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(54) **TOOTHBRUSH AND DEVICE FOR MOUNTING AND/OR DEMOUNTING A TOOTHBRUSH HEAD**

(57) The present invention provides a toothbrush and a device for attaching and/or detaching a toothbrush head. The toothbrush comprises a handle comprising a grip portion and a head attaching portion connected to the grip portion, a head comprising a body and bristles mounted to a first side of the body, the body further having a second side opposite to the first side, wherein a first hole is formed in one of the head attaching portion and the second side of the body, and a corresponding protruding plug is formed on the other of the head attaching portion and the second side of the body, the head is removably attached to the head attaching portion by inserting the protruding plug into the first hole. According to the present invention, the handle can be reused to improve resource utilization and reduce the amount of waste to be treated, as well as to enable the attachment and/or detachment of the head to be labor-savingly, easily and efficiently conducted.

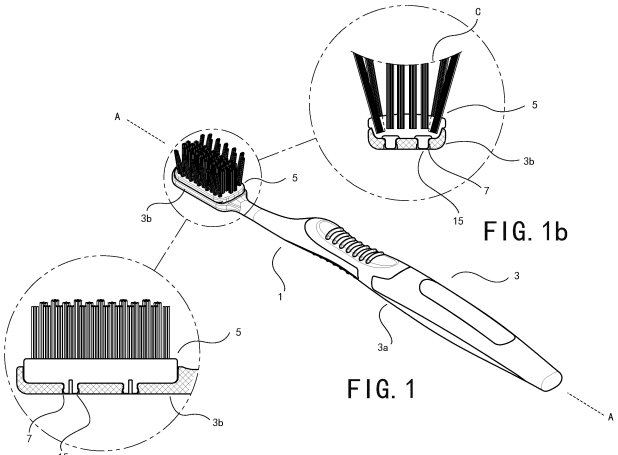


FIG. 1b

FIG. 1

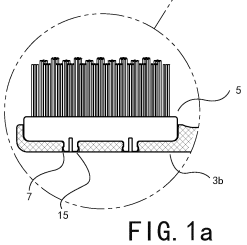


FIG. 1a

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## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates to a toothbrush and a device for attaching and/or detaching a toothbrush head.

### BACKGROUND OF THE INVENTION

**[0002]** According to dentists' recommendations, people should brush their teeth at least twice a day and replace their toothbrushes at least every three months. Thus, the consumption of toothbrushes worldwide is extremely high. When replacing a toothbrush, people usually replace the old one with a new one and dispose of the old toothbrush as waste. However, only the bristles on the head of the old toothbrush are not suitable for further use in brushing the teeth while the handle can continue to be used. Discarding the entire old toothbrush would result in a large waste of resources and a significant increase in the amount of waste to be treated.

**[0003]** Therefore, there is a need to improve the existing toothbrush.

### SUMMARY OF THE INVENTION

**[0004]** It is an object of the present invention to overcome at least one defect of above-mentioned existing toothbrushes and to provide an improved toothbrush that allows the handle to be reused when the bristles on the head are not suitable for further use in cleaning the teeth, in order to improve resource utilization and reduce the amount of waste to be treated.

**[0005]** A further object of the present invention is to provide a device for attaching and/or detaching a toothbrush head. This device enables a head to be easily attached to a handle and/or enables a head to be easily detached from a handle.

**[0006]** According to an aspect of the present invention, there is provided a toothbrush comprising:

a handle comprising a grip portion and a head attaching portion connected to the grip portion;
a head comprising a body and bristles mounted to a first side of the body, the body further having a second side opposite to the first side;
wherein a first hole is formed in one of the head attaching portion and the second side of the body, and a corresponding protruding plug is formed on the other of the head attaching portion and the second side of the body, the head is removably attached to the head attaching portion by inserting the protruding plug into the first hole.

**[0007]** In one embodiment, the first hole is a through hole formed in the head attaching portion and the protruding plug is formed on the second side of the body.

**[0008]** In one embodiment, four first holes are symmetrically distributed with respect to a longitudinal axis of the handle.

**[0009]** In one embodiment, the protruding plug comprises a root portion extending from the body and an end portion integral with the root portion but having an increased size, and an excised portion is formed in the protruding plug.

**[0010]** In one embodiment, the protruding plug comprises a root portion extending from the body and an end portion integral with the root portion but having an increased size, an excised portion is formed in the protruding plug, the first hole comprises a first portion corresponding to the root portion and a second portion corresponding to the end portion and having a larger size than the first portion.

**[0011]** In one embodiment, a radial size of the root portion is selected to be the same as or slightly smaller than a radial size of the first portion, and a radial size of the end portion is selected to be the same as or slightly smaller than a radial size of the second portion.

**[0012]** In one embodiment, a flange is formed around the periphery of the head attaching portion to define a concave space for accommodating the body, and the concave space has a size corresponding to the sizes of the body.

**[0013]** In one embodiment, the bristles comprise a first group of bristles arranged at the center of the body, a second group of bristles and a third group of bristles arranged symmetrically on either side of the first group of bristles along a longitudinal direction of the body, each group of bristles comprises a plurality of bristle clusters comprising a plurality of bristles combined together, the bristle clusters in the first group of bristles are arranged in a plurality of columns along the longitudinal direction of the body and separately apart from each other, each bristle cluster in the first group of bristles is arranged to be parallel to a plane passing through the longitudinal axis of the body and perpendicular to the first side, the bristle clusters in the second group of bristles and the third group of bristles are arranged in columns along the longitudinal axis of the body and separately from each other, each bristle cluster in the second group of bristles and the third group of bristles is arranged to be tilted outwardly with respect to the plane so that the gaps between the second group of bristles as well as the third group of bristles and the first group of bristles gradually increase in a direction along the plane away from the body.

**[0014]** In one embodiment, the second group of bristles and the third group of bristles each comprise at least two columns of bristle clusters, the column of bristle clusters in the at least two columns of bristle clusters away from the first group of bristles is tilted outwardly at a greater angle than the column of bristle clusters close to the first group of bristles.

**[0015]** In one embodiment, the bristles further comprise a fourth group of bristles arranged at the end of the

body away from the handle, the fourth group of bristles comprises at least one column of bristle clusters arranged in an arc.

**[0016]** In one embodiment, each bristle cluster in the fourth group of bristles is arranged to be tilted outwardly with respect to the center of the arc.

**[0017]** In one embodiment, a second hole is further formed in and extends through the head attaching portion.

**[0018]** According to other aspect of the present invention, there is provided a device for attaching a toothbrush head which is used for attaching a head to a handle of a toothbrush as above-mentioned comprising:

a lower housing;
an upper housing pivotally mounted to the lower housing; and
a lining component disposed in the lower housing;
wherein a head attaching cavity is formed in the lining component, a step for supporting an edge portion of the body is formed on an inner wall of the head attaching cavity, a protruding pressing portion is formed on a surface of the upper housing facing the lining component at a location corresponding to the head attaching cavity, the pressing portion can apply a force onto the head attaching portion to insert the protruding plug into the first hole when the head is supported in the head attaching cavity by the step and the protruding plug aligns with the first hole.

**[0019]** In one embodiment, the lining component is further formed with a recess opening to the head attaching cavity and for accommodating a portion of the handle.

**[0020]** In one embodiment, the lining component is further formed with a cleaning brush accommodating cavity.

**[0021]** In one embodiment, the lining component is further formed with a head accommodating cavity for accommodating a spare head.

**[0022]** In one embodiment, the lining component is formed separately from the lower housing and is mounted to the lower housing.

**[0023]** According to other aspect of the present invention, there is provided a device for detaching a toothbrush head which is used for detaching a head from a handle of a toothbrush as above-mentioned, a second hole being formed in and extending through the head attaching portion, the device comprising:

a lower housing;
an upper housing pivotally mounted to the lower housing; and
a lining component disposed in the lower housing;
wherein a head detaching cavity is formed in the lining component, a step for supporting the handle is formed on the inner wall of the head detaching cavity, a protruding pushing post is formed on a surface of the upper housing facing the lining component at a location corresponding to the head detaching cavity, the pushing post passing through the second hole can apply a force onto the body to disengage the protruding plug from the first hole when the head attached to the handle is placed in the head detaching cavity and the handle is supported by the step.

**[0024]** In one embodiment, the lining component is further formed with a recess opening to the head detaching cavity and for accommodating a portion of the handle.

**[0025]** According to further aspect of the present invention, there is provided a device for attaching and detaching a toothbrush head which is used for attaching a head to a handle or detaching the head from the handle of a toothbrush as above-mentioned, a second hole being formed in and extending through the head attaching portion, the device comprising:

a lower housing;
an upper housing pivotally mounted to the lower housing; and
a lining component disposed in the lower housing;
wherein a head attaching cavity is formed in the lining component, a step for supporting an edge portion of the body is formed on an inner wall of the head attaching cavity, a protruding pressing portion is formed on a surface of the upper housing facing the lining component at a location corresponding to the head attaching cavity, the pressing portion can apply a force onto the head attaching portion to insert the protruding plug into the first hole when the head is supported in the head attaching cavity by the step and the protruding plug aligns with the first hole; and
a head detaching cavity is formed in the lining component, a step for supporting the handle is formed on the inner wall of the head detaching cavity, a protruding pushing post is formed on the surface of the upper housing facing the lining component at a location corresponding to the head detaching cavity, the pushing post passing through the second hole can apply a force onto the body to disengage the protruding plug from the first hole when the head attached to the handle is placed in the head detaching cavity and the handle is supported by the step.

**[0026]** The toothbrush according to the present invention makes it possible to reuse the handle in order to improve resource utilization and reduce the amount of waste to be treated.

