieve this object, according to the invention a safety razor of the type as described in the section "Field of the Invention" is characterized in that the shaving-blade unit used therein is a shaving-blade unit according to the invention.

[0008] In the shaving-blade unit according to the invention, each blade carrier is connected, via a bent portion, to the continuous uninterrupted plate-shaped main portion of the supporting member, which is common to all blade carriers. Thus, the orientation of each respective blade carrier, and of the hair-cutting blade mounted thereto, relative to the housing is determined by the bent portion via which the respective blade carrier is connected to the plate-shaped main portion, but not by the bent portions via which the other blade carriers are connected to the plate-shaped main portion. During the manufacturing of the shaving-blade unit, the plate-shaped main portion may be formed as a common reference, and the blade carriers may subsequently be brought into their desired orientations by bending each respective blade carrier relative to the plate-shaped main portion, thus forming the bent portion associated with the respective blade carrier. Because in this manner the orientation of each respective hair-cutting blade relative to the housing is determined by the bent portion associated with the blade carrier of the respective hair-cutting blade but not by the bent portions associated with the blade carriers of the other hair-cutting blades, the accuracy of the orientation of each respective hair-cutting blade relative to the housing is relatively high and is not affected by the inaccuracies of the bent portions associated with the blade carriers of the other hair-cutting blades. In other words, whereas in the shaving-blade unit disclosed by WO 2017/041845 A1 the bent portions associated with the respective hair-cutting blades are arranged in a serial or concatenated arrangement, in the shaving-blade unit according to the invention the bent portions associated with the respective hair-cutting blades are arranged in a parallel arrangement relative to a single common reference, i.e. the continuous uninterrupted plate-shaped main portion of the supporting member.

[0009] It is noted that, in relation to the present invention, the term "plate-shaped", e.g. in the context of "plate-shaped main portion", does not imply that the related feature is straight or flat (plane-shaped). The term "plate-shaped" merely implies that the related feature is formed from a thin plate or sheet and, accordingly, is shaped as a portion of such a thin plate or sheet. Such a plate-shaped portion may also be curved or may be provided with one or more dimples to reinforce the plate-shaped portion.

[0010] In a preferred embodiment of a shaving-blade unit according to the invention, the plate-shaped main portion is straight in a direction perpendicular to the main direction of extension of the hair-cutting blades. This embodiment allows the cutting edges of the hair-cutting blades to be arranged in a common plane by means of

a relatively simple manufacturing process.

[0011] In a further embodiment of a shaving-blade unit according to the invention, the plate-shaped sub-portion is connected to the plate-shaped main portion via a twisted portion of the plate-shaped metal sheet, the plate-shaped sub-portion having an orientation twisted relative to the plate-shaped main portion about a bending axis extending parallel to the main direction of extension of the associated hair-cutting blade. In this embodiment, the blade carriers can be formed in a relatively simple manner during the manufacturing process of the supporting member by cutting free the plate-shaped sub-portions from the base member with the exception of a relatively small plate-shaped residual bridge portion between each plate-shaped sub-portion and the base member, and by subsequently twisting each plate-shaped sub-portion relative to the base member about said bending axis such that said residual bridge portion is twisted and deformed into said twisted portion.

[0012] In a further preferred embodiment of a shaving-blade unit according to the invention, the supporting member comprises a first base member and a second base member extending parallel to each other as, respectively, a first and a second continuous uninterrupted plate-shaped main portion of the supporting member each being common to all blade carriers, wherein each hair-cutting blade is arranged between said first and said second plate-shaped main portion and extends perpendicularly to said first and said second plate-shaped main portion, wherein a first end portion of each blade carrier is connected to said first plate-shaped main portion via a first bent portion of the plate-shaped metal sheet, and wherein a second end portion of each blade carrier is connected to said second plate-shaped main portion via a second bent portion of the plate-shaped metal sheet. In this preferred embodiment, each blade carrier is connected in a mechanically stable and rigid manner to the first and the second plate-shaped main portion via, respectively, said first and said second bent portion.

[0013] In a preferred embodiment of a shaving-blade unit according to the invention, each hair-cutting blade has a blade length in its main direction of extension, and each blade carrier extends at least along the blade length of the associated hair-cutting blade to support the associated hair-cutting blade fully along the blade length. In this way, each hair-cutting blade is supported in a mechanically stable and rigid manner by the associated blade carrier.

[0014] In a further embodiment of a shaving-blade unit according to the invention, each blade carrier comprises a first blade carrier portion to which the associated hair-cutting blade is mounted, and a second blade carrier portion which extends at least along part of the blade length of the associated hair-cutting blade and is bent relative to the first blade carrier portion. The second blade carrier portion significantly increases the mechanical rigidity of the blade carrier.

[0015] The above-described and other aspects of the

invention will be apparent from and elucidated with reference to the following detailed description of practical embodiments of a shaving-blade unit for use in a safety razor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The invention will be explained in greater detail with reference to the figures, in which:

Fig. 1 diagrammatically shows an embodiment of a safety razor in accordance with the invention;

Fig. 2 is a schematic cross-section, along the line II-II in Fig. 1, of an embodiment of a shaving-blade unit according to the invention used in the safety razor of Fig. 1;

Fig. 3a shows, in a first view, a supporting member of the embodiment of the shaving-blade unit of the safety razor of Fig. 1 with hair-cutting blades mounted thereon;

Fig. 3b shows, in a second view, the supporting member of Fig. 3a with the hair-cutting blades mounted thereon;

Fig. 4a shows, in an enlarged view, a portion of the supporting member of Fig. 3a without the hair-cutting blades; and

Fig. 4b shows, in a further enlarged view, a portion A of the supporting member as indicated in Fig. 4a.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] Fig. 1 diagrammatically shows an embodiment of a safety razor 1 in accordance with the invention. The safety razor 1 comprises a handle 3 and an embodiment of a shaving-blade unit 5 in accordance with the invention. The shaving-blade unit 5 is coupled to the handle 3 by means of a coupling mechanism not shown in Fig. 1. The coupling mechanism may be releasable such that a user can decouple the shaving-blade unit 5 from the handle 3, for example in order to replace the shaving-blade unit 5 when worn.

