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(54) Title: A TRIMMING BLADE HEAD AND A RAZOR COMPRISING A RAZOR HANDLE AND SUCH A TRIMMING BLADE HEAD

(57) Abstract: A trimming blade system (14) and a razor (10) comprising a razor handle (12) and a trimming blade head (14). The trimming blade head (14) having a front (14A) and comprising a supporting plate (22), a blade (16) and a cover plate (24), the blade (16) having a cutting edge (16A) facing forwardly toward the front (14A) of the trimming blade system (14), the trimming blade system (14)having a comb (18) provided with teeth (20) projecting forwardly toward the front (14A) of the trimming blade system (14) and overlapping said cutting edge (16A), the teeth (20) having an upper face (20A), two lateral faces (20B, 20C) and a lower face (20D). The lower face (20D) of the teeth (20) can be joined to the lateral faces (20B, 20C) by opposite chamfered faces. The teeth (20) can be stepped to form rearwardly directed shoulders against which the cutting edge (16A) is positioned and wherein each of the shoulders is provided with a shoulder chamfer.

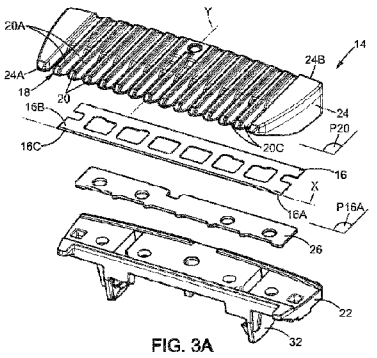

FIG. 3A

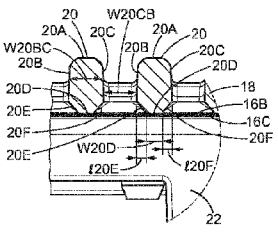

FIG. 5A

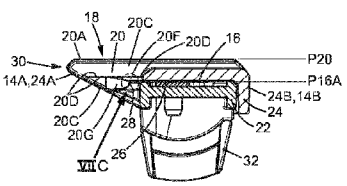

FIG. 7A

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A TRIMMING BLADE HEAD AND A RAZOR COMPRISING A RAZOR HANDLE AND SUCH A TRIMMING BLADE HEAD

FIELD OF THE DISCLOSURE

The invention relates to a trimming blade system and a razor comprising a razor handle and such a trimming blade system.

BACKGROUND OF THE DISCLOSURE

In particular, the invention is related to a trimming blade system having a front and comprising a supporting plate, a blade and a cover plate, the blade having a cutting edge facing forwardly toward the front of the head, the trimming blade system having a comb provided with teeth which project forwardly toward the front of the head and which overlap said cutting edge, each of the teeth having an upper face, two lateral faces and a lower face.

The invention is besides also related to a trimming blade system having a front and comprising a supporting plate, a blade and a cover plate, the blade having a cutting edge facing forwardly toward the front of the trimming blade system, the trimming blade system having a comb provided with teeth which project forwardly toward the front of the trimming blade system and which overlap said cutting edge.

Such trimming blade systems allow a precise hair trimming or grooming. Besides, in order to align the hair and raise it from the skin during shaving, the trimming blade head is provided with a comb. Actually, thanks to the comb, there is no immediate contact of the skin with the blade. Besides, the comb allows a separation of the hairs and leads to better trimming. The trimming distinguishes from the traditional shaving in that the trimmer is to achieve a stubble look or to leave hair to a certain length and not to shave it to the skin. The comb is the only part

to come in contact with the skin, and the first part to come in contact with the hair; it functions as a traditional comb, separates the hair and then the blade follows to cut the hair to the desired length.

The known head commonly comprising a comb are provided with a traditional blade and are thus not a trimming blade system.

Besides, due to the comb, the active length of the blade is reduced. In addition, further due to the comb, a gap is created between the teeth of the comb and the blade(s) where unwanted hairs can trap. Therefore, more strokes are required promoting clogging, and overall less efficiency.

Therefore, the known trimming blade systems provided with a comb do not allow trimming in good conditions.

SUMMARY OF THE DISCLOSURE

To this aim, a trimming blade system is provided with a specific geometry allowing a good and a precise trimming.

One object of the invention is to provide a trimming blade system wherein the lower face of each of the teeth is joined to the lateral faces by opposite chamfered faces. The object of the invention is to increase the active length of the blade, the number of hair that are being cut with a single stroke, the available space in front, etc.

This results in an increase of the active length of the blade. In addition, the chamfered faces aim at reducing the possibility of hair clogging.

Another object of the invention is to provide a trimming blade system wherein the teeth are stepped to form rearwardly directed shoulders against which the cutting edge is positioned and wherein each of the shoulders is provided with a shoulder chamfer. The object of the

invention is to increase the active length of the blade, the number of hair that are being cut with a single stroke, the available space in front, etc.

This results in an increase of the active length of the blade. In addition, the shoulder chamfer aims at reducing the possibility of hair clogging.

In various embodiments of the invention, one and/or the other of the following features may be incorporated in this skin contact member alone or in mutual combination:

The teeth are stepped to form rearwardly directed shoulders against which the cutting edge is positioned; in addition, each of the teeth is preferably tapered toward the shoulder.

Each of the teeth defines an elbow extending forwardly toward the front of the system;

The upper face of the teeth defines a trimming plane and wherein the cutting edge is comprised in a blade plane which is parallel to the trimming plane;

The lower face of each of the teeth is flat and wherein the lower face of each of the teeth is partly adjacent to the blade;

The lateral faces of each of the teeth extend parallel each other;

The cutting edge is elongated and defines a longitudinal axis and wherein the lateral faces of each of the teeth extend parallel to each other and extend transversally to said longitudinal axis;

The cutting edge is elongated and defines a longitudinal axis and wherein the lateral faces of each of the teeth extend parallel each other and extend perpendicularly to said longitudinal axis;

The teeth are spaced each other by an interval having a value comprised between 1 mm and 5 mm.

Each of the teeth has a length having a value comprised between 1 mm and 15 mm. More preferably, the

length has a value comprised between 0,5 mm and 11 mm, preferably about 10,3 mm.

Each of the teeth has a width having a value comprised between 1 mm and 4 mm. More preferably, the width has a value comprised between 0,8 mm and 4 mm. The number of teeth is comprised between 10 and 20.

The trimming blade system further comprises a spacer sandwiched between the blade and the supporting plate.

The comb is provided on the cover plate.

The comb is provided on the support plate.

Another object of the invention is to provide a razor comprising a razor handle and such a trimming blade system, the trimming blade system being provided with connecting means for connecting the trimming blade system to the razor handle. The razor handle can be connected to the trimming blade system pivotally or not; when the connection is pivotable, the connecting means can comprise shell bearings preferably provided on the trimming blade system. In addition, the razor handle can be provided with a lock and release mechanism allowing the trimming blade system to be detachable from the razor handle.

Another object of the invention is to provide a razor comprising a razor handle, a shaving head and such a trimming blade system, the shaving head being provided with connecting means for connecting the shaving head to the razor handle. The razor handle can be connected to the shaving head pivotally or not; when the connection is pivotable, the connecting means can comprise shell bearings preferably provided on the shaving head. In addition, the razor handle can be provided with a lock and release mechanism allowing the shaving head to be detachable from the razor handle.

BRIEF DESCRIPTION OF THE DRAWINGS

Other characteristics and advantages of the

invention will readily appear from the following description of several embodiments, provided as non-limitative examples, in reference to the accompanying drawings.

In the drawings:

Figure 1A is a front view of a razor according to the invention, the razor comprising a trimming blade head and a razor handle.

Figure 1B is a front view of a razor according to another embodiment, the razor comprising a trimming blade head and a razor handle.

Figure 1C is a front view of a razor according to another embodiment, the razor comprising a trimming blade system, a shaving head and a razor handle.

Figure 2A is a partial lower view of the razor of figure 1A.

Figure 2B is a partial lower view of the razor of figure 1B.

Figure 3A is a perspective exploded view of the trimming blade head of figure 1A.

Figure 3B is a perspective exploded view of the trimming blade head of figure 1B.

Figure 3C is a perspective exploded view of a trimming blade head according to another embodiment.

Figure 4A is a partial longitudinal sectional view of the trimming blade head of figure 1A along line IVA-IVA.

Figure 4B is a partial longitudinal sectional view of the trimming blade head of figure 1B along line IVB-IVB.

Figure 5A is a detailed sectional view of trimming blade head of figure 4A.