**[0027]** The device for attaching and/or detaching the toothbrush head according to the present invention enables the attachment and/or detachment of the head to be labor-savingly, easily and efficiently conducted.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0028]**

FIG. 1 is a schematic perspective of a toothbrush

according to a first preferred embodiment of the present invention;

FIG. 1a is an enlarged cross-sectional view taken along a direction parallel to a longitudinal axis of the toothbrush in FIG. 1 and through protruding plugs on the head;

FIG. 1b is an enlarged cross-sectional view taken along a direction perpendicular to a longitudinal axis of the toothbrush in FIG. 1 and through protruding plugs on the head;

FIG. 2 is another schematic perspective of the toothbrush according to the first preferred embodiment of the present invention;

FIG. 3 is a schematic side view of the toothbrush according to the first preferred embodiment of the present invention;

FIG. 3a is an enlarged view similar to FIG. 1a;

FIG. 3b is an enlarged view similar to FIG. 3a, wherein the head is detached from the handle;

FIG. 4 is a schematic perspective of the handle according to the first preferred embodiment of the present invention;

FIG. 5 is another schematic perspective of the handle according to the first preferred embodiment of the present invention;

FIG. 6 is a schematic perspective of the head according to the first preferred embodiment of the present invention;

FIG. 7 is another schematic perspective of the head according to the first preferred embodiment of the present invention;

FIG. 8 is a schematic front view of the head according to the first preferred embodiment of the present invention;

FIG. 9 is a schematic end view of the head according to the first preferred embodiment of the present invention;

FIG. 10 is a schematic bottom view of the head according to the first preferred embodiment of the present invention;

FIG. 11 is a schematic top view of the head according to the first preferred embodiment of the present invention;

FIG. 12 is a schematic perspective of a toothbrush according to a second preferred embodiment of the present invention;

FIG. 12a is an enlarged cross-sectional view taken along a direction parallel to a longitudinal axis of the toothbrush in FIG. 12 and through protruding plugs on the head;

FIG. 12b is an enlarged cross-sectional view taken along a direction perpendicular to a longitudinal axis of the toothbrush in FIG. 12 and through protruding plugs on the head;

FIG. 13 is a schematic perspective of the head according to the second preferred embodiment of the present invention;

FIG. 14 is another schematic perspective of the head according to the second preferred embodiment of the present invention;

FIG. 15 is a schematic front view of the head according to the second preferred embodiment of the present invention;

FIG. 16 is a schematic end view of the head according to the second preferred embodiment of the present invention;

FIG. 17 is a schematic bottom view of the head according to the second preferred embodiment of the present invention;

FIG. 18 is a schematic top view of the head according to the second preferred embodiment of the present invention;

FIG. 19 is a schematic perspective of a device for attaching and detaching a head according to a preferred embodiment of the present invention;

FIG. 20 is a front view of the device for attaching and detaching the head shown in FIG. 19;

FIG. 21 is an end view of the device for attaching and detaching the head shown in FIG. 19;

FIG. 22 is a top view of the device for attaching and detaching the head shown in FIG. 19;

FIG. 23 is a bottom view of the device for attaching and detaching the head shown in FIG. 19;

FIG. 24 is a perspective of the device for attaching and detaching the head shown in FIG. 19 in the open state;

FIG. 25 is an exploded perspective of the device for attaching and detaching the head shown in FIG. 19;

FIG. 26 is a bottom perspective of a lining component of the device for attaching and detaching the head shown in FIG. 19;

FIG. 27 is a cross-sectional view showing the lining component of the device for attaching and detaching the head shown in FIG. 19 mounted to the lower housing;

FIG. 28 is a perspective showing the attachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the head is placed in a head attachment cavity;

FIG. 29 is a cross-sectional view showing the attachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the handle is placed on the head;

FIG. 30 is a perspective showing the attachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the upper housing is rotated into a closed state;

FIG. 31 is a cross-sectional view showing the attachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the head has been attached to the handle;

FIG. 32 is a perspective showing the attachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the toothbrush whose head has been attached to the handle is removed;

FIGS. 33 and 34 are perspective and cross-sectional views showing respectively the detachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the head attached to the handle is placed in the head detachment cavity;

FIG. 35 is a perspective showing the detachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the upper housing is rotated into a closed state;

FIG. 36 is a cross-sectional view showing the detachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the head has been detached from the handle;

FIG. 37 is a perspective showing the detachment of the head using the device for attaching and detaching the head shown in FIG. 19, wherein the handle and the head have been removed separately;

FIG. 38 is a variant of the device for attaching and detaching the head shown in FIGS. 19-27;

FIG. 39 is another variant of the device for attaching and detaching the head shown in FIGS. 19-27; and

FIG. 40 is further variant of the device for attaching and detaching the head shown in FIGS. 19-27.

## DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

**[0029]** Preferred embodiments of the present invention are described in detail below in connection with examples. It should be understood by those skilled in the art that these exemplary embodiments are not meant to form any limit to the present invention.

**[0030]** FIG. 1 is a schematic perspective of a toothbrush according to a first preferred embodiment of the present invention and FIG. 2 is another schematic perspective of the toothbrush according to the first preferred embodiment of the present invention. As shown in FIGS. 1 and 2, a toothbrush 1 according to the first preferred embodiment of the present invention comprises a handle 3 and a head 5 detachably mounted to the handle 3.

**[0031]** FIG. 4 is a schematic perspective of the handle according to the first preferred embodiment of the present invention and FIG. 5 is another schematic perspective of the handle according to the first preferred embodiment of the present invention. As shown in FIGS. 4 and 5, the handle 3 comprises a grip portion 3a to be grasped by a user and a head attaching portion 3b connected to the grip portion 3a. Although the grip portion 3a and the head attaching portion 3b may be formed separately and subsequently assembled together, the grip portion 3a and the head attaching portion 3b are preferably formed integrally. First holes 7 are formed in and extend through the head attaching portion 3b. Although in the preferred embodiment the first holes 7 are shown to be four and are symmetrically distributed with respect to a longitudinal axis AA of the handle, it should be understood that the number of first holes 7 may be less than four, e.g., three, two, or even one. Of course, the number of first holes 7 may be more than four. As required, the first holes may be distributed in other ways. Furthermore, although the first holes 7 are shown as through holes, it should be understood that the first holes can also be blind holes.

**[0032]** Second holes 9 may be further formed in and extend through the head attaching portion 3b. Although in the preferred embodiment the second holes 9 are shown to be three and are distributed along the longitudinal axis AA of the toothbrush, it should be understood that the number of second holes 9 may be less than three, e.g., two or even one. Of course, the number of the second holes 9 may be more than three. As required, the second holes may be distributed in other ways.

**[0033]** Figures 6-11 schematically show a head of the toothbrush according to the first preferred embodiment of the present invention. As shown in FIGS. 6-11, the head 5 of the toothbrush according to the first preferred embodiment of the present invention includes a body 11 and bristles 13 mounted on a first side 11a of the body 11. According to the present invention, the head 5 further includes protruding plugs 15 formed on a second side 11b of the body 11 opposite to the first side 11a. The number and distribution of the protruding plugs 15 on the head 5 correspond to the number and distribution of the first holes 7 on the head attaching portion 3b of the handle 3 so that each protruding plug 15 on the head 5 can be inserted into the corresponding first hole 7 in the head attaching portion 3b of the handle 3. As a result, the head 5 can be reliably attached to the head attaching portion 3b of the handle 3, as shown in Figures 1 and 2.

**[0034]** The head 5 can be reliably attached to the head attaching portion 3b of the handle 3 by forming a tight fit between the protruding plug 15 and the first hole 7. However, in order to facilitate easier attachment of the head 5 to and detachment from the handle 3, as shown in FIG. 3b, the protruding plugs 15 on the head 5 each comprise a root portion 15a extending from the body 11 and an end portion 15b integral with the root portion 15a but having an increased size, and a excised portion 15c extending from the end portion 15b to the body 11 is formed in the protruding plug 15. Correspondingly, the first hole 7 includes a first portion 7a corresponding to the root portion 15a of the protruding insert 15 and a second portion 7b corresponding to the end portion 15b of the protruding insert 15 and having a larger size than the first portion 7a. The radial size of the root portion 15a of the protruding plug 15 is selected to be substantially the same as or slightly smaller than the radial size of the first portion 7a of the first hole 7, and the radial size of the end portion 15b of the protruding plug 15 is selected to be substantially the same as or slightly smaller than the radial size of the second portion 7b of the first hole 7. The body 11 and the protruding plug 15 and/or the handle 3 are typically injection molded from a plastic material. When the protruding insert 15 is inserted into the corresponding first hole 7 in the head attaching portion 3b of the handle 3, the end portion 15b of the protruding insert 15 is in contact with the side wall of the first hole 7 and squeezed, and the excised portion 15c allows two parts of the end portion 15b to come closer to each other and have a smaller radial size to pass through the first portion 7a of the first hole 7. Once the end 15b of the protruding plug 15 passes through the first portion 7a of the first hole 7, the end 15b of the protruding plug 15 enters the second portion 7b of the first hole 7 and returns to its original size so that the head 5 and the handle 3 can be reliably locked together, as shown in Figure 3a. Although in the preferred embodiment the excised portion 15c is shown as a transverse cutout through the side wall of the protruding plug 15, the excised portion 15c may also be formed in a cross shape, a petal shape, a hollow shape, or any other suitable shape capable of reducing the radial size of the end portion 15b of the protruding plug 15 when subjected to compression.

**[0035]** In order to easily align the protruding plugs 15 on the head 5 with the corresponding first holes 7 in the head attaching portion 3b when the head 5 is attached to the handle 3, a flange 3c is formed around the periphery of the head attaching portion 3b of the handle 3 to define a concave space 3d for accommodating the body 11. The size of the concave space 3d corresponds substantially to the size of the body 11. In this way, the protruding plugs 15 on the head 5 align with the corresponding first holes 7 in the head attaching portion 3b when the body 11 is positioned in the concave space 3d. Furthermore, the size of the concave space 3d corresponding substantially to the size of the body 11 makes a gap between the head attaching portion 3b and the body 11 as small as possible to prevent or minimize dirt or moisture trapped between the head attaching portion 3b and the body 11.

**[0036]** Figures 6-11 also show in detail the distribution of the bristles 13 on the head 5 according to the first preferred embodiment of the present invention. The bristles 13 can be substantially divided into three groups, a first group of bristles 13a arranged at the center of the body 11, a second group of bristles 13b and a third group of bristles 13c arranged symmetrically on either side of the first group of bristles along the longitudinal direction of the body 11. Each group of bristles comprises a plurality of bristle clusters comprising a plurality of bristles combined together. The bristle clusters in the first group of bristles 13a are arranged in a plurality of linear columns along the longitudinal direction of the body 11 and separately apart from each other. In the preferred embodiment, the bristle clusters in the first group of bristles 13a are shown to be arranged in four columns, but it should be understood that they may be arranged in fewer or more than four columns. Each bristle cluster in the first group of bristles 13a is also arranged substantially parallel to a plane P passing through the longitudinal axis BB of the body 11 and substantially perpendicular to the first side 11a of the body 11. The bristle clusters in the second group of bristles 13b and the third group of bristles 13c are arranged in a plurality of linear columns along the longitudinal axis of the body 11 and separately apart from each other. In the preferred embodiment, the bristle clusters in the second group of bristles 13b and the third group of bristles 13c are arranged in two columns respectively, but it should be understood that they may be arranged in fewer or more than two columns. Each bristle cluster in the second group of bristles 13b and the third group of bristles 13c is also arranged to be tilted substantially outwardly with respect to the plane P so that the gaps between the second group of bristles 13b as well as the third group of bristles 13c and the first group of bristles 13a gradually increase in a direction along the plane P away from the body 11, as shown in FIG. 9. Although in the preferred embodiment the column of bristle clusters in the second group of bristles 13b and the

third group of bristles 13c away from the first group of bristles 13a is tilted outwardly at a greater angle than the column of bristle clusters close to the first group of bristles 13a, it is also feasible that the column of bristle clusters in the second group of bristles 13b and the third group of bristles 13c away from the first group of bristles 13a is tilted outwardly at the same angle as the column of bristle clusters close to the first group of bristles 13a. The bristles arranged in this way allow the first group of bristles 13a to penetrate deeper into the gaps between the teeth during brushing to remove debris in the gaps between the teeth to improve the cleaning effect on the teeth. At the same time, the second group of bristles 13b and the third group of bristles 13c can provide a massaging effect on the gums. More preferably, when viewed from the end side of the head 5, the ends of the bristle clusters in the first group of bristles 13a, the second group of bristles 13b and the third group of bristles 13c away from the body 11 are located substantially on a concave arcuate surface C so that the bristles fit the teeth and gums better to further improve the cleaning and massaging effect.