[0018] As shown in Fig. 1, the shaving-blade unit 5 comprises a housing 7 in the form of a blade-cartridge and a plurality of metal hair-cutting blades 9 accommodated in the housing 7. In the present example the number of hair-cutting blades 9 is five, but the shaving-blade unit 5 may have a different number of hair-cutting blades 9 such as three, four, or more than five. The hair-cutting blades 9 each have a main direction of extension Y and a straight cutting edge 11 extending in the main direction of extension Y. The cutting edges 11 of the hair-cutting blades 9 are parallel and define a shaving direction X of the shaving-blade unit 5 which extends perpendicularly to the main direction of extension Y.

[0019] The housing 7 comprises a first skin-supporting member 13, which is arranged in front of the hair-cutting blades 9 seen in the shaving direction X, and a second skin-supporting member 15 which is arranged behind the

hair-cutting blades 9 seen in the shaving direction X. The first skin-supporting member 13 comprises a skin-stretching element and the second skin-supporting member 15 comprises a skin-lubricating element. Such skin-stretching and skin-lubricating elements are well-known to the skilled person. Between the first skin-supporting member 13 and the second skin-supporting member 15, an opening 17 in the housing 7 is provided. The opening 17 is best visible in Fig. 2, which represents a schematic cross-section of the shaving-blade unit 5 taken along the line II-II in Fig. 1. The cutting edges 11 of the hair-cutting blades 9 are arranged in the opening 17. As a result, during use of the safety razor 1 when a user's skin is in contact with the first skin-supporting member 13 and the second skin-supporting member 15, the cutting edges 11 are exposed to the user's skin for cutting hairs present on the user's skin when the shaving-blade unit 5 is moved over the user's skin in the shaving direction X.

[0020] The shaving-blade unit 5 further comprises a supporting member 19 which is arranged in the housing 7 for supporting the hair-cutting blades 9 relative to the housing 7. The supporting member 19 is schematically shown in Fig. 2 and comprises, for each respective hair-cutting blade 9, a respective metal blade carrier 21 to which the respective hair-cutting blade 9 is mounted, for example by means of a laser-welding process. The blade carriers 21 are connected to a metal base member 23b of the supporting member 19. The base member 23b is connected to the housing 7. As will be described in more detail hereafter, the base member 23b and the blade carriers 21 are integrally formed from a plate-shaped metal sheet.

[0021] As is known to the skilled person, the hair-cutting properties of the hair-cutting blades 9 and the resulting overall shaving properties of the shaving-blade unit 5 depend on the orientation of each hair-cutting blade 9 relative to a reference plane 25 tangent to the skin-contacting surfaces of the first skin-supporting member 13 and the second skin-supporting member 15, as shown in Fig. 2. In particular, said hair-cutting properties depend on a cutting angle α of each hair-cutting blade 9 shown in Fig. 2, which is defined as the sharp angle enclosed by the reference plane 25 and the angle bisector 27 of the cutting-tip angle β of the hair-cutting blade 9. Said hair-cutting properties also depend on other parameters of the hair-cutting blades 9, such as the so-called exposure of each hair-cutting blade 9, which is defined as the distance between the cutting edge 11 and the reference plane 25, and the distance between each pair of adjacent cutting edges 11. To optimize the overall shaving properties of the shaving-blade unit 5, the hair-cutting blades 9 may have mutually different cutting angles α , cutting-tip angles β and exposures. To safeguard these optimized shaving properties, the cutting angles α of the hair-cutting blades 9 relative to the reference plane 25 must be accurately defined, which imposes particular requirements on the accuracy of the supporting member 19 and, in particular, on the accuracy of the orientations of the

blade carriers 21 relative to the housing 7 and the reference plane 25.

[0022] The supporting member 19 is shown in detail in Figs. 3a, 3b, 4a and 4b. Fig. 3a shows the supporting member 19 in a first view from the outside of the shaving-blade unit 5, and Fig. 3b shows the supporting member 19 in a second view from the inside of the shaving-blade unit 5. Figs. 3a and 3b show the supporting member 19 in a condition with the hair-cutting blades 9 mounted on the blade carriers 21. As shown in Figs. 3a and 3b, each blade carrier 21 is defined as an elongate plate-shaped metal sub-portion 29 of the supporting member 19 extending in the main direction of extension Y of the hair-cutting blade 9 mounted to the respective blade carrier 21. The supporting member 19 further comprises a first metal base member 23a and a second metal base member 23b. It is noted that the cross-sectional view in Fig. 2 is in the direction from the first base member 23a to the second base member 23b, so that in Fig. 2 the second base member 23b is visible in side view. The first base member 23a extends as a first continuous uninterrupted plate-shaped metal main portion 31a of the supporting member 19, and the second base member 23b extends as a second continuous uninterrupted plate-shaped metal main portion 31b of the supporting member 19. In the example shown, the first plate-shaped main portion 31a and the second plate-shaped main portion 31b extend as straight portions of the supporting member 19 in a direction perpendicular to the main direction of extension Y of the hair-cutting blades 9, so that the first base member 23a and the second base member 23b extend parallel to each other. The first base member 23a and the second base member 23b are mutually connected by a first elongate plate-shaped metal connecting portion 33a of the supporting member 19 arranged in front of the blade carriers 21 (seen in the shaving direction X) and by a second elongate plate-shaped metal connecting portion 33b of the supporting member 19 arranged behind the blade carriers 21 (seen in the shaving direction X), wherein the first connecting portion 33a and the second connecting portion 33b both extend parallel to the main direction of extension Y of the hair-cutting blades 9. The first connecting portion 33a and the second connecting portion 33b are provided at their extremities with mounting members 35, by means of which the supporting member 19 is connected to the housing 7.