Figure 5B is a detailed sectional view of the trimming blade head of figure 4B.

Figure 6A is lower view of the cover plate of the trimming blade head of figure 1A.

Figure 6B is lower view of the cover plate of the

trimming blade head of figure 1B.

Figure 7A is a transversal sectional view of the trimming blade head of figure 1A along line VIIA-VIIA.

Figure 7B is a transversal sectional view of the trimming blade head of figure 1B along line VIIB-VIIB.

Figure 7C is a partial view of detail VIIC of the trimming blade head of figure 7A.

Figure 8A is a partial lower perspective view of the cover plate of the trimming blade head of figure 1A.

Figure 7D is a partial view of detail VIID of the trimming blade head of figure 7B.

Figure 8B is a partial lower perspective view of the cover plate of the trimming blade head of figure 1B.

On the different Figures, the same reference signs designate identical or similar elements.

DETAILED DESCRIPTION OF THE DISCLOSURE

The Figures illustrate a wet razor 10 according to the invention, comprising a razor handle 12 and a trimming blade system 14.

As best seen on Figure 1A and 1B, the trimming blade system 14 is provided on a trimming blade head 14 (or head 14). This trimming blade head 14 according to the invention has a front 14A and a rear 14B opposite the front 14A.

Figures 1C and 3C illustrate other embodiments, in which the trimming blade system 14 is provided on a protector 14 that can be attached to a shaving head 13. In that case, the user can shave traditionally when the trimming blade system 14 is detached from the shaving head 13 and the user can trim when the trimming blade system 14 is attached onto the shaving head 13. As an example, the trimming blade system 14 can be slidably attached to the blade head 13. It can also be snap-fitted on the blade head 13.

The following description will be done with regard

to a trimming blade head 14 as depicted on Figures 1A and 1B, however it applies to a trimming blade system 14 provided on a protector as depicted on Figure 1C or 3C.

The trimming blade head 14 comprises at least one blade 16, but might be provided with several blades. Blade 16 has a cutting edge 16A facing forwardly toward the front 14A of the head 14. The cutting edge 16A is preferably elongated and defines a longitudinal axis X-X.

The trimming blade head 14 further comprises a comb 18 provided with teeth 20. The teeth 20 project forwardly toward the front 14A of the head 14. The teeth 20 overlap the cutting edge 16 (see figures 1A-1B and 2A-2B).

As best seen on the exploded view of figures 3A and 3B, the trimming blade head 14 comprises a supporting plate 22 and a cover plate 24.

The trimming blade system has further a comb 18 provided with teeth 20.

The comb 18 can be provided on the cover plate 24 as best visible on the embodiments depicted on Figures 1A-1C and 3A-3B.

In another embodiment, as depicted on Figure 3C, the comb 18 can be provided on the support plate 22. The description is given in reference to the embodiments in which the comb 18 is provided on the cover plate 24, but one skill in the art should understand that it applies also to any other embodiments of the invention, especially to the one in which the comb 18 is provided on the support plate 22, apart when a specific description is given for a specific embodiment. This embodiment in which the comb 18 is provided on the support plate 22 is disclosed and depicted (see Figure 3C) with regard to a trimming blade system 14 provided on a protector 14 that can be attached to a shaving head 13; however, one might understand that an embodiment in which the comb is provided on the support plate, the trimming blade system 14 being provided on a

trimming blade head 14 (or head 14) is also covered by the present invention.

Actually, the invention concerns a comb provided on a trimming blade system, the trimming blade system being provided either on a trimming blade head (or head), and/or on a protector that can be attached to a shaving head. In each case, the comb can be provided on the cover plate and/or on the support plate.

The front 14A and the rear 14B of the trimming blade head 14 correspond to the front 24A and a rear 24B (opposite the front 24A) of the cover plate 24.

As depicted on the figures, blade 16 can be flat. Blade 16 is preferably supported by a spacer 26 sandwiched between the blade 16 and the supporting plate 22. When the trimming blade head 14 is provided with several blades (not illustrated), the trimming blade head 14 is accordingly provided with several spacers; the blades and the spacers being alternatively superimposed.

Besides, the blade could be supported by a blade support which might be curved. The blade could also be a curved blade.

As illustrated on the figures, each of the teeth 20 has an upper face 20A and two lateral faces 20B and 20C. The lateral faces 20B and 20C of each of the teeth 20 extend preferably parallel each other. In other words, the lateral face 20B is parallel to the lateral face 20C of a tooth 20. In addition, the lateral faces 20B and the lateral faces 20C of all the teeth 20 are parallel each other.

Besides, the lateral faces 20B and 20C of each of the teeth 20 can extend transversally to the longitudinal axis X-X (see figures 1A-1B and 2A-2B). Actually, lateral faces 20B and 20C of each of the teeth 20 can extend along a transversal axis Y-Y. The axis Y-Y can be oblique, or as illustrated on figures 1A and 1B, it can be perpendicular

to the longitudinal axis X-X when the faces 20B and 20C of each of the teeth 20 are perpendicularly to the cutting edge 14A.

As visible on figures 2A-2B and 4A and 4B, each of the teeth 20 has a lower face 20D. The lower face 20D of each of the teeth 20 is preferably flat as best visible on figures 4A-4B, 5A-5B and 6A-6B. Besides, the lower face 20D of each of the teeth 20 is partly adjacent to the blade 16. Actually, the blade 16 has an upper face 16B and a lower face 16C (opposite the upper face 16B). In the embodiments in which the comb 18 is provided on the cover plate 24 and as depicted on figures 2A-2B and 4A and 4B, the lower face 20D of the teeth is in contact with the upper face 16B of the blade 16. In the embodiment in which the comb 18 is provided on the support plate 22 as depicted on Figure 3C, the lower face 20D of the teeth is in contact with the lower face 16C of the blade 16 or at least is in front of it.

Due to the comb 18, the teeth 20 form during trimming an obstacle to the blade 16 for the hairs. In order to increase the active length of the blade 16, the lower face 20D of each of the teeth 20 is joined to the lateral faces 20B-20C by opposite chamfered faces 20E and 20F. In other words, all things being equal, when considering an effective area located between the teeth, the effective area A1 of the teeth (see Figures 2A and 2B) according to the invention (i.e. provided with chamfered faces 20D) is greater than the effective area A2 of teeth provided without chamfered faces (equivalent to area A2 depicted on figures 1A-1B).

In reference to figures 5A-5B, the lower face 20D of each of the teeth 20 is joined to the lateral face 20B by the chamfered face 20E, respectively, the lower face 20D of each of the teeth 20 is joined to the lateral face 20C by the chamfered face 20F. Therefore, for a given blade's

length, the active length of the cutting edge 16 is increased with regard to the same blade with a comb the teeth of which are not chamfered. With the invention, there is no necessity to increase the number of teeth to increase the active length of the blade. With the invention, the available space in front of the cutting edge of the blade is increased; thus, the number of hairs cut during one single stroke may be increased.

The dimensions of the teeth can be defined as following:

- W20BC: width of one tooth between the lateral faces 20B and 20C of one tooth 20 (along the longitudinal axis X-X)
- W20CB: interval between two adjacent teeth between corresponding lateral face 20C of one tooth and corresponding lateral face 20B of tooth adjacent to said one tooth (along the longitudinal axis X-X)
- W20D: width of one tooth between the chamfered faces 20E and 20F of one tooth 20 (along the longitudinal axis X-X), measured on the smallest width which corresponds to the width of the lower face 20D.

According to the invention, the teeth are spaced each other by an interval W20CB having a value which can be comprised between 1 mm and 5 mm.

Besides, the teeth have a width W20BC having a value which can be comprised between 1 mm and 4 mm.

The number of teeth is preferably comprised between 10 and 20.

As an example, for a cutting edge having a length of 35,0 mm and thirteen teeth of a width W20BC equal to 1,37 mm, the active length of the cutting edge is of about to 17,1 mm when the teeth are not provided with chamfered faces, whereas it is equal to about 26,2 mm when the teeth

are chamfered and the width W20D is reduced to about 0,68 mm. Thus, with these dimensions of the teeth, for a given blade's length, the active length of the cutting edge 16 is increased by up to about 53%.

As depicted on the figures, the chamfered faces 20E and 20F can be opposite and the tooth is symmetric; in other words, the reduced width W20D is obtained by the subtraction of two identical values ℓ20E and ℓ20F (see figures 5a and 5B). The teeth could be asymmetric; in that case the value of ℓ20E is different from the one of ℓ20F. In any case, the increase of the active length of the blade corresponds to the addition of the ℓ20E and ℓ20F heighten by the number of teeth.