**[0037]** FIGS. 12-18 show a toothbrush according to a second preferred embodiment of the present invention. The toothbrush according to the second preferred embodiment shown in FIGS. 12-18 is substantially the same as the toothbrush according to the first preferred embodiment shown in FIGS. 1-11 except for a slight difference in arrangement of the bristles. For the sake of simplicity, only the differences between the second preferred embodiment and the first preferred embodiment are described below, and the detailed description for the other portions is omitted.

**[0038]** As shown in FIGS. 12-18, in addition to the first group of bristles 13a, the second group of bristles 13b and the third group of bristles 13c, the head 5 according to the second preferred embodiment of the present invention further includes a fourth group of bristles 13d arranged at the end of the body 11 away from the handle 3. In the preferred embodiment, the fourth group of bristles 13d includes two arced columns of bristle clusters but it should be understood that one or more arced columns of bristle clusters can be provided. More preferably, each bristle cluster in the fourth group of bristles 13d is arranged to be tilted outwardly with respect to the center of the arc. By providing the fourth group of bristles 13d, the cleaning effect on the teeth and the massaging effect on the gums can be further improved.

**[0039]** Although the head can be detached from the handle by means of a tool passing directly through the second holes 9 in the handle, a specific device 20 for attaching and detaching the head is proposed in the present invention. As shown in Figures 19-27, the device 20 for attaching and detaching the head comprises a lower housing 21 and an upper housing 23 pivotally mounted to the lower housing 21. The upper housing 23 is pivoted relative to the lower housing to open or close the device 20 for attaching and detaching the head. The device 20 for attaching and detaching the head further includes a lining component 25 mounted to the lower housing 21. A head attaching cavity 27 is formed in the lining component 25 to accommodate the head 5 to be attached. Steps 27a are formed on the inner wall of the head attaching cavity 27. In the preferred embodiment, the steps 27a are formed at the longitudinal ends of the head attaching cavity 27, but it should be understood that it is also feasible that the steps 27a are formed at the longitudinal sides of the head attaching cavity 27. As shown in FIG. 29, when the head 5 is placed in the head attaching cavity 27, the edge portion of the body 11 of the head 5 is supported on the steps 27a, thereby holding the head 5 in the head attaching cavity 27 in place. Preferably, the lining component 25 may also be formed with a first recess 29 opening to the head attaching cavity 27 and for accommodating a portion of the handle 3.

**[0040]** The lining component 25 is also formed with a head detaching cavity 31 to accommodate the head attached to the handle and a portion of the handle. Steps 31a are formed on the inner wall of the head detaching cavity 31. In the preferred embodiment, the steps 31a are formed at the longitudinal ends of the head detaching cavity 31, but it should be understood that it is also feasible that the steps 31a are formed at both longitudinal sides of the head detaching cavity 31. As shown in FIG. 34, when the head 5 attached to the handle is placed in the head detaching cavity 31, the handle 3 is supported on the steps 31a but the body 11 of the head 5 is located in the inside of the steps 31a, thereby holding the head 5 attached to the handle in the head detaching cavity 31 in place. Preferably, the lining component 25 may also be formed with a second recess 33 opening to the head detaching cavity 31 and for accommodating a portion of the handle 3.

**[0041]** The lining component 25 may also formed with a cleaning brush accommodating cavity 35 for accommodating a cleaning brush 37. The cleaning brush 37 may be used to clean the toothbrush, in particular, to remove dirt that may be trapped between the head 5 and the handle 3. In the preferred embodiment, the cleaning brush accommodating cavity 35 is formed between the head attaching cavity 27 and the head detaching cavity 31, but it should be understood that the cleaning brush accommodating cavity 35 may be formed at other locations, for example, at the end side of the head attaching cavity 27 and the head detaching cavity 31, as shown in Figure 38. The lining component 25 may also formed with a head accommodating cavity 39 formed for accommodating a spare head 5. Through holes 41 corresponding to the protruding plugs 15 on the body 11 may be formed in the bottom wall of the head accommodating cavity 39 to accommodate the protruding plug 15 on the body 11 so that the spare head 5 is securely placed in the head accommodating cavity 39. In the preferred embodiment, there are two head accommodating cavities 39 arranged on either side of the head attaching cavity 27 and the head detaching cavity 31 respectively, but it should be

understood that the head accommodating cavity 39 may be more or less than two and may be arranged in other locations.

**[0042]** The lower housing 21 is formed with a boss 45 with a central cavity 43 and a projection 49 with a snap-in portion 47. A positioning post 51 and a projection 55 with an opening 53 are formed correspondingly on the bottom side of the lining component 25. By inserting the positioning post 51 on the bottom side of the lining component 25 into the central cavity 43 of the boss 45 on the lower housing 21, the lining component 25 can be quickly positioned relative to the lower housing 21. By further pressing the lining component 25 downwardly, the snap-in portion 47 of the projection 49 on the lower housing 21 can be received in the opening 53 of the projection 55 on the bottom side of the lining component 25, thereby reliably mounting the lining component 25 to the lower housing 21, as shown in FIG. 27. It should be understood that the lining component 25 may also be mounted to the lower housing 21 in other ways. Further, although in the preferred embodiment the lining component 25 is formed separately from the lower housing 21, it is also feasible that the lining component 25 is formed integrally with the lower housing 21.

**[0043]** A protruding pressing portion 57 is formed on a surface of the upper housing 23 facing the lower housing 21 or the lining component 25 at a location corresponding to the head attaching cavity 27. In the preferred embodiment, the pressing portion 57 is formed in a hollow lattice shape, but it may be in other shapes as long as pressure can be applied to the handle by the pressing portion. Protruding pushing posts 59 are formed on the surface of the upper housing 23 facing the lower housing 21 or the lining component 25 at a location corresponding to the head detaching cavity 31. The number and position of the pushing posts 59 correspond to the number and position of the second holes 9 in the handle 3. The pushing posts 59 may pass freely through the second holes 9. In addition, locking means are formed on the lower housing 21 and the upper housing 23, for example a protrusion 61 formed on the lower housing 21 and a notch formed in the upper housing 23 to receive the protrusion 61, so as to reliably lock the lower housing 21 and the upper housing 23 together when the device 20 for attaching and detaching the head is not in use. The components of the device 20 for attaching and detaching the head may be substantially injection molded from a plastic material.

**[0044]** FIGS. 28-32 are schematic views showing the attachment of the head 5 using the device 20 for attaching and detaching the head. The process of attaching the head using the device 20 for attaching and detaching the head will be described below in connection with FIGS. 28-32. Firstly, the upper housing 23 is pivoted relative to the lower housing 21 to open the device 20 for attaching and detaching the head, and then the head 5 is placed in the head attaching cavity 27 with the protruding plug 15 on the body 11 facing upwardly, as shown in FIG. 28. Next, the handle 3 is placed on the head 5 so that the first holes 7 on the head attaching portion 3b of the handle 3 align with the protruding plugs 15 on the head 5, as shown in FIG. 29. Subsequently, the upper housing 23 is pivoted to a position in which it is closed with the lower housing 21, as shown in FIG. 30. Next, the upper housing 23 is pressed downwardly so that the pressing portion 57 on the upper housing 23 contacts the head attaching portion 3b of the handle 3 and applies a downward force to the head attaching portion 3b of the handle 3. Since the body 11 is supported on the steps 27a of the head attaching cavity 27, the protruding plugs 15 on the head 5 pass through the first holes 7 in the head attaching portion 3b, thereby attaching the head 5 to the handle 3 as shown in FIG. 31. Finally, the upper housing 23 is pivoted again with respect to the lower housing 21 to open the device 20 for attaching and detaching the head, and the assembled toothbrush 1 is removed and ready for use, as shown in FIG. 32.

**[0045]** FIGS. 33-38 are schematic views showing the detachment of the head 5 using the device 20 for attaching and detaching the head. The process of detaching the head using the device 20 for attaching and detaching the head will be described below in connection with FIGS. 33-38. Firstly, the upper housing 23 is pivoted relative to the lower housing 21 to open the device 20 for attaching and detaching the head, and then the head 5 attached to the handle 3 is placed in the head detaching cavity 31 with the handle 3 facing upwardly, as shown in FIGS. 33 and 34. Next, the upper housing 23 is pivoted to a position in which it is closed with the lower housing 21 as shown in FIG. 35. Next, the upper housing 23 is pressed downwardly so that the pushing posts 59 on the upper housing 23 pass through the second holes 9 in the head attaching portion 3b, contact the body 11 and applies a downward force to the body 11. Since the handle 3 is supported on the steps 31a of the head detaching cavity 31, the pushing posts 59 on the upper housing 23 causes the protruding plugs 15 on the head 5 to disengage from the first holes 7 on the head attaching portion 3b, thereby detaching the head 5 from the handle 3, as shown in FIG. 36. Finally, the upper housing 23 is pivoted again with respect to the lower housing 21 to open the device 20 for attaching and detaching the head and remove the handle 3 and the head 5 that have been separated from each other, as shown in FIG. 37.

**[0046]** FIG. 38 is a variant of the device for attaching and detaching the head shown in FIGS. 19-27. The device for attaching and detaching the head shown in FIG. 38 differs from the device for attaching and detaching the head described in connection with FIGS. 19-27 only in that the cleaning brush accommodating cavity 35 is formed on the end side of the head attaching cavity 27 and the head detaching cavity 31.

**[0047]** FIG. 39 is another variant of the device for attaching and detaching the head shown in FIGS. 19-27. The device for attaching and detaching the head shown in FIG. 39 differs from the device for attaching and de-

taching the head described in connection with FIGS. 19-27 only in that it does not include a head accommodating cavity for accommodating the spare head.