[0023] Each blade carrier 21, with its associated hair-cutting blade 9 mounted thereon, is arranged between the first base member 23a and the second base member 23b and extends perpendicularly to the first and second plate-shaped main portions 31a, 31b that define the first and second base members 23a, 23b. In the present example, each blade carrier 21 extends in the main direction of extension Y of the hair-cutting blade 9 mounted thereon along the entire blade length of the hair-cutting blade 9, so that the hair-cutting blade 9 is supported along its entire blade length by the blade carrier 21. A first end portion 37 of each blade carrier 21 is connected to the

first plate-shaped main portion 31a of the supporting member 19 via a first bent portion 39, and a second end portion 41 of each blade carrier 21 is connected to the second plate-shaped main portion 31b of the supporting member 19 via a second bent portion 43. The first and second bent portions 39 and 43 will be described in more detail here after. Thus, the first base member 23a and the second base member 23b each constitute a portion of the supporting member 19 which is common to all blade carriers 21. Since each plate-shaped sub-portion 29, defining a respective one of the blade carriers 21, is connected to the common first plate-shaped main portion 31a and to the common second plate-shaped main portion 31b via, respectively, the first bent portion 39 and the second bent portion 43, the plate-shaped sub-portions 29 do not form part of the first plate-shaped main portion 31a or the second plate-shaped main portion 31b.

[0024] All portions of the supporting member 19, i.e. the first and second plate-shaped main portions 31a, 31b that define the first and second base members 23a, 23b, the plate-shaped sub-portions 29 that define the blade carriers 21, the first and second bent portions 39, 43 via which the plate-shaped sub-portions 29 are connected to the first and second plate-shaped main portions 31a, 31b, and the first and second connecting portions 33a, 33b including the mounting members 35 are integrally formed from a plate-shaped metal sheet, preferably a single plate-shaped metal sheet. During manufacturing of the supporting member 19, in a first step the plate-shaped main portions 31a, 31b, the plate-shaped sub-portions 29 and the connecting portions 33a, 33b may be initially formed in the plate-shaped metal sheet by a punching process. During this punching process, each plate-shaped sub-portion 29 may be cut free from the plate-shaped main portions 31a, 31b with the exception of a relatively small plate-shaped residual bridge portion between the plate-shaped sub-portion 29 and each of the plate-shaped main portions 31a, 31b. During the first step of the manufacturing process, the plate-shaped main portions 31a, 31b may each be formed as a common reference for all plate-shaped sub-portions 29. In a subsequent step of the manufacturing process after the first step, the plate-shaped sub-portions 29 may each be bent relative to the plate-shaped main portions 31a, 31b into the desired orientations relative to the plate-shaped main portions 31a, 31b. During this bending process the plate-shaped sub-portions 29 are not deformed, but the plate-shaped residual bridge portions between each plate-shaped sub-portion 29 and the first and second plate-shaped main portions 31a, 31b are twisted and deformed, about a bending axis extending parallel to the main direction of extension Y of the hair-cutting blade 9, into the first and second bent portions 39, 43. Thus, the first and second bent portions 39, 43 constitute twisted portions of the plate-shaped metal sheet.

[0025] Fig. 4a is an enlarged view of a portion of the supporting member 19 including the first base member 23a, and Fig. 4b is a further enlarged view of a portion A

of the supporting member 19 which is indicated in Fig. 4a. In Fig. 4a, the hair-cutting blades 9 are not shown. The first bent (twisted) portion 39 is visible in detail in Fig. 4b. Fig. 4b also shows the bending axis 45 about which the first bent portion 39 is twisted and deformed during said bending process. Fig. 4b further shows a bending angle γ , which corresponds to the angle over which the plate-shaped sub-portion 29 is bent or twisted relative to the first plate-shaped main portion 31a about the bending axis 45 and corresponds to the angular orientation of the plate-shaped sub-portion 29 relative to the first plate-shaped main portion 31a. When the cutting tip of the hair-cutting blade 9 is symmetrically shaped, the bending angle γ may correspond to the cutting angle α of the hair-cutting blade 9.