Besides, the teeth have a length L20 having a value which can be comprised between 1 mm and 15mm. In the example illustrated on figures 1A-8A, the length L20 of the teeth is of about 2 mm, whereas it is of about 1 mm in the example illustrated on figures 1B-8B.

When the comb 18 is provided on the cover plate 24, the upper face 20A of the teeth defines a trimming plane P20. Actually, the upper face 20A of each of the teeth is preferably flat and the upper faces 20A all the teeth are coplanar. Besides, a blade plane P16A can be defined; the blade 16 is generally flat (see figures 3A and 3B) and extend in a plane; more precisely both faces 16B and 16C of the blade 16 are in two planes which are parallel and the cutting edge 16A is comprised in said blade plane P16A which is parallel to both planes containing faces 16B and 16C; the blade plane P16A is also parallel to the trimming plane P20 (as best seen on figures 7A and 7B).

As depicted on figures 7A-7B and 8A-8B, the teeth 20 can be stepped to form rearwardly directed shoulders 28 against which the cutting edge 16A is positioned. The teeth define elbows 30 extending forwardly toward the front 14A

of the head 14.

In other words, each tooth is back on itself; in the vicinity of the elbow 30, the upper face 20A of each tooth 20 is folded inward toward the lower face 20D and toward the cutting edge 16A. In the vicinity of the elbow, the lower face 20D of each of the teeth 20 is facing each other, especially contacting each other.

In addition, the teeth 20 can be tapered toward the shoulder 28. In the vicinity of the blade 16, as in the vicinity of the elbow 30, the lateral faces 20B and 20C are parallel each other. However, the shoulder 28 is connected to these lateral faces 20B and 20C via oblique faces 20G and 20H. The fact that the lateral faces 20B and 20C join the shoulder 28 in being tapered reduce the possibility of hairs clogging; actually, unwanted hairs can trap in the gap provided between the cutting edge and the shoulder. With the oblique faces 20G and 20H, this gap is reduced.

The oblique faces or chamfers 20E, F, G, H are provided to increase the affecting cutting area, to increase blade edge contact. The shoulder 28 against which the cutting edge 16A is positioned can be either a sole rectilinear face, directly arriving to the corresponding lower face 20D of each of the teeth 20 as depicted in detail on Figure 7C or it can be in two rectilinear parts as depicted in detail on Figure 7D. More precisely, the shoulder 28 has in that last case, a first face 28A and an oblique face 28B transversal to both faces 28A and 20D, defining an additional shoulder chamfer 28B. The chamfer 28B focuses on clogging reduction only by closing (i.e. reducing substantially) the gap 29 that may exists between the blade edge 16A and the shoulder 28.

In order to be connected to a razor handle 12 as depicted on figures 1A-1B, the trimming blade head is provided with connecting means 32. These connecting means 32 can allow a pivotal motion of the trimming blade head 14

with regard to the razor handle 12 along a pivotal axis (not illustrated). The pivotal axis can be parallel to the longitudinal axis X-X. When the trimming blade head 14 is pivotally connected to the razor handle 12, the connecting means 32 can comprise shell bearings 32.

A lock and release mechanism (not illustrated) can be provided such that the trimming blade head can be attached to and detached from the razor handle.

The supporting plate 22, like the cover plate 24 may comprise many materials and preferably a plastic, for instance a thermoplastic like ABS. In some cases, it may be desired to have a metal cover plate to improve accuracy and to achieve better. The comb 18 and its teeth 20 are preferably made unitary with the cover plate 24 in order to form a sole element.

CLAIMS

1. A trimming blade system having a front (14A) and comprising a supporting plate (22), a blade (16) and a cover plate (24), the blade (16) having a cutting edge (16A) facing forwardly toward the front (14A) of the trimming blade system (14), the trimming blade system having a comb (18) provided with teeth (20) which project forwardly toward the front (14A) of the trimming blade system (14) and which overlap said cutting edge (16A), each of the teeth (20) having an upper face (20A), two lateral faces (20B, 20C) and a lower face (20D), wherein the lower face (20D) of each of the teeth (20) is joined to the lateral faces (20B, 20C) by opposite chamfered faces (20E, 20F).

2. A trimming blade system having a front (14A) and comprising a supporting plate (22), a blade (16) and a cover plate (24), the blade (16) having a cutting edge (16A) facing forwardly toward the front (14A) of the trimming blade system (14), the trimming blade system having a comb (18) provided with teeth (20) which project forwardly toward the front (14A) of the trimming blade system (14) and which overlap said cutting edge (16A), wherein the teeth (20) are stepped to form rearwardly directed shoulders (28) against which the cutting edge (16A) is positioned and wherein each of the shoulders (28) is provided with a shoulder chamfer (28B).

3. The trimming blade system of claim 1, wherein the teeth (20) are stepped to form rearwardly directed shoulders (28) against which the cutting edge (16A) is positioned.

4. The trimming blade system of claim 3, wherein each of the shoulders (28) is provided with a shoulder chamfer (28B).

5. The trimming blade system of anyone of claims 2 to 4, wherein each of the teeth (20) is tapered toward the shoulder (28).

6. The trimming blade system according to anyone of the preceding claims, wherein each of the teeth (20) defines an elbow (30) extending forwardly toward the front (14A) of the trimming blade system (14).

7. The trimming blade system according to anyone of the preceding claims, wherein the lower face (20D) of each of the teeth (20) is flat and wherein the lower face (20D) of each of the teeth (20) is partly adjacent to the blade (16).

8. The trimming blade system according to anyone of the preceding claims, wherein the lateral faces (20B, 20C) of each of the teeth (20) extend parallel each other.

9. The trimming blade system according to anyone of the preceding claims, wherein the cutting edge (16A) is elongated and defines a longitudinal axis (X-X) and wherein the lateral faces (20B, 20C) of each of the teeth (20) extend parallel each other and extend transversally to said longitudinal axis (X-X).

10. The trimming blade system according to anyone of the preceding claims, wherein the cutting edge (16A) is elongated and defines a longitudinal axis (X-X) and wherein the lateral faces (20B, 20C) of each of the teeth (20) extend parallel each other and extend perpendicularly to said longitudinal axis (X-X).

11. The trimming blade system according to anyone of the preceding claims, wherein the teeth (20) are spaced each other by an interval (W20CD) having a value comprised between 1 mm and 5 mm.

12. The trimming blade system according to anyone of the preceding claims, wherein each of the teeth (20) has a length (L20) having a value comprised between 1 mm and 15 mm.

13. The trimming blade system according to anyone of the preceding claims, wherein each of the teeth (20) has a width (W20BC) having a value comprised between 1 mm and 4 mm.

14. The trimming blade system according to anyone of the preceding claims, wherein the number of teeth (20) is comprised between 10 and 20.

15. The trimming blade system according to anyone of the preceding claims, further comprising a spacer (26) sandwiched between the blade (16) and the supporting plate (22).

16. The trimming blade system according to anyone of claims 1-15, wherein the comb (18) is provided on the cover plate (24).