**[0048]** FIG. 40 is further variant of the device for attaching and detaching head shown in FIGS. 19-27. The device for attaching and detaching the head shown in FIG. 40 differs from the device for attaching and detaching the head described in connection with FIGS. 19-27 only in that the cleaning brush accommodating cavity 35 is formed on the end side of the head attaching cavity 27 and the head detaching cavity 31 and that it does not include a head accommodating cavity for accommodating the spare head.

**[0049]** Further, it should be understood that the arrangement of bristles of the spare head stored in the head accommodating cavity is not limited to that shown in the preferred embodiment.

**[0050]** The device for attaching and detaching head according to the present invention allows the attachment and the detachment of the head to be labor-savingly, easily and efficiently conducted.

**[0051]** Although the present invention has been described in detail in connection with preferred embodiments, it should be understood that such detailed description is intended only to illustrate the present invention and does not constitute any limit to the present invention. For example, the protruding plugs may be formed on the handle and the holes for receiving the protruding plugs are formed in the body of the head. It is also feasible that the device for attaching and detaching the head do not include the head attaching cavity and the corresponding pressing portion or the head detaching cavity and the corresponding pushing posts. In this way, the device has only one function of the attachment and the detachment. Thus, the scope of the invention is defined by the technical solutions in the claims.

## Claims

**1.** A toothbrush (1) comprising:

a handle (3) comprising a grip portion (3a) and a head attaching portion (3b) connected to the grip portion (3a);
a head (5) comprising a body (11) and bristles (13) mounted to a first side (11a) of the body (11),
the body (11) further having a second side (11b) opposite to the first side (11a);
wherein a first hole (7) is formed in one of the head attaching portion (3b) and the second side (11b) of the body (11), and a corresponding protruding plug (15) is formed on the other of the head attaching portion (3b) and the second side (11b) of the body (11), the head (5) is removably attached to the head attaching portion (3b) by inserting the protruding plug (15) into the first hole (7).

**2.** A toothbrush according to claim 1, wherein the first hole (7) is a through hole formed in the head attaching portion (3b) and the protruding plug (15) is formed on the second side (11b) of the body (11).

**3.** Toothbrush according to claim 2, wherein four first holes (7) are symmetrically distributed with respect to a longitudinal axis (AA) of the handle (3).

**4.** The toothbrush according to claim 2, wherein the protruding plug (15) comprises a root portion (15a) extending from the body (11) and an end portion (15b) integral with the root portion (15a) but having an increased size, and an excised portion (15c) is formed in the protruding plug (15).

**5.** A toothbrush according to claim 2, wherein the protruding plug (15) comprises a root portion (15a) extending from the body (11) and an end portion (15b) integral with the root portion (15a) but having an increased size, an excised portion (15c) is formed in the protruding plug (15), the first hole (7) comprises a first portion (7a) corresponding to the root portion (15a) and a second portion (7b) corresponding to the end portion (15b) and having a larger size than the first portion (7a).

**6.** A toothbrush according to claim 5, wherein a radial size of the root portion (15a) is selected to be the same as or slightly smaller than a radial size of the first portion (7a), and a radial size of the end portion (15b) is selected to be the same as or slightly smaller than a radial size of the second portion (7b).

**7.** A toothbrush according to claim 1, wherein a flange (3c) is formed around the periphery of the head attaching portion (3b) to define a concave space (3d) for accommodating the body (11), and the concave space (3d) has a size corresponding to the sizes of the body (11).

**8.** The toothbrush according to claim 1, wherein the bristles (13) comprise a first group of bristles (13a) arranged at the center of the body (11), a second group of bristles (13b) and a third group of bristles (13c) arranged symmetrically on either side of the first group of bristles (13a) along a longitudinal direction of the body (11), each group of bristles comprises a plurality of bristle clusters comprising a plurality of bristles combined together, the bristle clusters in the first group of bristles (13a) are arranged in a plurality of columns along the longitudinal direction of the body (11) and separately apart from each other, each bristle cluster in the first group of bristles (13a) is arranged parallel to a plane (P) passing through the longitudinal axis (BB) of the body (11)

and perpendicular to the first side (11a), the bristle clusters in the second group of bristles (13b) and the third group of bristles (13c) are arranged in columns along the longitudinal axis (BB) of the body (11) and separately from each other, each bristle cluster in the second group of bristles (13b) and the third group of bristles (13c) is arranged to be tilted outwardly with respect to the plane (P) so that the gaps between the second group of bristles (13b) as well as the third group of bristles (13c) and the first group of bristles (13a) gradually increase in a direction along the plane (P) away from the body (11).

**9.** A toothbrush according to claim 8, wherein the second group of bristles (13b) and the third group of bristles (13c) each comprise at least two columns of bristle clusters, the column of bristle clusters in the at least two columns of bristle clusters away from the first group of bristles (13a) is tilted outwardly at a greater angle than the column of bristle clusters close to the first group of bristles (13a).

**10.** A toothbrush according to claim 8, wherein the bristles (13) further comprise a fourth group of bristles (13d) arranged at the end of the body (11) away from the handle (3), the fourth group of bristles (13d) comprises at least one column of bristle clusters arranged in an arc.

**11.** A toothbrush according to claim 10, wherein each bristle cluster in the fourth group of bristles (13d) is arranged to be tilted outwardly with respect to the center of the arc.

**12.** A toothbrush according to claim 1, wherein a second hole (9) is further formed in and extends through the head attaching portion (3b).

**13.** A device for attaching a toothbrush head which is used for attaching a head (5) to a handle (3) of a toothbrush according to any one of claims 1-12 comprising:

a lower housing (21);
an upper housing (23) pivotally mounted to the lower housing (21); and
a lining component (25) disposed in the lower housing (21);
wherein a head attaching cavity (27) is formed in the lining component (25), a step (27a) for supporting an edge portion of the body (11) is formed on an inner wall of the head attaching cavity (27), a protruding pressing portion (57) is formed on a surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head attaching cavity (27), the pressing portion (57) can apply a force onto the head attaching portion (3b) to insert the protruding plug (15) into the first hole (7) when the head (5) is supported in the head attaching cavity (27) by the step (27a) and the protruding plug (15) aligns with the first hole (7).

**14.** A device for attaching a toothbrush head according to claim 13, wherein the lining component (25) is further formed with a recess (29) opening to the head attaching cavity (27) and for accommodating a portion of the handle (3).

**15.** A device for attaching a toothbrush head according to claim 13, wherein the lining component (25) is further formed with a cleaning brush accommodating cavity (35).

**16.** A device for attaching a toothbrush head according to claim 13, wherein the lining component (25) is further formed with a head accommodating cavity (39) for accommodating a spare head (5).

**17.** A device for attaching a toothbrush head according to claim 13, wherein the lining component (25) is formed separately from the lower housing (21) and is mounted to the lower housing (21).

**18.** A device for detaching a toothbrush head which is used for detaching a head (5) from a handle (3) of a toothbrush according to any one of claims 1-12, a second hole (9) being formed in and extending through the head attaching portion (3b), the device comprising:

a lower housing (21);
an upper housing (23) pivotally mounted to the lower housing (21); and
a lining component (25) disposed in the lower housing (21);
wherein a head detaching cavity (31) is formed in the lining component (25), a step (31a) for supporting the handle (3) is formed on the inner wall of the head detaching cavity (31), a protruding pushing post (59) is formed on a surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head detaching cavity (31), the pushing post (59) passing through the second hole (9) can apply a force onto the body (11) to disengage the protruding plug (15) from the first hole (7) when the head (5) attached to the handle (3) is placed in the head detaching cavity (31) and the handle (3) is supported by the step (31a).

**19.** A device for detaching a toothbrush head according to claim 18, wherein the lining component (25) is further formed with a recess (33) opening to the head detaching cavity (31) and for accommodating a portion of the handle (3).

**20.** A device for detaching a toothbrush head according to claim 18, wherein the lining component (25) is further formed with a cleaning brush accommodating cavity (35).

**21.** A device for detaching a toothbrush head according to claim 18, wherein the lining component (25) is further formed with a head accommodating cavity (39) for accommodating a spare head (5).

**22.** A device for detaching a toothbrush head according to claim 18, wherein the lining component (25) is formed separately from the lower housing (21) and is mounted to the lower housing (21).

**23.** A device for attaching and detaching a toothbrush head which is used for attaching a head (5) to a handle (3) or detaching the head (5) from the handle (3) of a toothbrush according to any one of claims 1-12, a second hole (9) being formed in and extending through the head attaching portion (3b), the device comprising:

a lower housing (21);
an upper housing (23) pivotally mounted to the lower housing (21); and
a lining component (25) disposed in the lower housing (21);
wherein a head attaching cavity (27) is formed in the lining component (25), a step (27a) for supporting an edge portion of the body (11) is formed on an inner wall of the head attaching cavity (27), a protruding pressing portion (57) is formed on a surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head attaching cavity (27), the pressing portion (57) can apply a force onto the head attaching portion (3b) to insert the protruding plug (15) into the first hole (7) when the head (5) is supported in the head attaching cavity (27) by the step (27a) and the protruding plug (15) aligns with the first hole (7); and
a head detaching cavity (31) is formed in the lining component (25), a step (31a) for supporting the handle (3) is formed on the inner wall of the head detaching cavity (31), a protruding pushing post (59) is formed on the surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head detaching cavity (31), the pushing post (59) passing through the second hole (9) can apply a force onto the body (11) to disengage the protruding plug (15) from the first hole (7) when the head (5) attached to the handle (3) is placed in the head detaching cavity (31) and the handle (3) is supported by the step (31a) on the head detaching cavity (31).

**24.** A device for attaching and detaching a toothbrush head according to claim 23, wherein the lining component (25) is further formed with a recess (29) opening to the head attaching cavity (27) and for accommodating a portion of the handle (3).

**25.** A device for attaching and detaching a toothbrush head according to claim 23, wherein the lining component (25) is further formed with a recess (33) opening to the head detaching cavity (31) and for accommodating a portion of the handle (3).

**26.** A device for attaching and detaching a toothbrush head according to claim 23, wherein the lining component (25) is further formed with a cleaning brush accommodating cavity (35).

**27.** A device for attaching and detaching a toothbrush head according to claim 23, wherein the lining component (25) is further formed with a head accommodating cavity (39) for accommodating a spare head (5).

**28.** A device for attaching and detaching a toothbrush head according to claim 23, wherein the lining component (25) is formed separately from the lower housing (21) and is mounted to the lower housing (21).