[0026] From the description here before it follows that the angular orientation of each respective blade carrier 21, and of the hair-cutting blade 9 mounted thereto, relative to the housing 7 is determined by the first and second bent (twisted) portions 39, 43 via which the respective blade carrier 21 is connected to the first and second plate-shaped main portions 31a, 31b, but not by the bent portions 39, 43 via which the other blade carriers 21 are connected to the first and second plate-shaped main portions 31a, 31b. In other words, since the first and second plate-shaped main portions 31a, 31b of the supporting member 19 are each formed as a common reference for all plate-shaped sub-portions 29 of the supporting member 19, all blade carriers 21 are individually bent relative to the same common reference (i.e. the first or the second plate-shaped main portion 31a, 31b) via only a single bent portion (i.e. the first or the second bent portion 39, 43). Since the angular orientation of each respective blade carrier 21 is not influenced by the accuracy of the first and second bent portions 39, 43 via which the other blade carriers 21 are connected the first and second plate-shaped main portions 31a, 31b, the accuracy of the angular orientation of each respective hair-cutting blade 9 relative to the housing 7 is relatively high.

[0027] The blade carriers 21 are connected in a mechanically stable and rigid manner to the first and second base members 23a, 23b by means of the first and second bent portions 39, 43. In the present example, the mechanical stability of the blade carriers 21 is further increased by providing each blade carrier 21 with a first blade carrier portion 47 and a second blade carrier portion 49 as shown in Figs. 4a and 4b. The hair-cutting blades 9 are mounted to the first blade carrier portions 47. The second blade carrier portions 49 extend at least along part of the blade length of the hair-cutting blades 9 and are bent relative to the first blade carrier portions 47 over a relatively large angle, in the present example close to 90°. During manufacturing of the supporting member 19, the second blade carrier portions 49 may be cut free from the plate-shaped metal sheet during the initial punching process and may be bent relative to the first blade carrier portions 47 by an additional bending step. In the present example, the mechanical stability of

the supporting member 19 is further increased by providing the first and second base members 23a, 23b with dimpled portions 51, as shown in Fig. 4a. Such dimpled portions 51 may be provided by punching.

[0028] As described here before, in the present example the first plate-shaped main portion 31a and the second plate-shaped main portion 31b extend as straight portions of the supporting member 19, in particular when observed in the main direction of extension Y of the hair-cutting blades 9. Since the first and second plate-shaped main portions 31a, 31b are straight portions, it is possible, for example, to arrange the cutting edges 11 of all hair-cutting blades 9 in the reference plane 25 or at an identical distance from the reference plane 25, such that all hair-cutting blades 9 have a similar exposure relative to the reference plane 25. It is noted that, in accordance with the present invention, the plate-shaped main portion of the supporting member does not need to be straight. The first and second plate-shaped main portions 31a, 31b of the shaving-blade unit 5 as described here before may also be curved or slightly curved, in particular when observed in the main direction of extension Y of the hair-cutting blades 9. With such curved plate-shaped main portions, it may be possible to arrange the hair-cutting blades 9 with mutually different exposures relative to the reference plane 25. Of course, such mutually different exposures can also be achieved with the supporting member 19 as described here before by mounting the hair-cutting blades 9 in mutually different positions to the blade carriers 21.

[0029] It will be clear to a person skilled in the art that the scope of the invention is not limited to the examples discussed in the foregoing, but that several amendments and modifications thereof are possible without deviating from the scope of the invention as defined in the attached claims. It is intended that the invention be construed as including all such amendments and modifications insofar they come within the scope of the claims or the equivalents thereof. While the invention has been illustrated and described in detail in the figures and the description, such illustration and description are to be considered illustrative or exemplary only, and not restrictive. The invention is not limited to the disclosed embodiments. The drawings are schematic, wherein details which are not required for understanding the invention may have been omitted, and not necessarily to scale.

[0030] Variations to the disclosed embodiments can be understood and effected by a person skilled in the art in practicing the claimed invention, from a study of the figures, the description and the attached claims. In the claims, the word "comprising" does not exclude other steps or elements, and the indefinite article "a" or "an" does not exclude a plurality. Any reference signs in the claims should not be construed as limiting the scope of the invention.

[0031] Elements and aspects discussed for or in relation with a particular embodiment may be suitably combined with elements and aspects of other embodiments,

unless explicitly stated otherwise. Thus, the mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0032] The terms "comprise" and "include" as used in this text will be understood by a person skilled in the art as covering the term "consist of". Hence, the term "comprise" or "include" may in respect of an embodiment mean "consist of", but may in another embodiment mean "contain/have/be equipped with at least the defined species and optionally one or more other species".

Claims

1. A shaving-blade unit (5) for a safety razor (1), comprising:

- a housing (7);
- a plurality of hair-cutting blades (9) each having a main direction of extension (Y) and each comprising a cutting edge (11) arranged in an opening (17) of the housing such that, during use, the cutting edge is exposed to skin of a user in contact with the housing; and
- a supporting member (19) arranged in the housing and supporting the plurality of hair-cutting blades;

wherein:

- the supporting member comprises a base member (23a, 23b) and, for each respective hair-cutting blade, a blade carrier (21) to which the respective hair-cutting blade is mounted; and
- the base member and each blade carrier are integrally formed from a plate-shaped metal sheet;

characterized in that:

- the base member (23a, 23b) extends as a continuous uninterrupted plate-shaped main portion (31a, 31b) of the supporting member (19) which is common to all blade carriers (21); and
- each blade carrier is defined as a plate-shaped sub-portion (29) of the supporting member which does not form part of said plate-shaped main portion and is connected to said plate-shaped main portion via a bent portion (39, 43) of the plate-shaped metal sheet.

2. A shaving-blade unit (5) as claimed in claim 1, wherein the plate-shaped main portion (31a, 31b) is straight in a direction perpendicular to the main direction of extension (Y) of the hair-cutting blades (9).