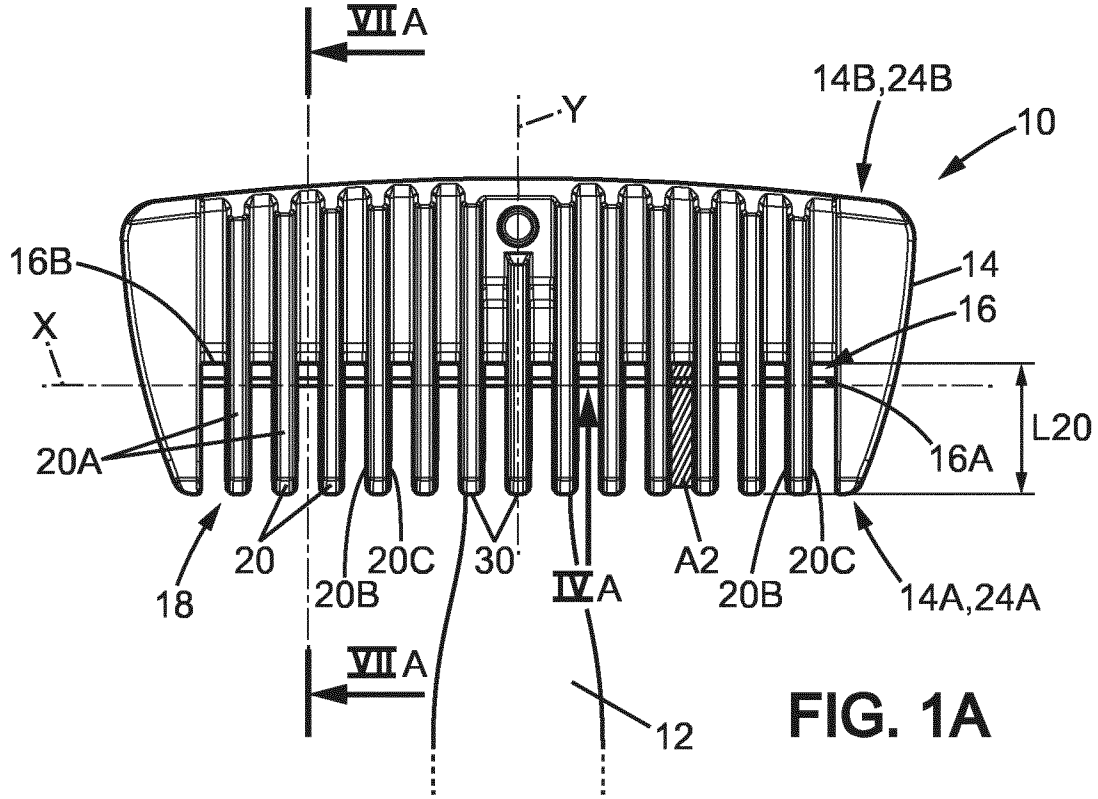
17. The trimming blade system according to anyone of claims 1-15, wherein the comb (18) is provided on the support plate (22).

18. The trimming blade system according to claim 16 and to anyone of the preceding claims, wherein the upper face (20A) of the teeth (20) defines a trimming plane (P20) and wherein the cutting edge (16A) is comprised in a blade plane (P16A) which is parallel to the trimming plane (P20).

19. A razor comprising a razor handle (12) and a trimming blade system (14) according to anyone of the preceding claims, wherein the trimming blade system (14) is provided with connecting means (32) for connecting the trimming blade system (14) to the razor handle (12).

20. A razor comprising a razor handle (12), a shaving head (13) and a trimming blade system (14) according to anyone of claims 1 to 18, wherein the shaving head (13) is provided with connecting means (32) for connecting the shaving head (13) to the razor handle (12).

21. The razor according to claim 19 or to claim 20, wherein the connecting means comprises shell bearings (32).


VII A
Y
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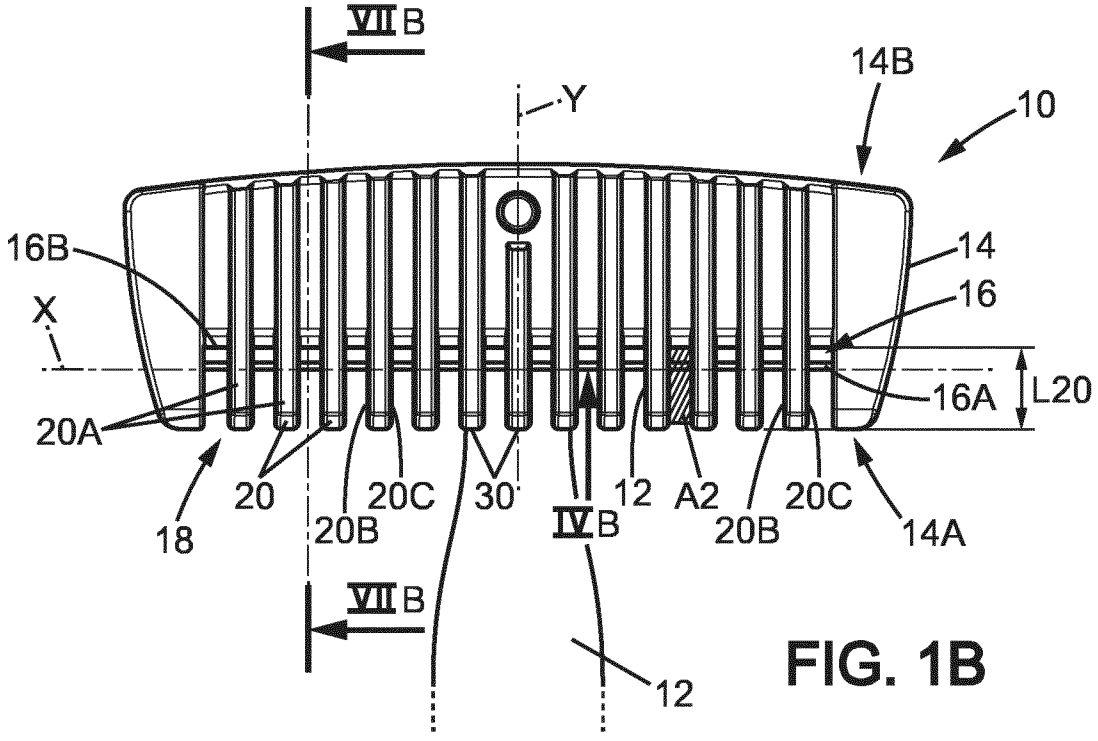
10
16B
14
X
16
L20
16A
20A
18
20
20C
30
IV A
A2
20B
20C
14A,24A
VII A
12

FIG. 1A


VII B
Y
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10
16B
14
X
16
16A
L20
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18
20
20C
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12
A2
20B
20C
IV B
14A
VII B
12

FIG. 1B

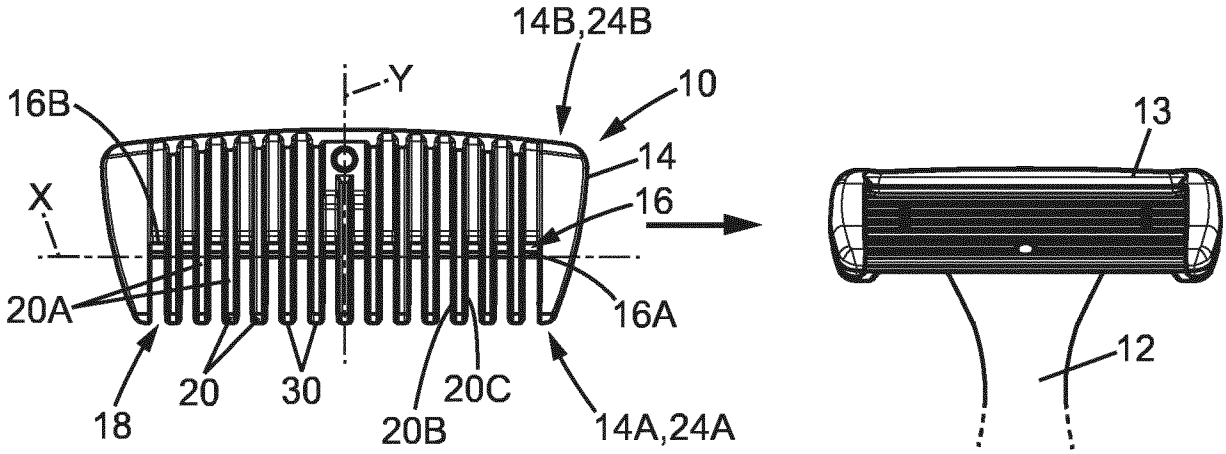
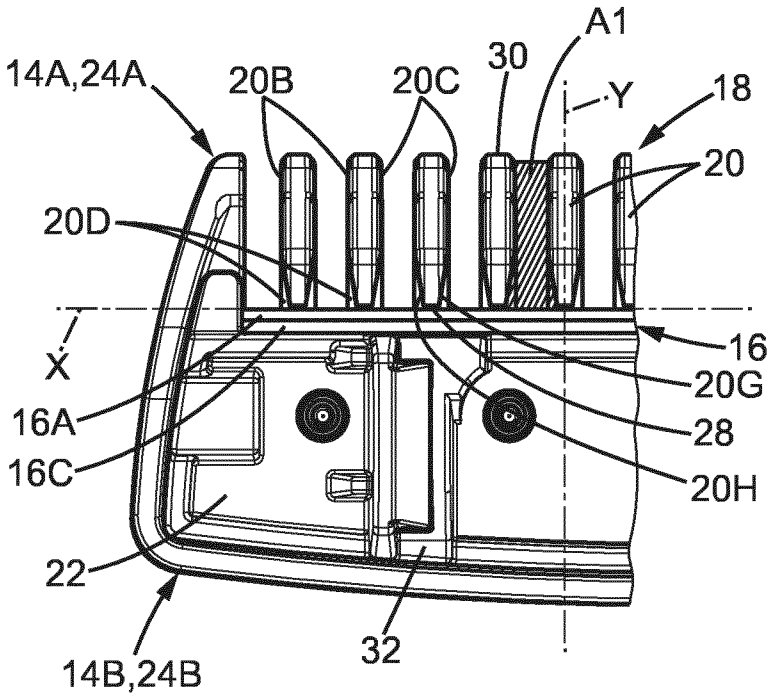