**Amended claims under Art. 19.1 PCT**

**1.** A device for attaching a toothbrush head to a toothbrush handle, the head (5) comprising a body (11) and bristles (13) mounted to the body (11), the handle (3) comprising a head attaching portion (3b), the device:

a lower housing (21);
an upper housing (23) pivotally mounted to the lower housing (21); and
a lining component (25) disposed in the lower housing (21);
wherein a head attaching cavity (27) is formed in the lining component (25), a step (27a) for supporting an edge portion of the body (11) is formed on an inner wall of the head attaching cavity (27), a protruding pressing portion (57) is formed on a surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head attaching cavity (27), the pressing portion (57) can apply a force onto the head attaching portion (3b) to attach the body (11) to the head attaching portion (3b).

**2.** A device for attaching a toothbrush head according to claim 1, wherein the lining component (25) is further formed with a recess (29) opening to the head

attaching cavity (27) and for accommodating a portion of the handle (3).

**3.** A device for attaching a toothbrush head according to claim 1, wherein the lining component (25) is further formed with a cleaning brush accommodating cavity (35).

**4.** A device for attaching a toothbrush head according to claim 1, wherein the lining component (25) is further formed with a head accommodating cavity (39) for accommodating a spare head (5).

**5.** A device for attaching a toothbrush head according to claim 1, wherein the lining component (25) is formed separately from the lower housing (21) and is mounted to the lower housing (21).

**6.** A device for attaching a toothbrush head according to claim 1, wherein the pressing portion (57) is formed in a hollow lattice shape.

**7.** A toothbrush kit comprising:

a device for attaching a toothbrush head according to any one of claims 1-6; and
a toothbrush head and/or a toothbrush handle accommodated in the head attaching cavity (27).

**8.** A device for detaching a toothbrush head from a toothbrush handle, the head (5) comprising a body (11) and bristles (13) mounted to the body (11), the handle (3) comprising a head attaching portion (3b), the body (11) being attached to the head attaching portion (3b), the device comprising:

a lower housing (21);
an upper housing (23) pivotally mounted to the lower housing (21); and
a lining component (25) disposed in the lower housing (21);
wherein a head detaching cavity (31) is formed in the lining component (25), a step (31a) for supporting the head attaching portion (3b) of the handle (3) is formed on the inner wall of the head detaching cavity (31), a protruding pushing post (59) is formed on a surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head detaching cavity (31), the pushing post (59) can apply a force onto the body (11) to detach the body (11) from the head attaching portion (3b).

**9.** A device for detaching a toothbrush head according to claim 8, wherein the lining component (25) is further formed with a recess (33) opening to the head detaching cavity (31) and for accommodating a portion of the handle (3).

**10.** A device for detaching a toothbrush head according to claim 8, wherein the lining component (25) is further formed with a cleaning brush accommodating cavity (35).

**11.** A device for detaching a toothbrush head according to claim 8, wherein the lining component (25) is further formed with a head accommodating cavity (39) for accommodating a spare head (5).

**12.** A device for detaching a toothbrush head according to claim 8, wherein the lining component (25) is formed separately from the lower housing (21) and is mounted to the lower housing (21).

**13.** A toothbrush kit comprising:

a device for detaching a toothbrush head according to any one of claims 8-12; and
a toothbrush head and/or a toothbrush handle accommodated in the head detaching cavity (31).

**14.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle, the head (5) comprising a body (11) and bristles (13) mounted to the body (11), the handle (3) comprising a head attaching portion (3b), the body (11) being capable of attaching to the head attaching portion (3b), the device comprising:

a lower housing (21);
an upper housing (23) pivotally mounted to the lower housing (21); and
a lining component (25) disposed in the lower housing (21);
wherein a head attaching cavity (27) is formed in the lining component (25), a step (27a) for supporting an edge portion of the body (11) is formed on an inner wall of the head attaching cavity (27), a protruding pressing portion (57) is formed on a surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head attaching cavity (27), the pressing portion (57) can apply a force onto the head attaching portion (3b) to attach the body (11) to the head attaching portion (3b); and
a head detaching cavity (31) is formed in the lining component (25), a step (31a) for supporting the head attaching portion (3b) of the handle (3) is formed on the inner wall of the head detaching cavity (31), a protruding pushing post (59) is formed on the surface of the upper housing (23) facing the lining component (25) at a location corresponding to the head detaching

cavity (31), the pushing post (59) can apply a force onto the body (11) to detach the body (11) from the head attaching portion (3b).

**15.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to claim 14, wherein the lining component (25) is further formed with a recess (29) opening to the head attaching cavity (27) and for accommodating a portion of the handle (3).

**16.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to claim 14, wherein the lining component (25) is further formed with a recess (33) opening to the head detaching cavity (31) and for accommodating a portion of the handle (3).

**17.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to claim 14, wherein the pressing portion (57) is formed in a hollow lattice shape.

**18.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to claim 14, wherein the lining component (25) is further formed with a cleaning brush accommodating cavity (35).

**19.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to claim 14, wherein the lining component (25) is further formed with a head accommodating cavity (39) for accommodating a spare head (5).

**20.** A device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to claim 14, wherein the lining component (25) is formed separately from the lower housing (21) and is mounted to the lower housing (21).

**21.** A toothbrush kit comprising:

a device for attaching a toothbrush head to a toothbrush handle and detaching the toothbrush head from the toothbrush handle according to any one of claims 14-20;
a toothbrush head and/or a toothbrush handle accommodated in the head attaching cavity (27); and
a toothbrush head and/or a toothbrush handle accommodated in the head detaching cavity (31).