3. A shaving-blade unit (5) as claimed in claim 1 or 2, wherein the plate-shaped sub-portion (29) is connected to the plate-shaped main portion (31a, 31b) via a twisted portion (39, 43) of the plate-shaped metal sheet, the plate-shaped sub-portion having an orientation twisted relative to the plate-shaped main portion about a bending axis (45) extending parallel to the main direction of extension (Y) of the associated hair-cutting blade (9).

4. A shaving-blade unit (5) as claimed in claim 1, 2 or 3, wherein:

- the supporting member (19) comprises a first base member (23a) and a second base member (23b) extending parallel to each other as, respectively, a first and a second continuous uninterrupted plate-shaped main portion (31a, 31b) of the supporting member each being common to all blade carriers (21);
- each hair-cutting blade (9) is arranged between said first and said second plate-shaped main portion and extends perpendicularly to said first and said second plate-shaped main portion;
- a first end portion (37) of each blade carrier (21) is connected to said first plate-shaped main portion (31a) via a first bent portion (39) of the plate-shaped metal sheet; and
- a second end portion (41) of each blade carrier is connected to said second plate-shaped main portion (31b) via a second bent portion (43) of the plate-shaped metal sheet.

5. A shaving-blade unit (5) as claimed in claim 1, 2, 3 or 4, wherein each hair-cutting blade (9) has a blade length in its main direction of extension (Y), and wherein each blade carrier (21) extends at least along the blade length of the associated hair-cutting blade to support the associated hair-cutting blade fully along the blade length.

6. A shaving-blade unit (5) as claimed in claim 5, wherein each blade carrier (21) comprises a first blade carrier portion (47) to which the associated hair-cutting blade (9) is mounted, and a second blade carrier portion (49) which extends at least along part of the blade length of the associated hair-cutting blade and is bent relative to the first blade carrier portion.

7. A safety razor (1) comprising a handle (3) and a shaving-blade unit (5) coupled to the handle, wherein the shaving-blade unit is a shaving-blade unit as claimed in claim 1, 2, 3, 4, 5 or 6.