FIG. 1C


14A,24A
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A1
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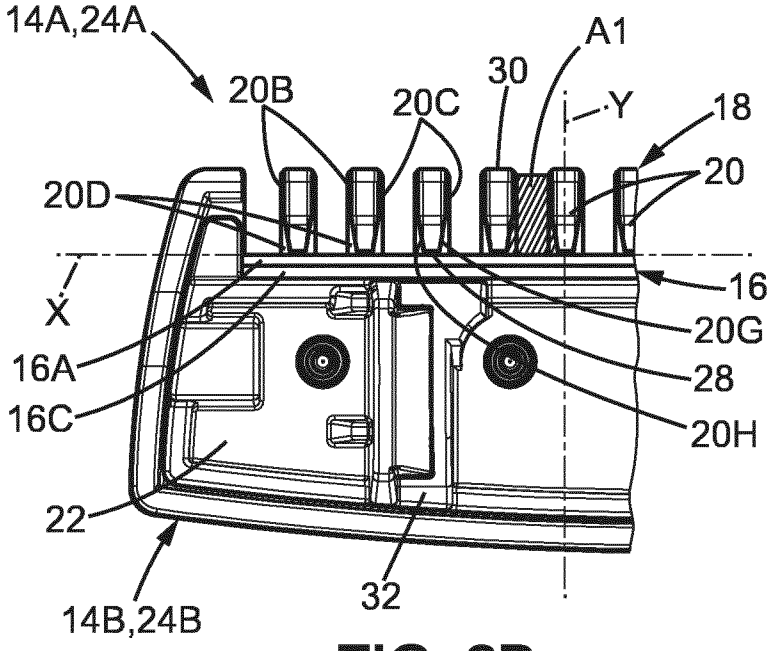
20
20D
X
16
20G
28
16A
16C
20H
22
14B,24B
32

FIG. 2A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A1
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20
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X
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16A
16C
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22
14B,24B
32