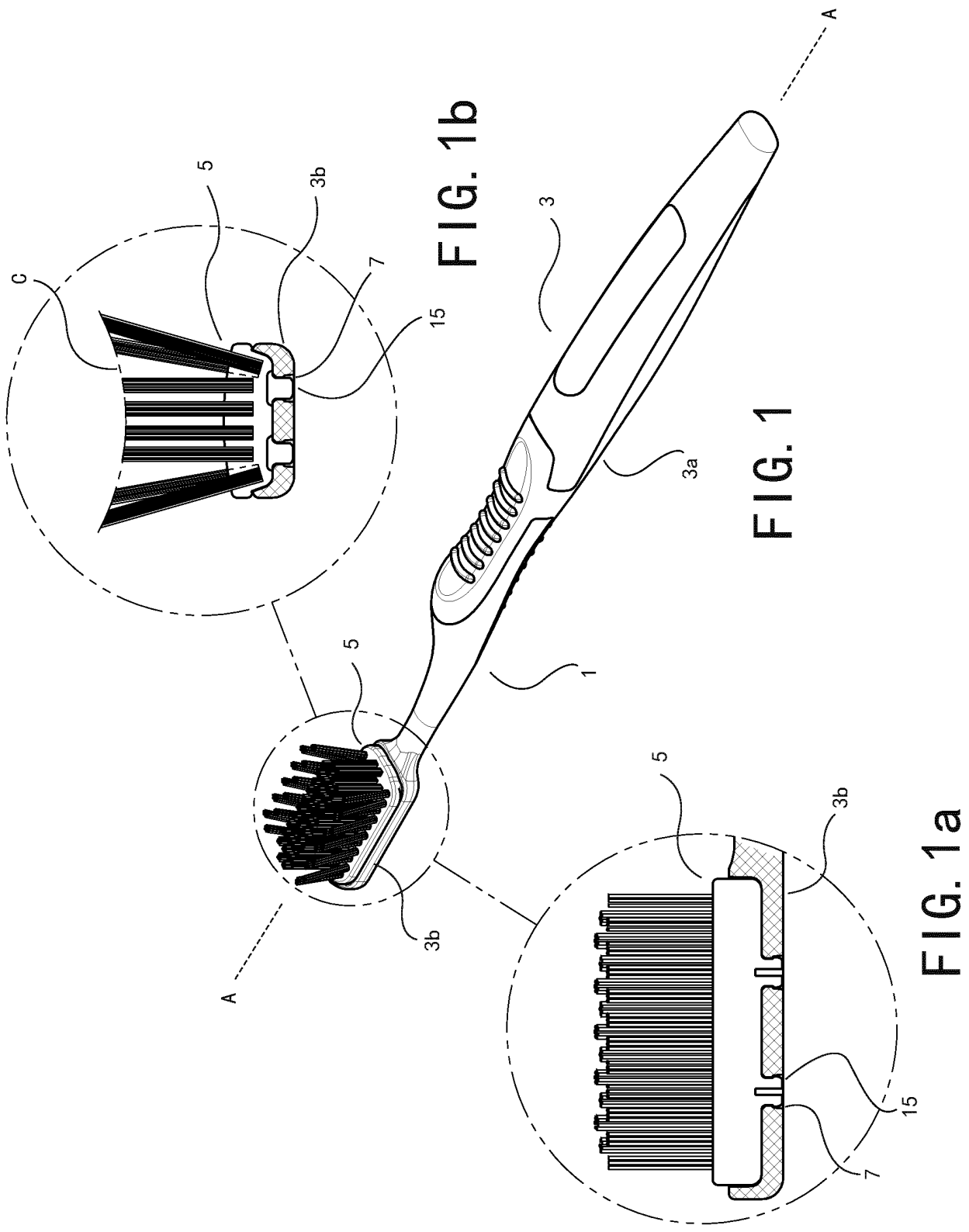


FIG. 1

FIG. 1a

FIG. 1b

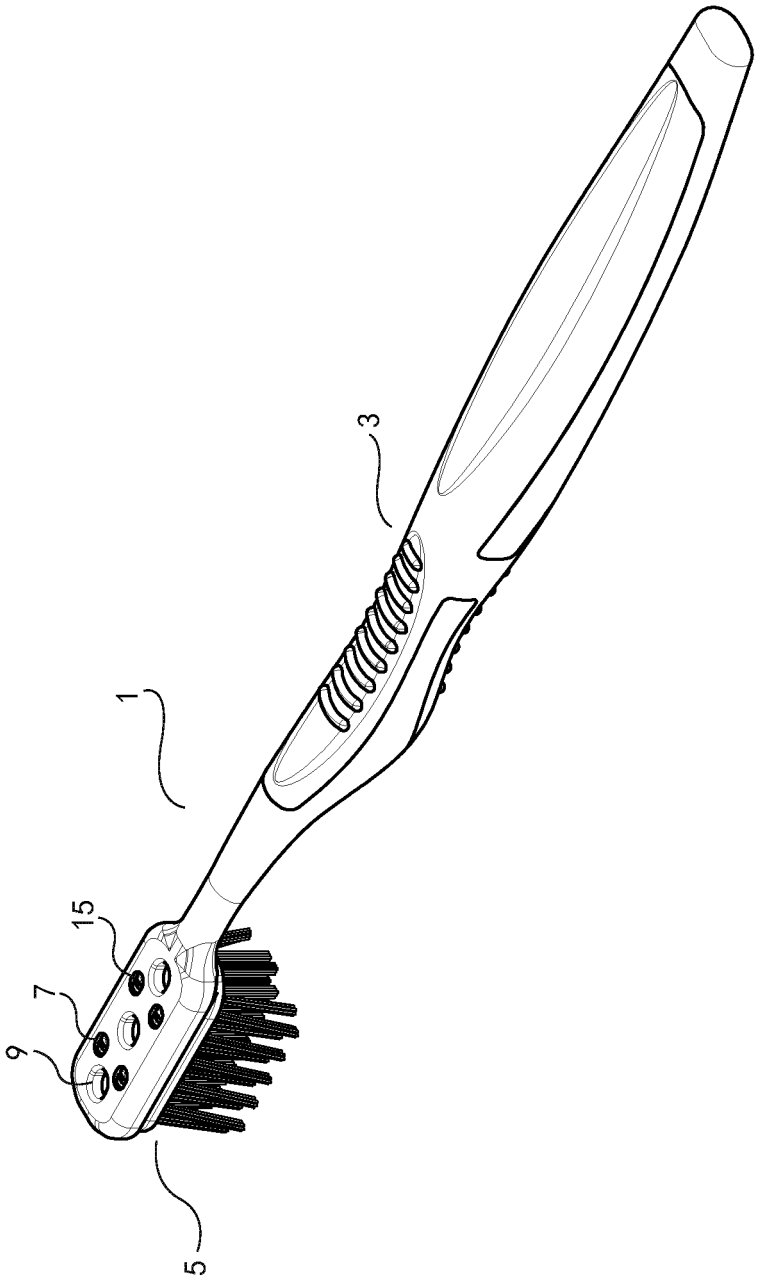


FIG. 2

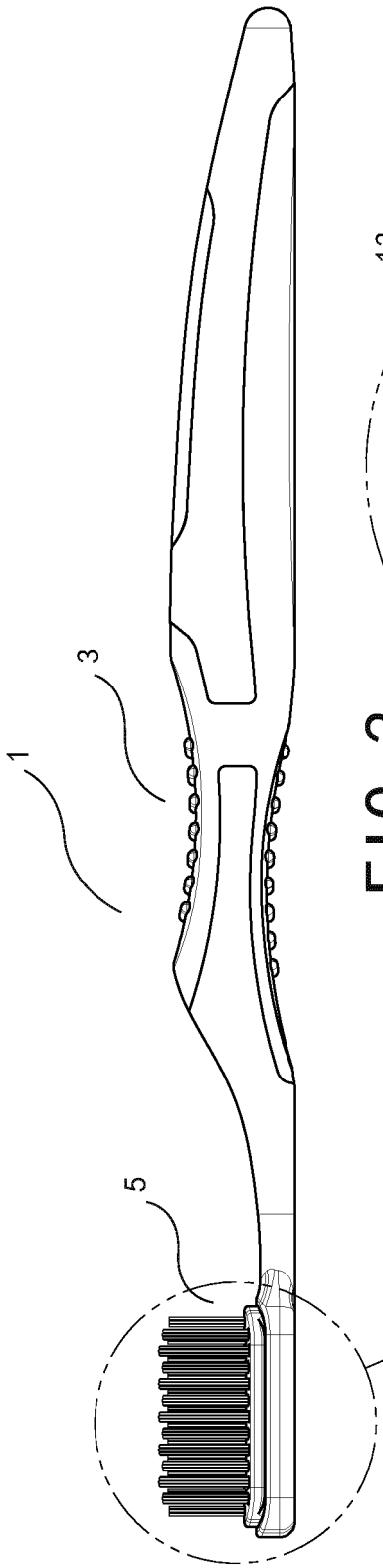


FIG. 3

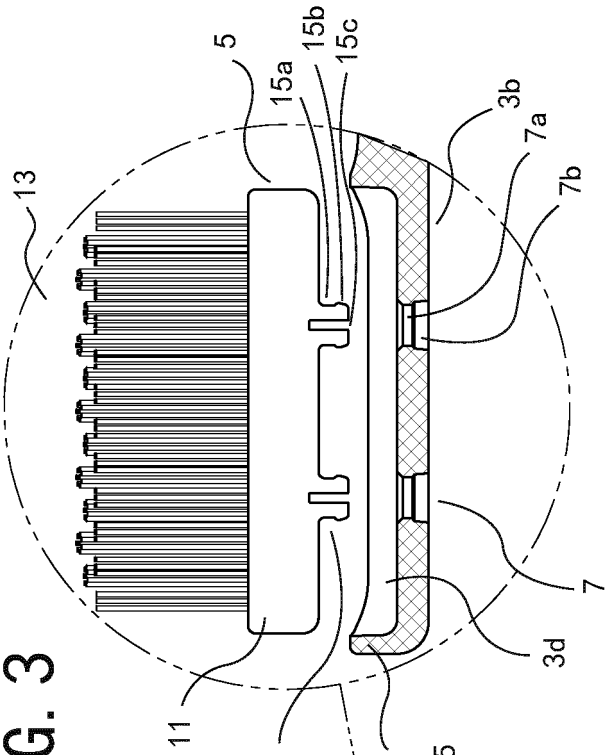


FIG. 3b

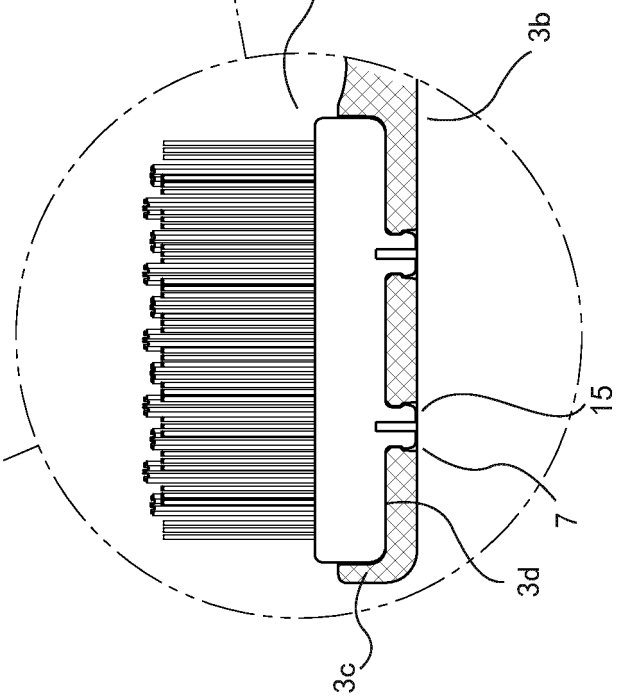


FIG. 3a

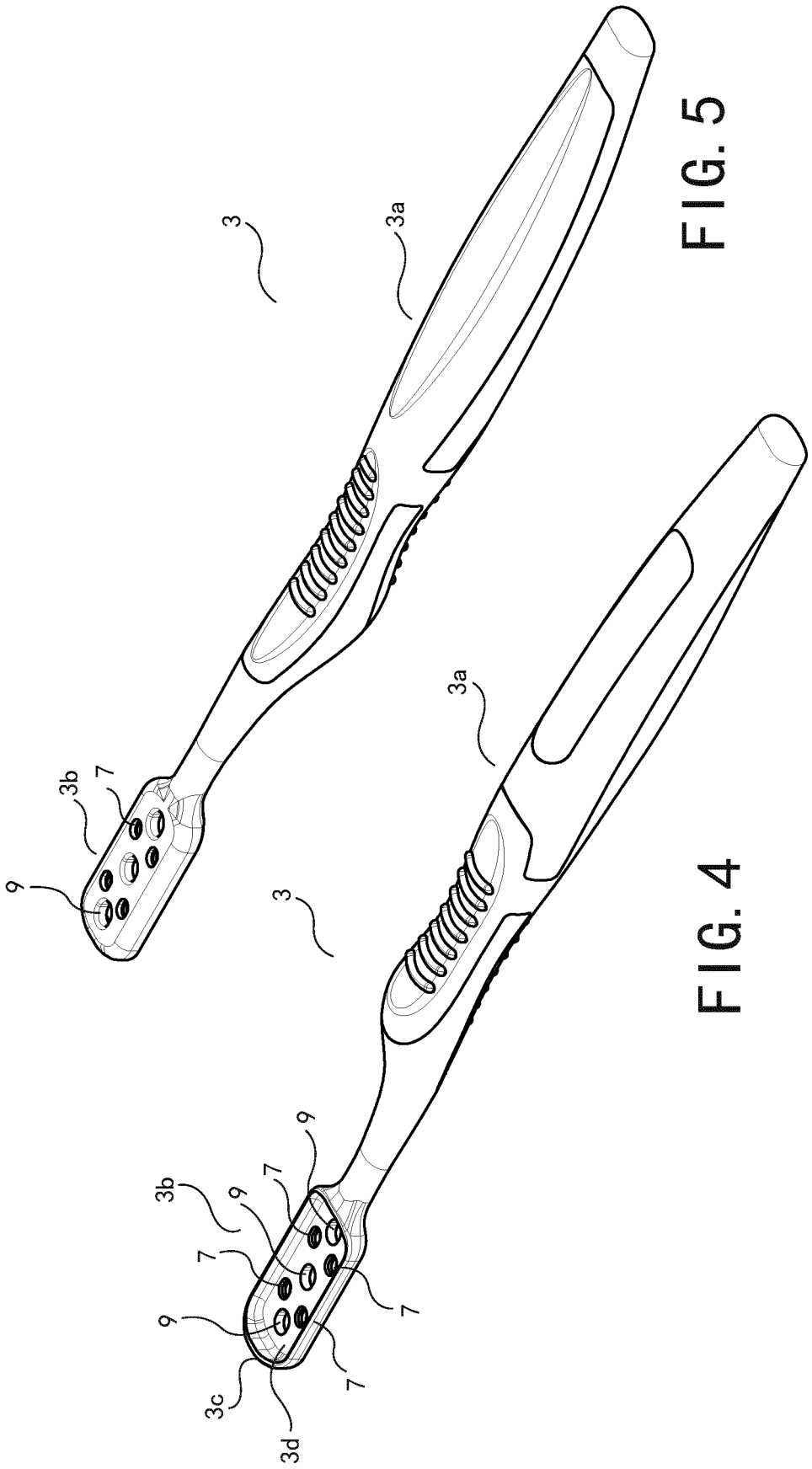


FIG. 5

FIG. 4

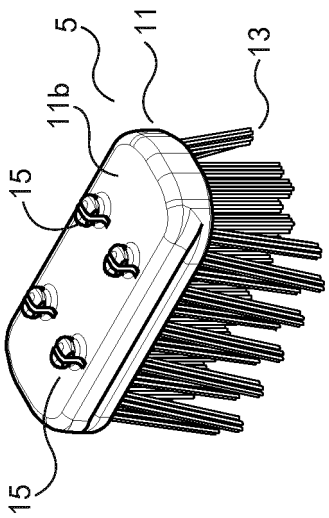


FIG. 7

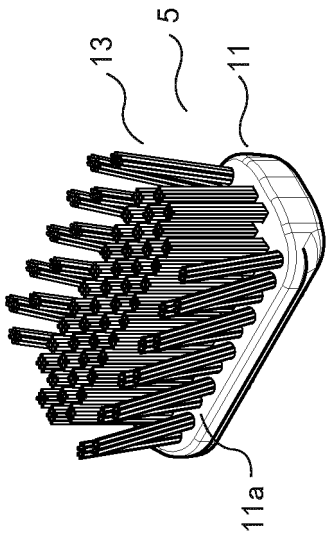


FIG. 6