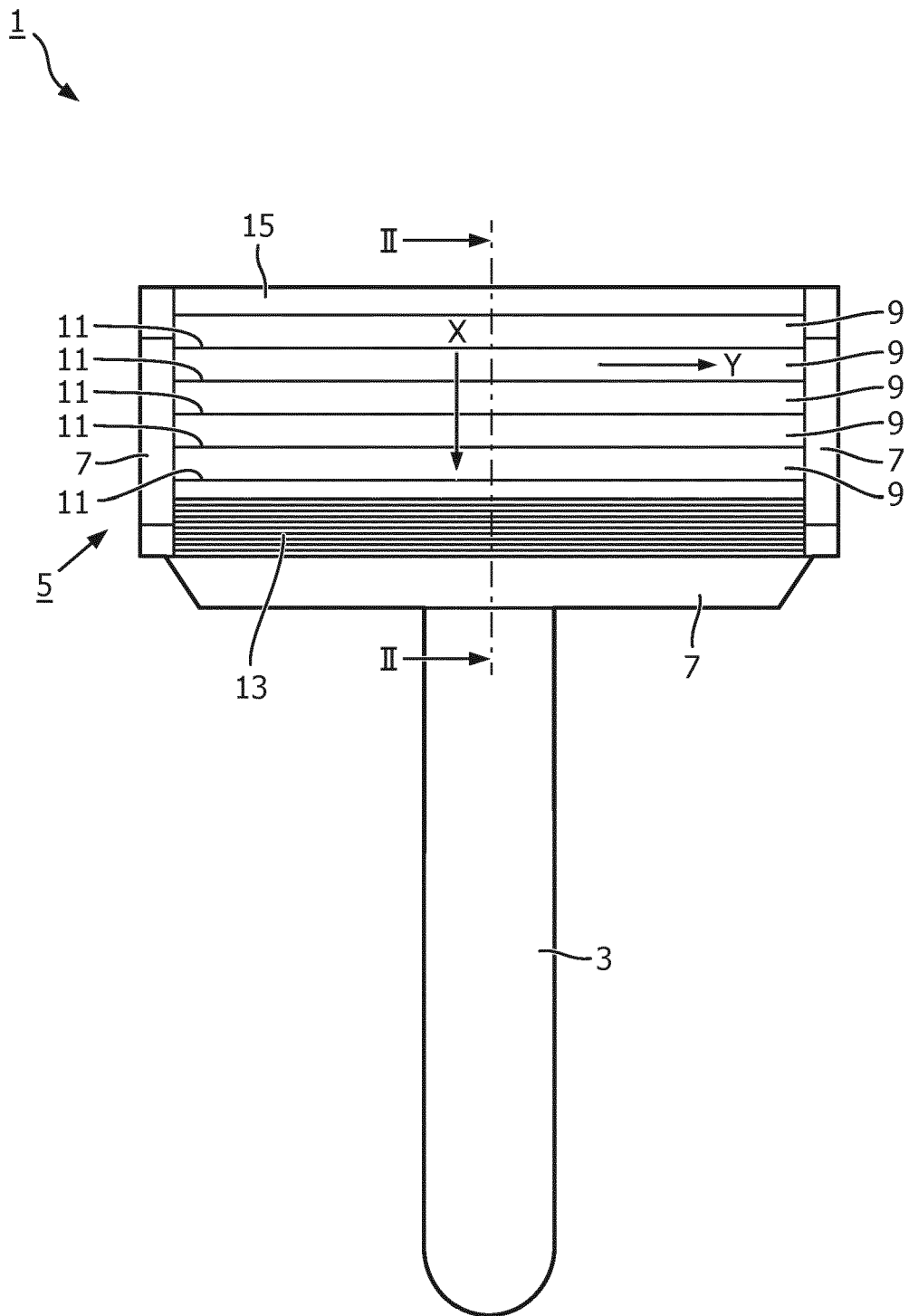


FIG. 1

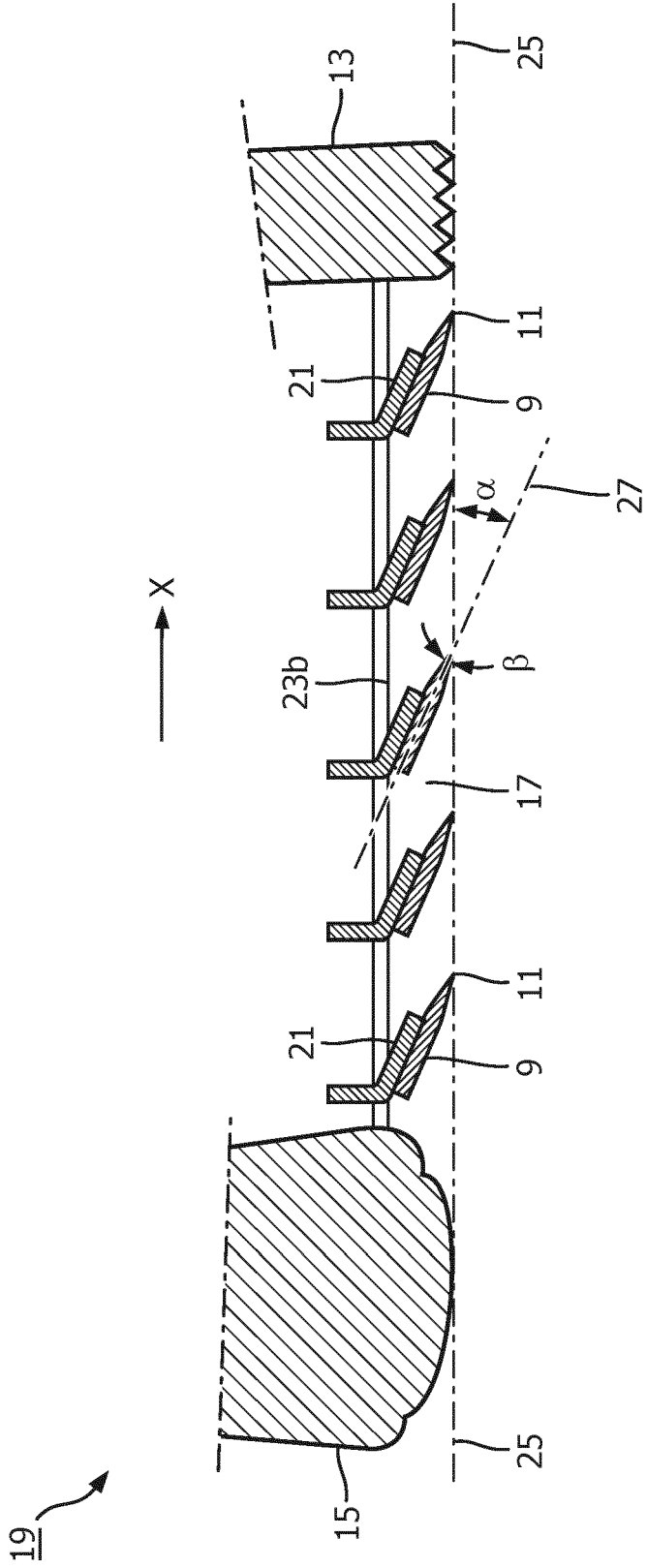