FIG. 2B

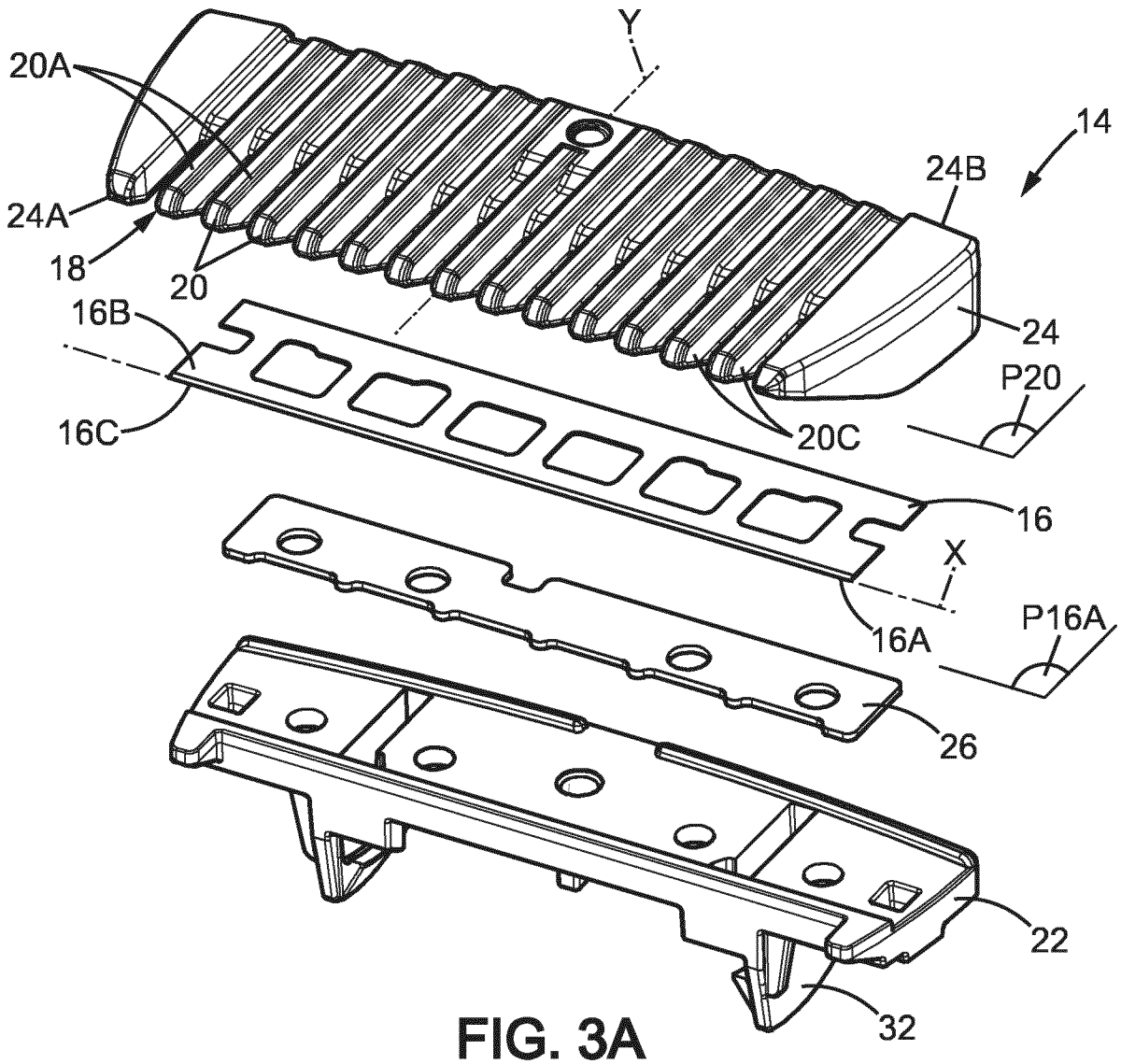


FIG. 3A

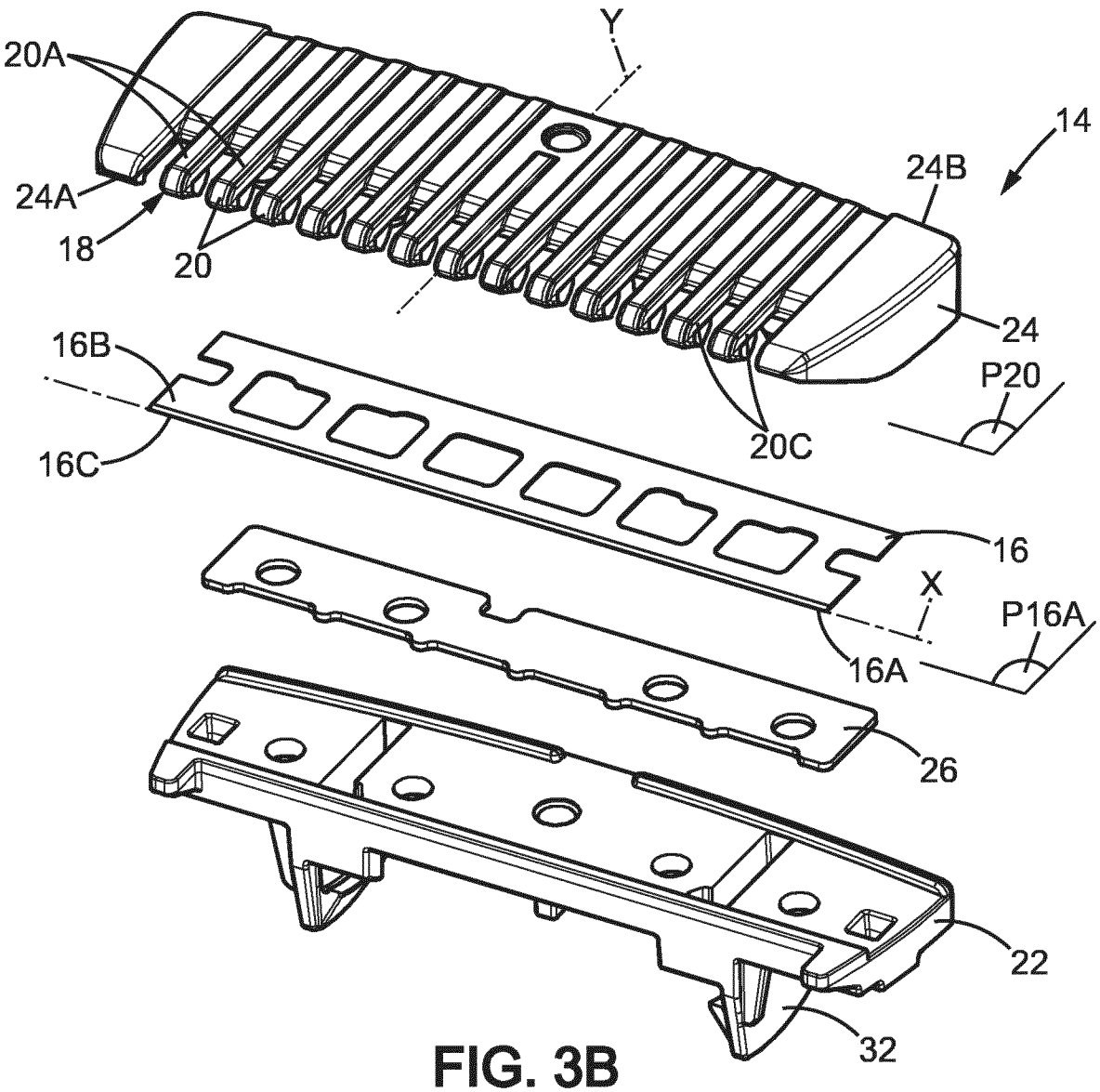


FIG. 3B

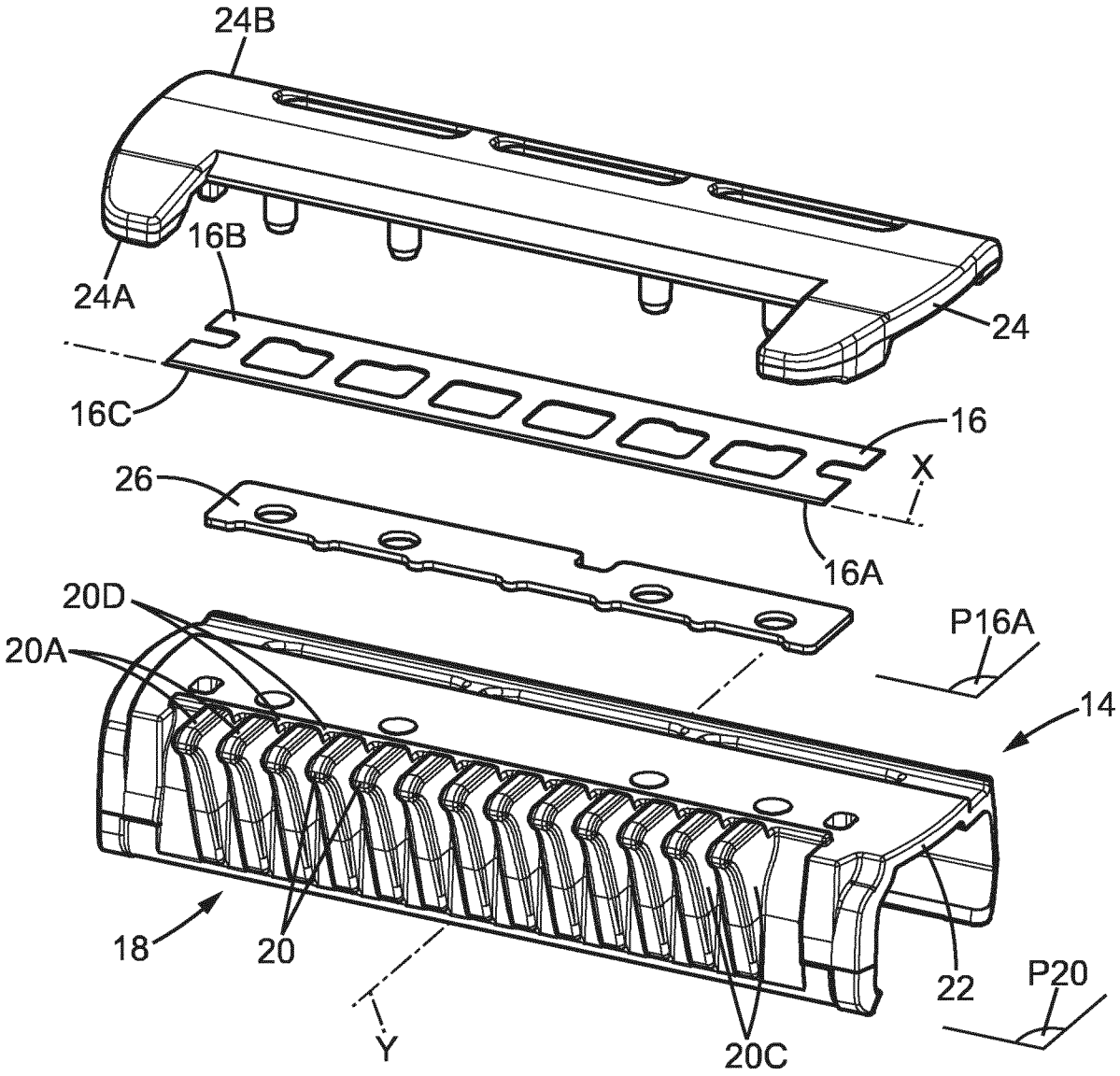
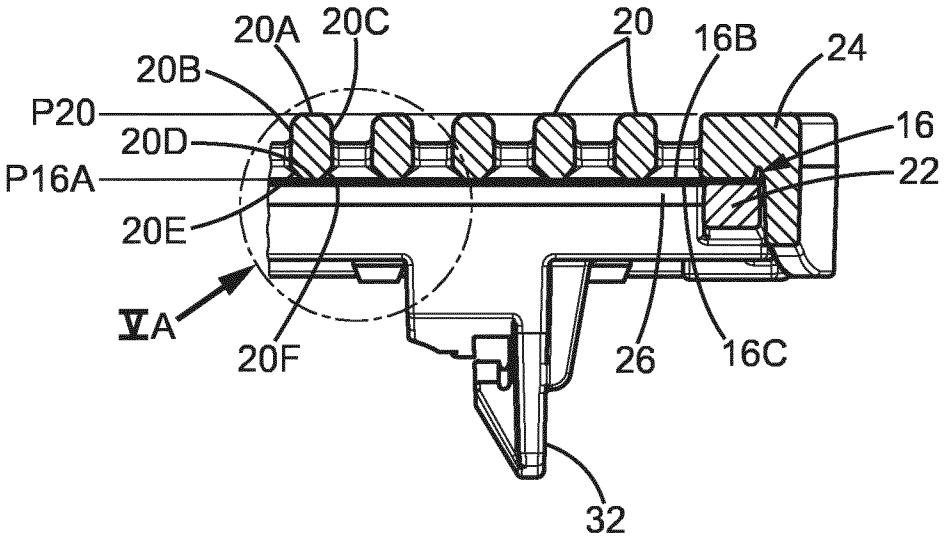


FIG. 3C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P16A
20E
VA
20F
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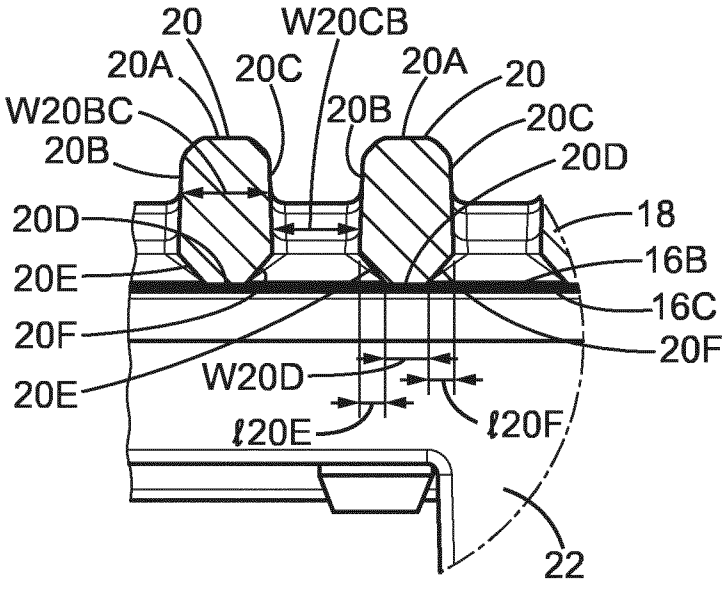
16C
32