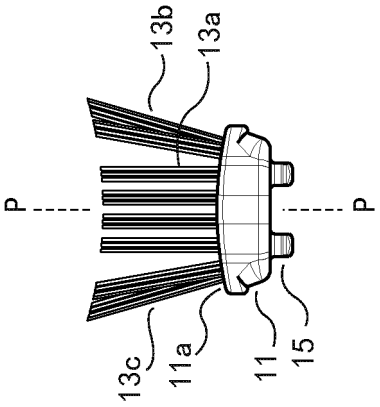


FIG. 9

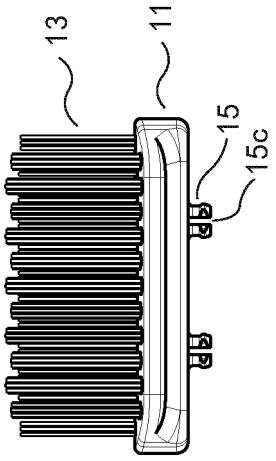


FIG. 8

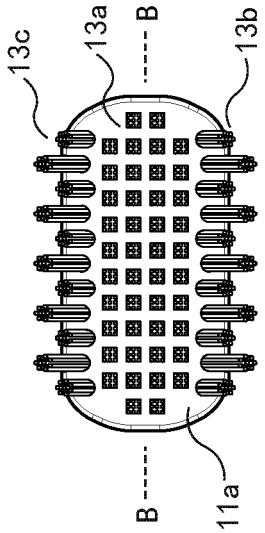


FIG. 11

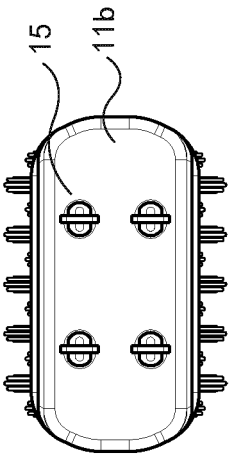


FIG. 10

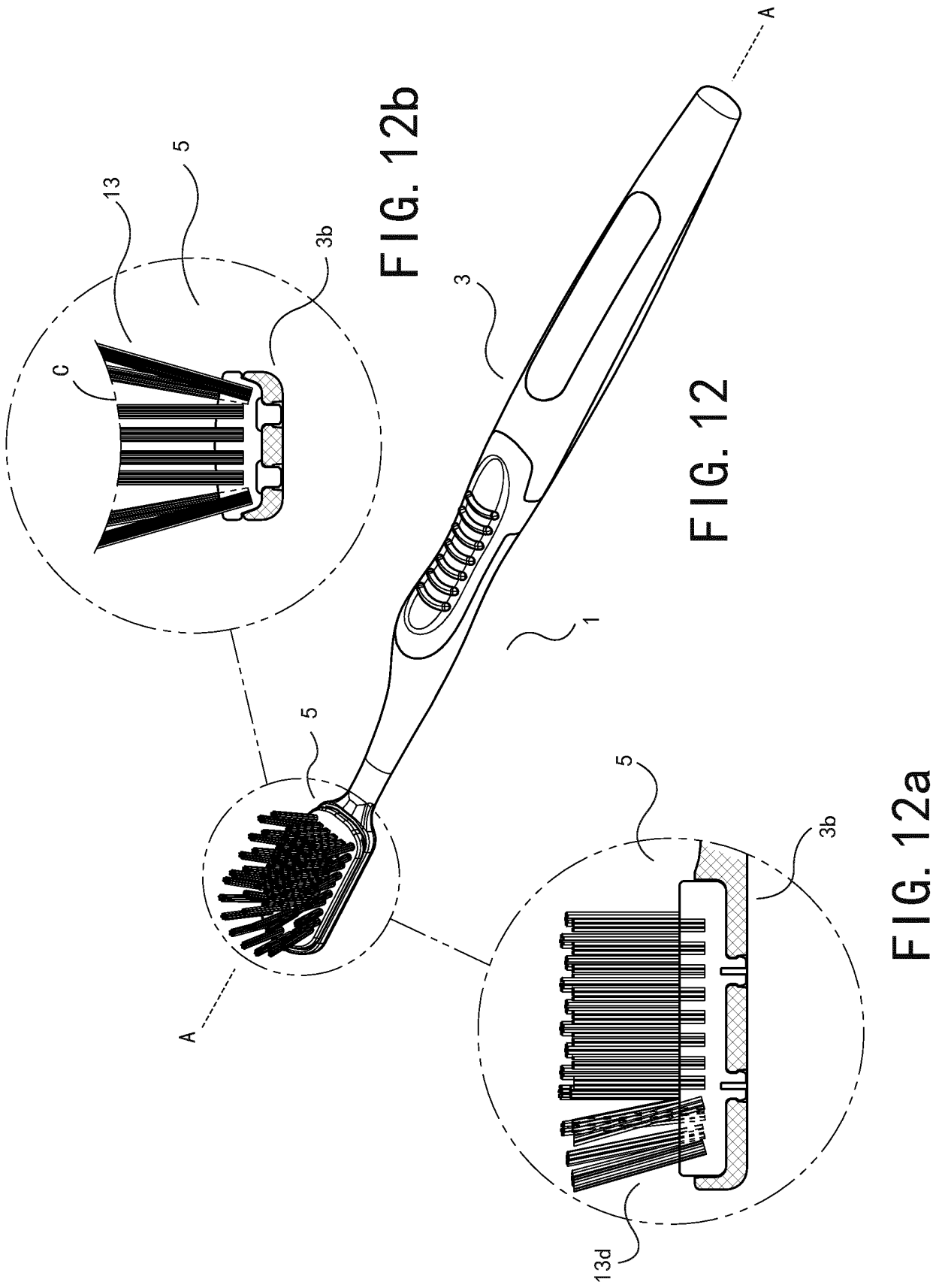


FIG. 12b

FIG. 12

FIG. 12a

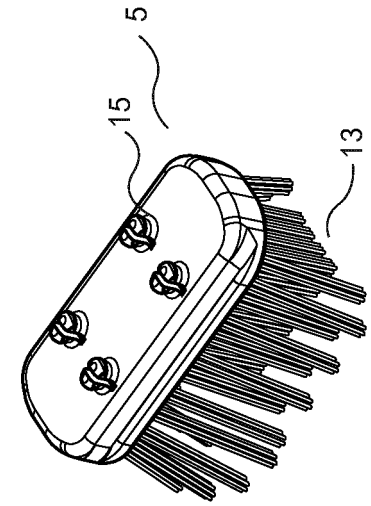


FIG. 14

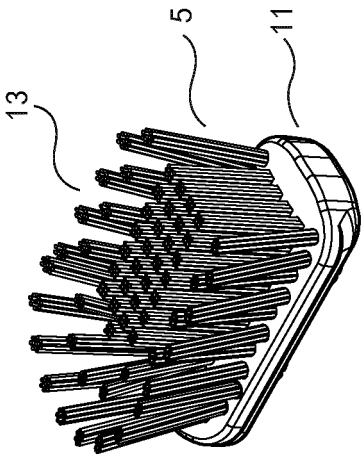


FIG. 13

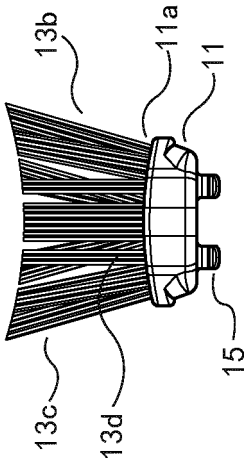


FIG. 16

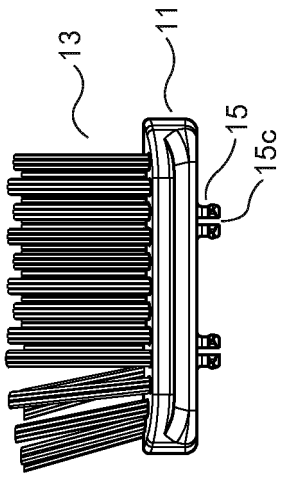