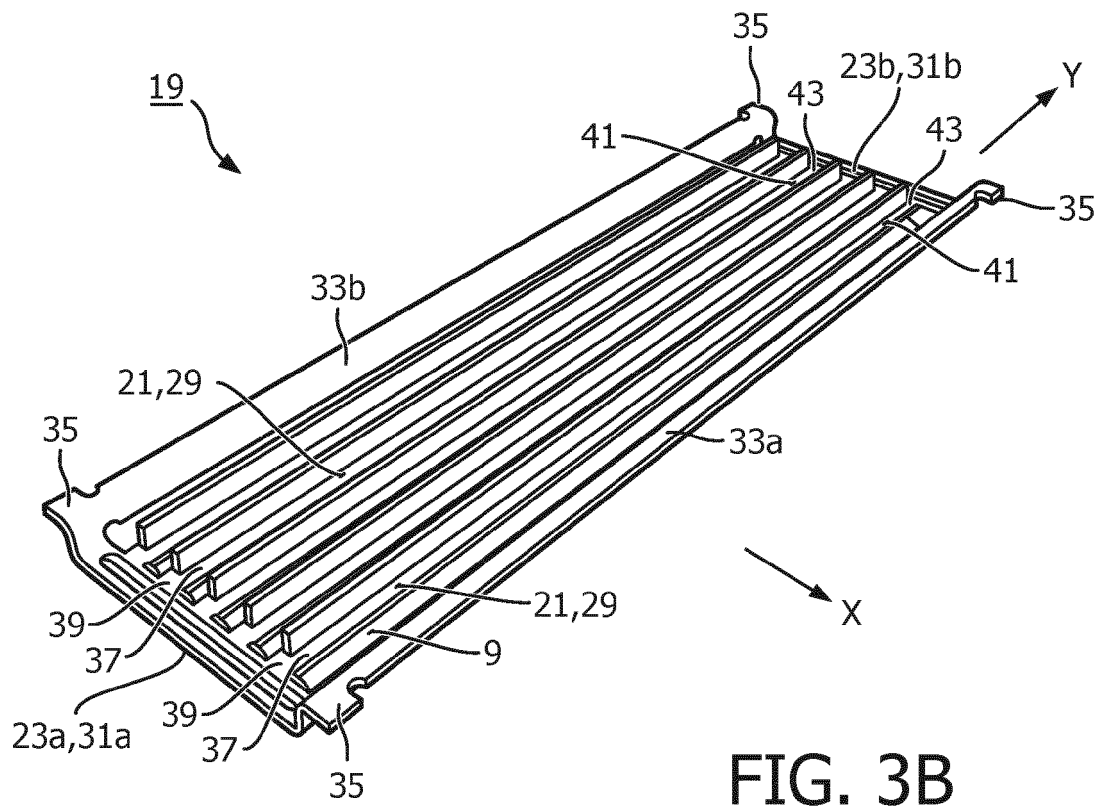
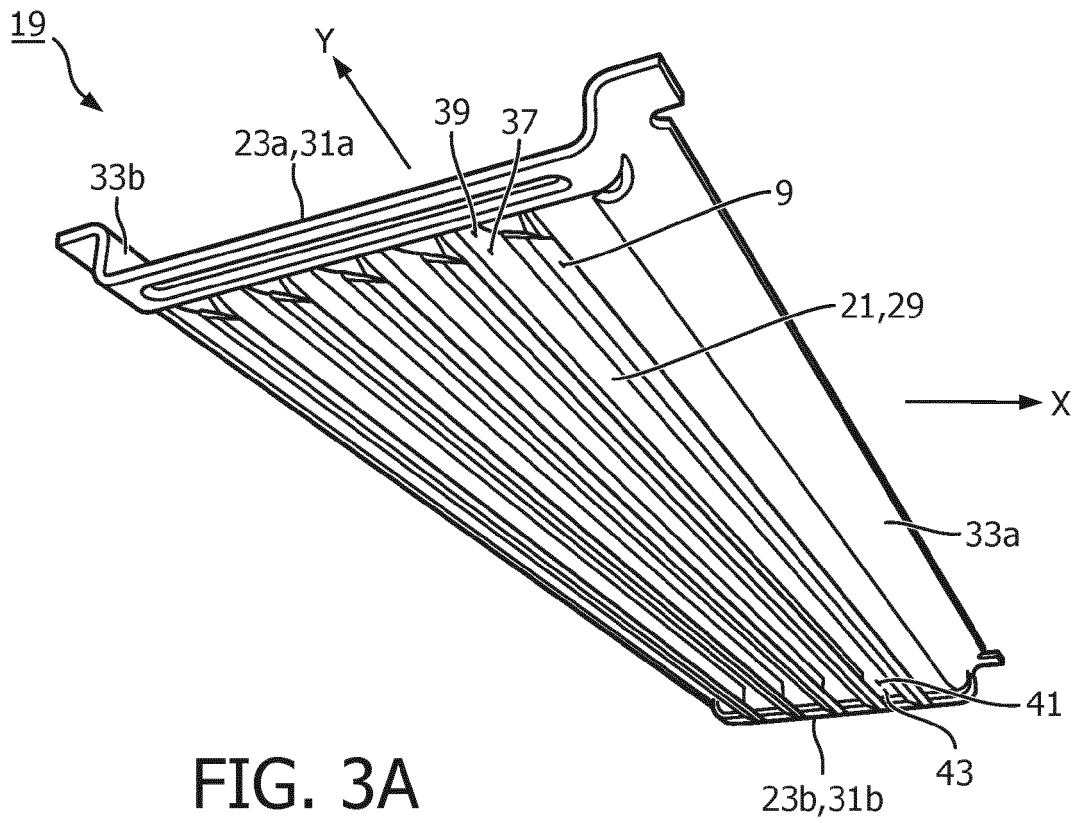