FIG. 4A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20C
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20C
20D
20D
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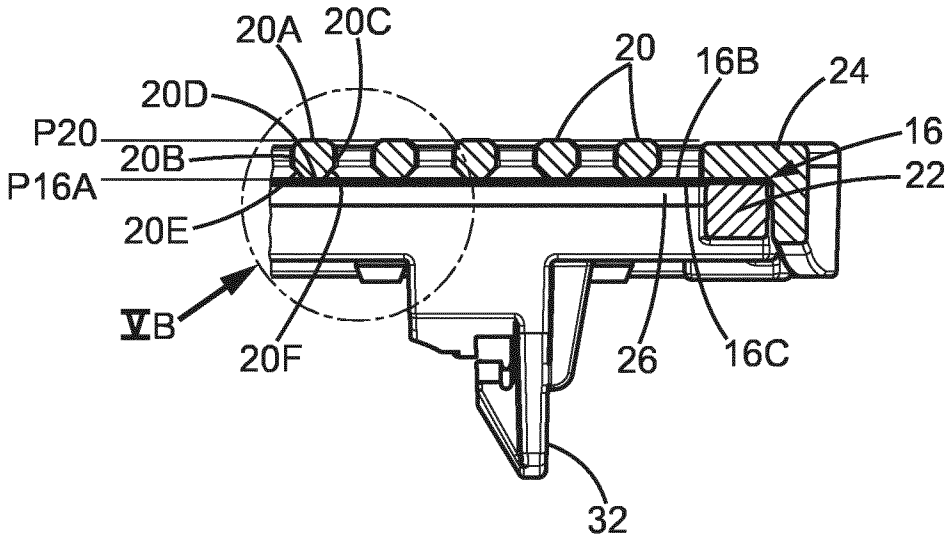
20E
16B
16C
20F
20F
W20D
20E
ℓ20E
ℓ20F
22

FIG. 5A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16B
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20D
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20B
22
P16A
20E
VB
20F
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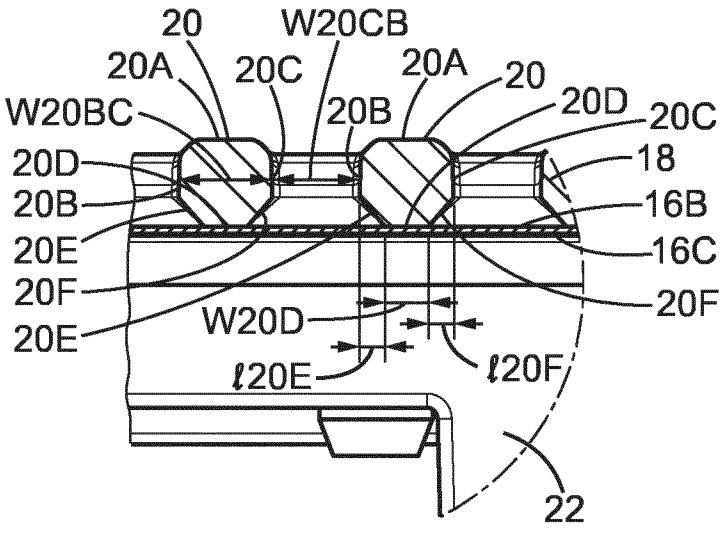
16C
32

FIG. 4B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20C
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W20BC
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20C
20D
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20E
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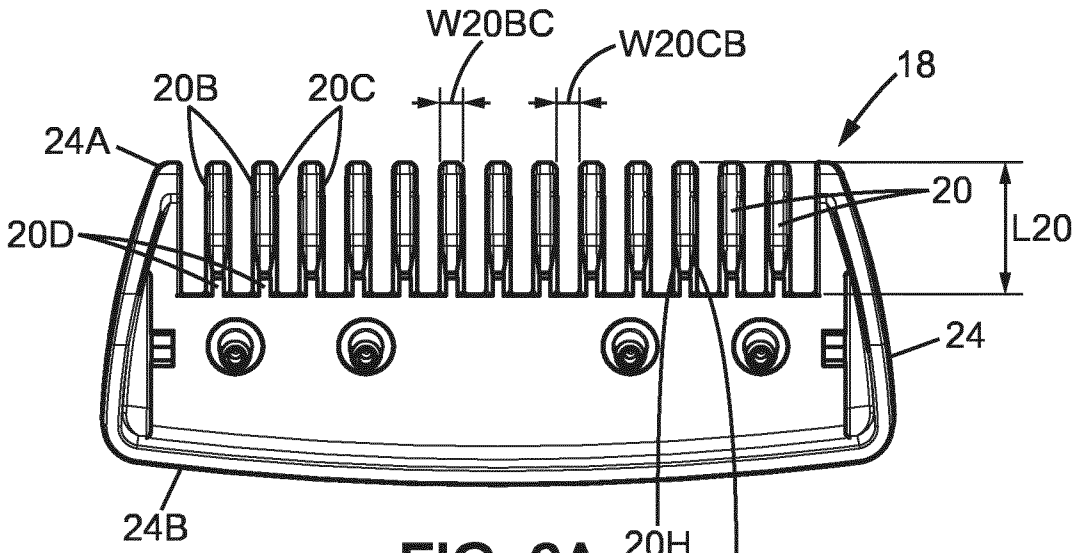
W20D
20E
ℓ20E
ℓ20F
22

FIG. 5B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24A
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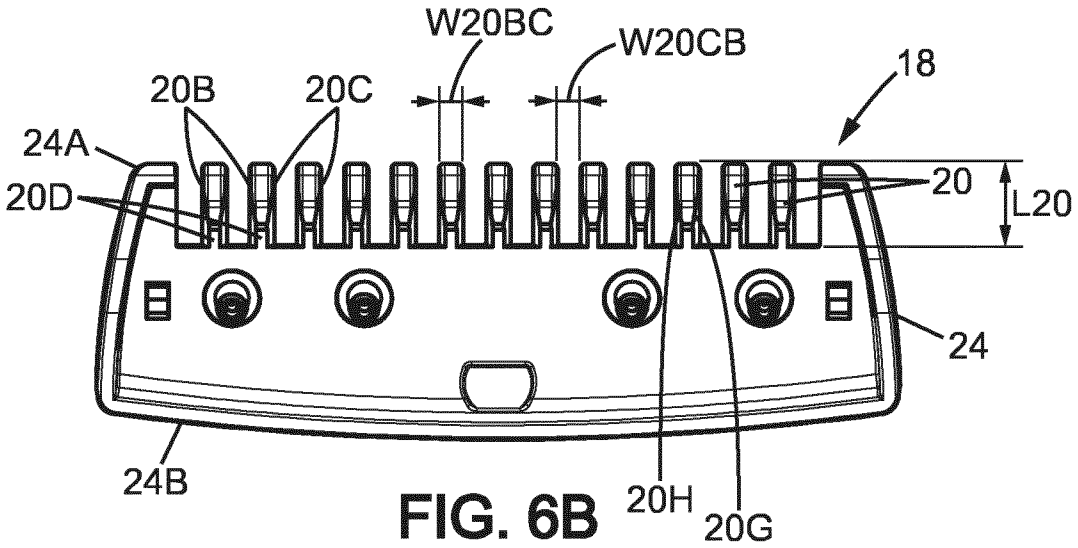
L20
20D
24
24B
20H
20G

FIG. 6A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24A
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L20
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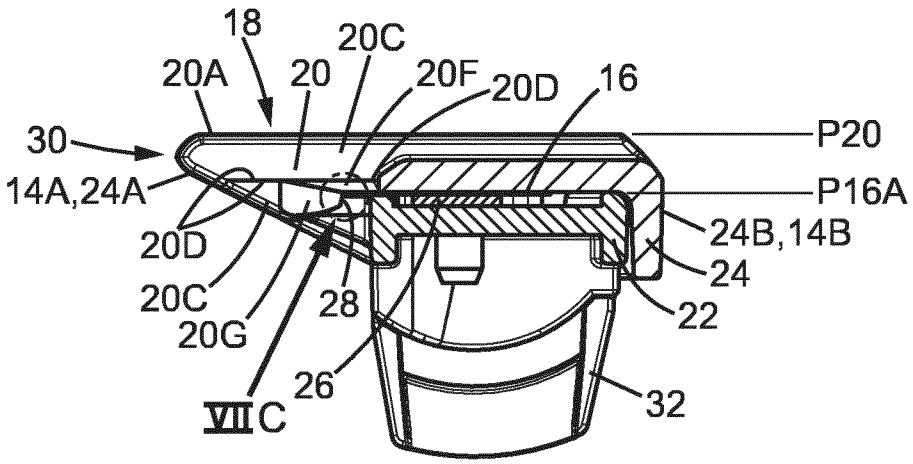
24B
20H
20G

FIG. 6B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P20
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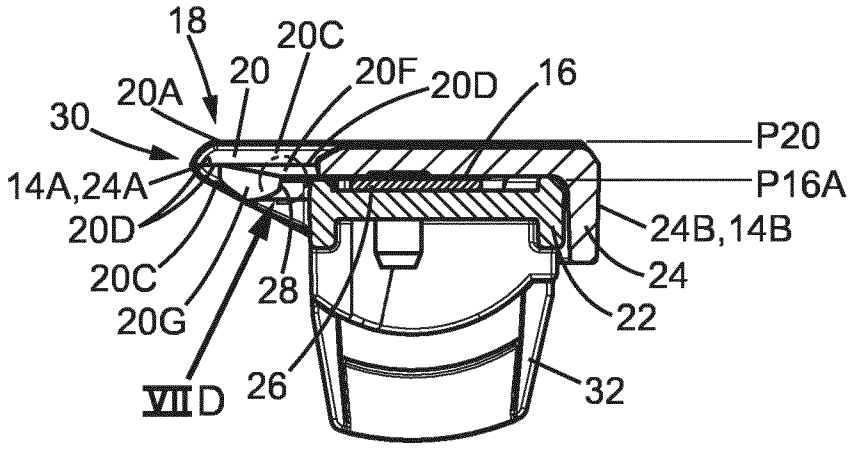
P16A
20D
24B,14B
24
20C
28
22
20G
26
32
VII C

FIG. 7A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P20
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P16A
20D
24B,14B
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20C
28
22
20G
26
32
VII D

FIG. 7B

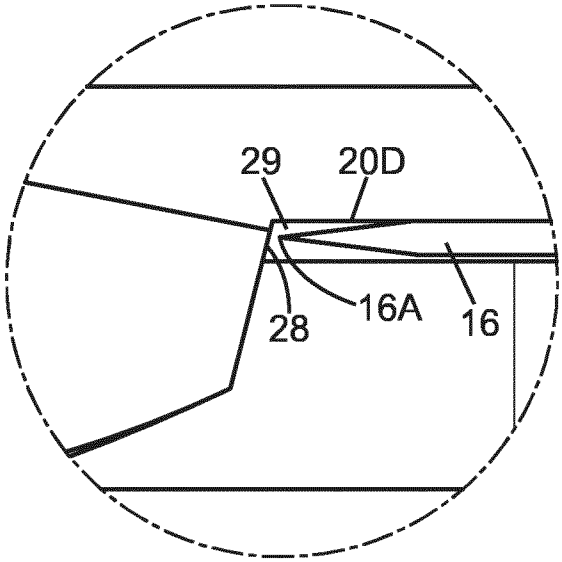

FIG. 7C

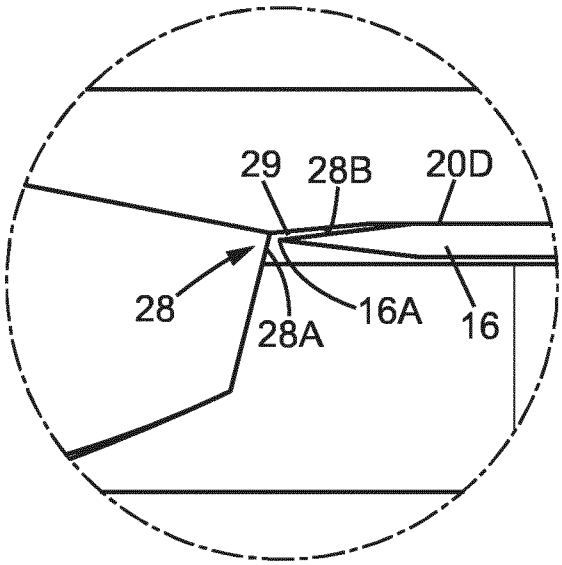

FIG. 7D

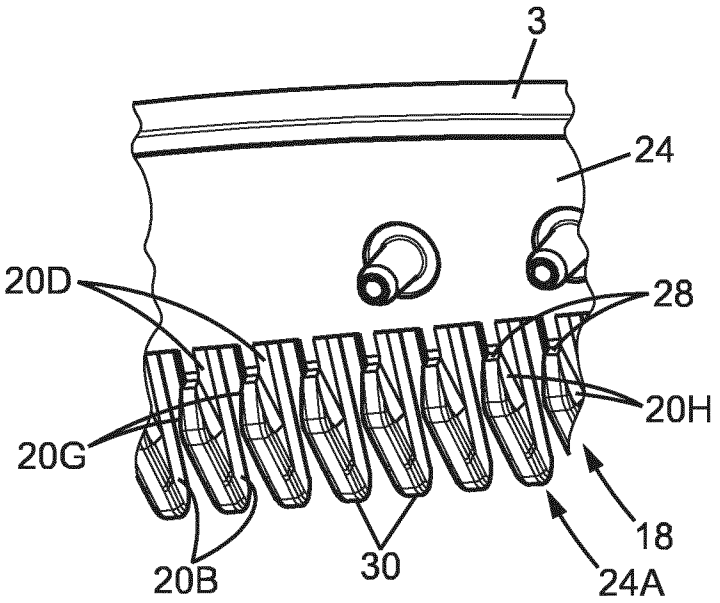

FIG. 8A

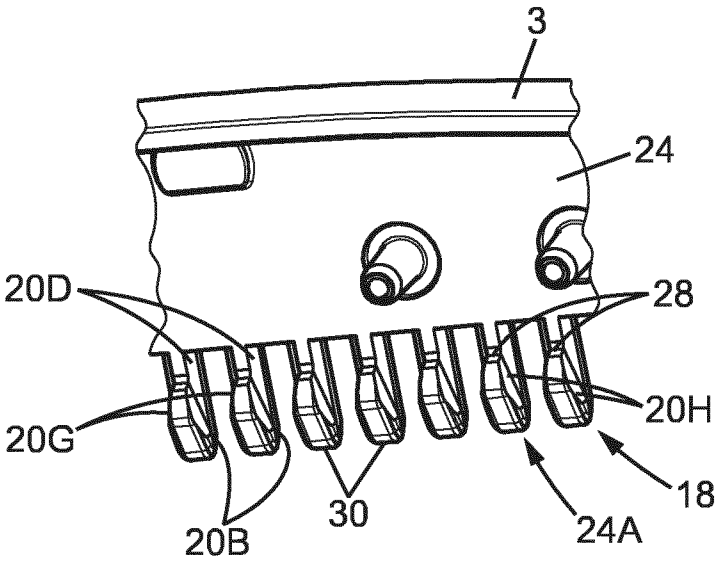

FIG. 8B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/066975

A. CLASSIFICATION OF SUBJECT MATTER
INV. B26B21/42 B26B21/40
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B26B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 802 752 A (WM PENN LTD) 8 October 1958 (1958-10-08) page 1, line 54 - page 2, line 2; figures 1, 2	1-21
A	US 2009/218252 A1 (MICHEL MATTHEW JUSTIN [US]) 3 September 2009 (2009-09-03) paragraphs [0144], [0145]; figures 27-30	1-21
A	US 5 386 750 A (MORRISON DAVID J [US]) 7 February 1995 (1995-02-07) column 3, line 44 - column 4, line 31; figures 1, 2	1-21
A	US 2010/011586 A1 (NICOLL ROY [GB] ET AL) 21 January 2010 (2010-01-21) paragraph [0035]; figures 1-3	1-21

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 March 2015	16/04/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Rattenberger, B

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/066975

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 612 684 A (MANSFIELD WARREN M) 7 October 1952 (1952-10-07) column 3, lines 8-17; figures 1-4 -----	1-21

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2014/066975

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2009218252 A1	03-09-2009	NONE	
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		JP 2011527934 A	10-11-2011
		US 2010011586 A1	21-01-2010
		WO 2010009181 A2	21-01-2010
US 2612684 A	07-10-1952	NONE	