FIG. 2



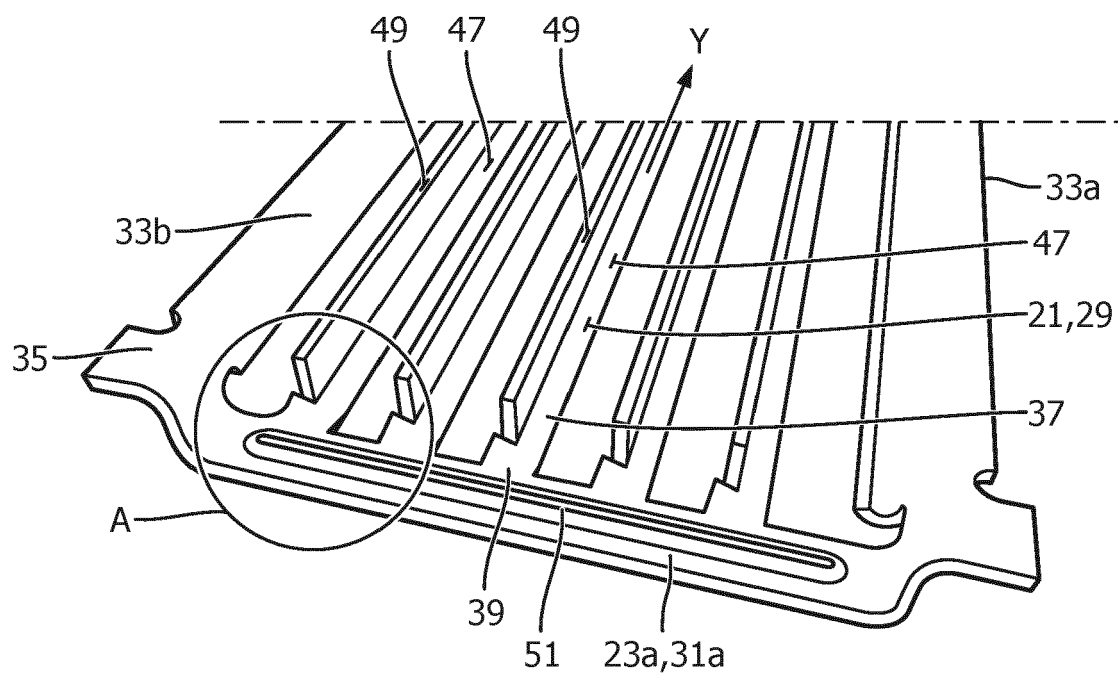


FIG. 4A

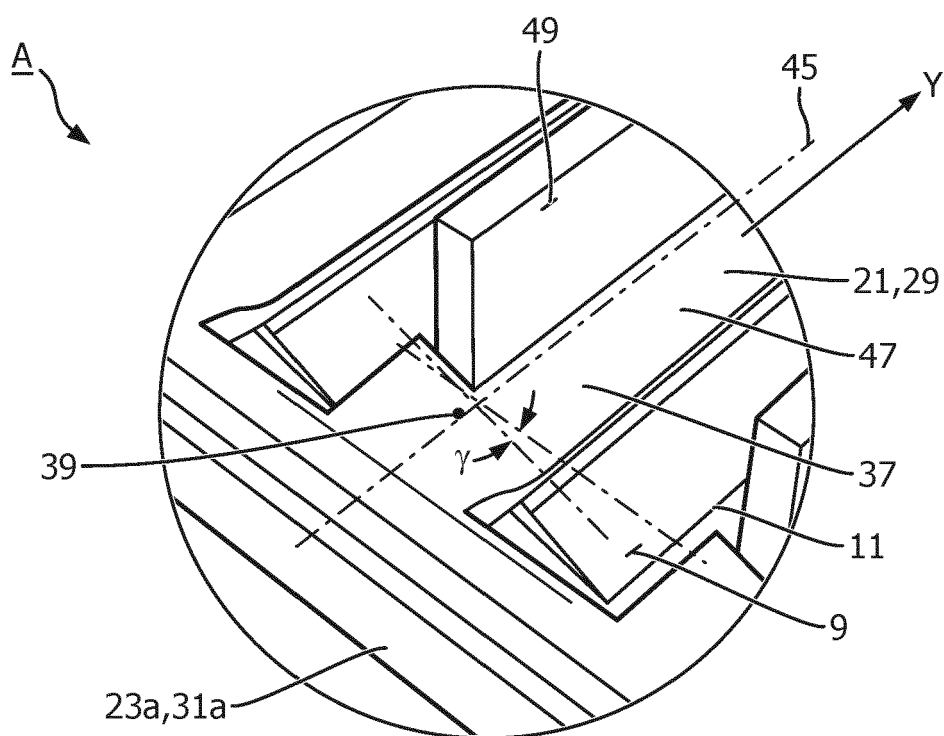


FIG. 4B



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 15 9354

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 531 491 A (THE KING OF SHAVES COMPANY LTD [GB]) 27 April 2016 (2016-04-27) * page 9, line 20 - page 10, line 20; figures 4-8 * * page 7, lines 22-23 *	1-7	INV. B26B21/56 B26B21/40 B26B21/22
A	----- WO 2008/012740 A2 (GILLETTE CO [US]; ROYLE TERENCE GORDON [GB]) 31 January 2008 (2008-01-31) * page 9, paragraph 3; figures 1, 4, 5, 12 *	1-7	
A	----- WO 2017/161341 A1 (PERSONAL CARE MARKETING AND RES INC [US]) 21 September 2017 (2017-09-21) * page 4, paragraph 26 - page 7, paragraph 42; figures 1-3 * -----	1-7	
			TECHNICAL FIELDS SEARCHED (IPC)
			B26B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 August 2020	Examiner Rattenberger, B
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 15 9354

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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17-08-2020

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2531491 A	27-04-2016	NONE	
WO 2008012740 A2	31-01-2008	BR PI0715183 A2 CA 2660354 A1 CN 101495276 A EP 2046539 A2 JP 2009542401 A KR 20090031919 A US 2008022530 A1 WO 2008012740 A2	11-06-2013 31-01-2008 29-07-2009 15-04-2009 03-12-2009 30-03-2009 31-01-2008 31-01-2008
WO 2017161341 A1	21-09-2017	AU 2017235651 A1 BR 112018068899 A2 CA 3018095 A1 CN 109414828 A EP 3429809 A1 US 2019016001 A1 WO 2017161341 A1	04-10-2018 22-01-2019 21-09-2017 01-03-2019 23-01-2019 17-01-2019 21-09-2017

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2017041845 A1 [0004] [0005] [0008]