FIG. 15

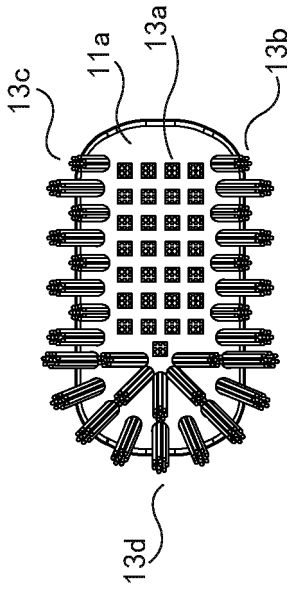


FIG. 18

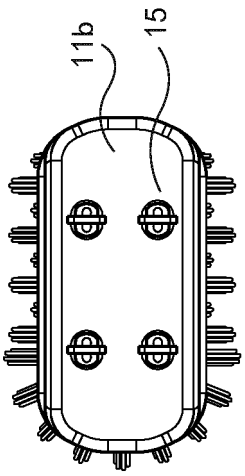


FIG. 17

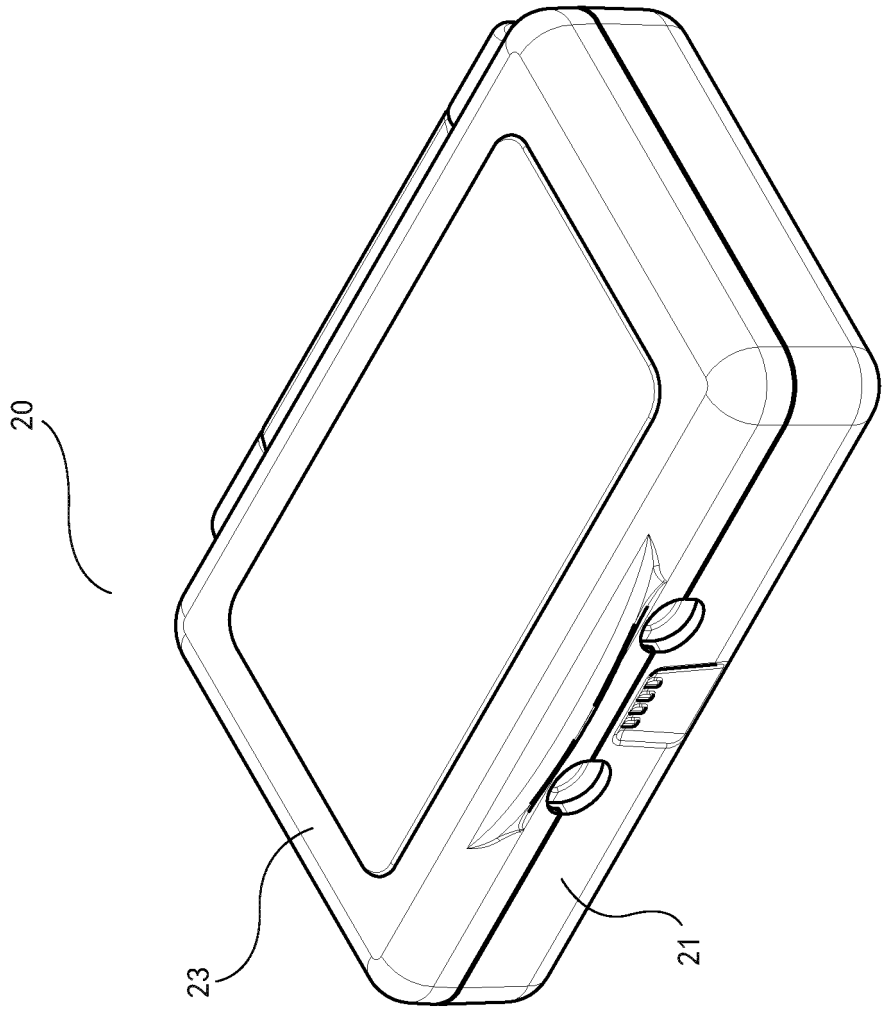


FIG. 19

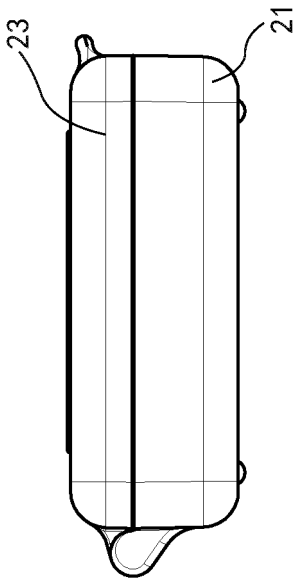


FIG. 21

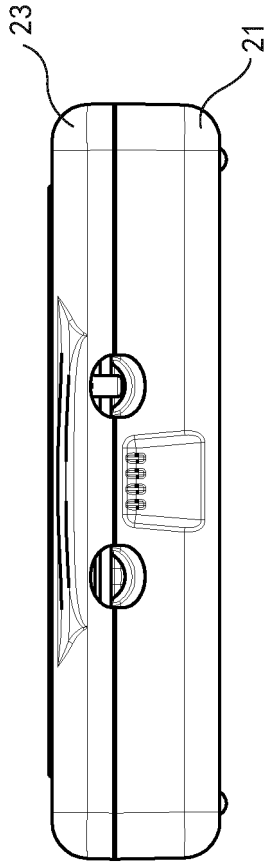


FIG. 20

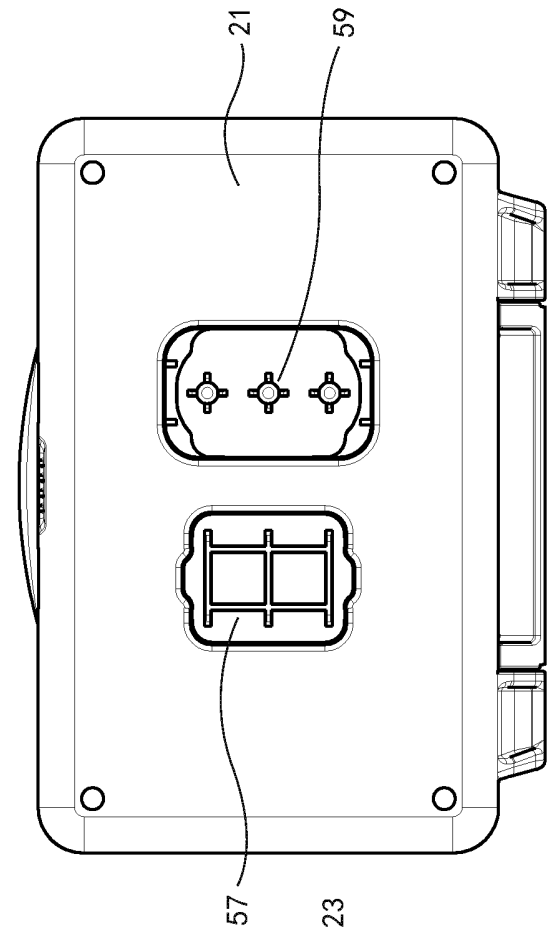


FIG. 23

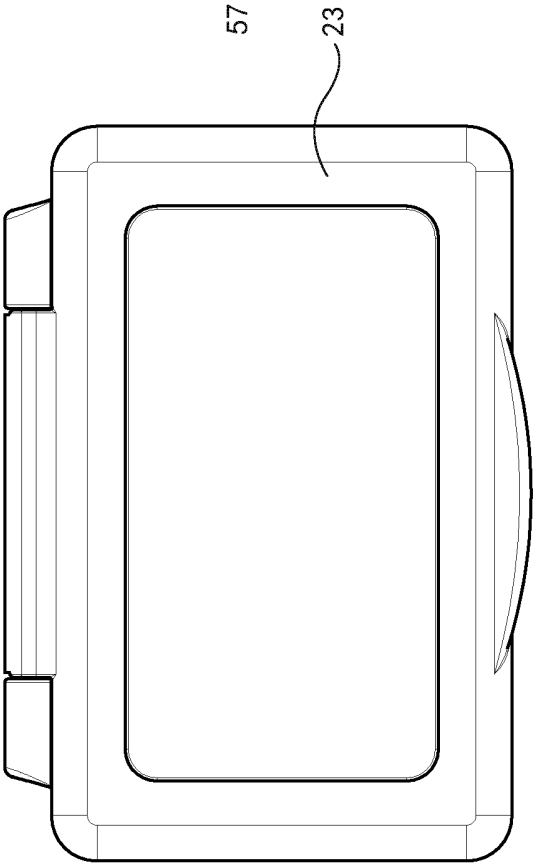


FIG. 22

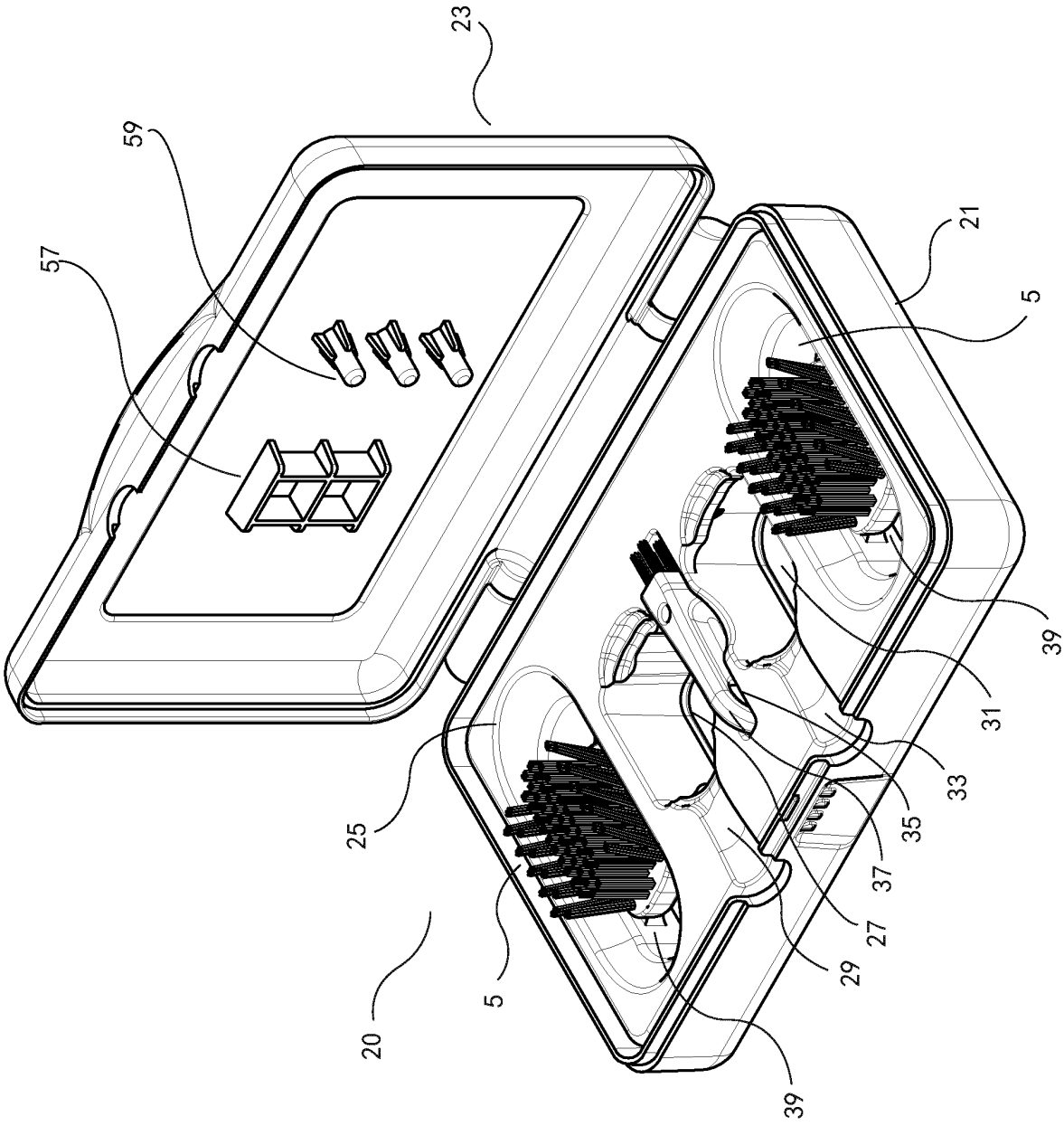


FIG. 24

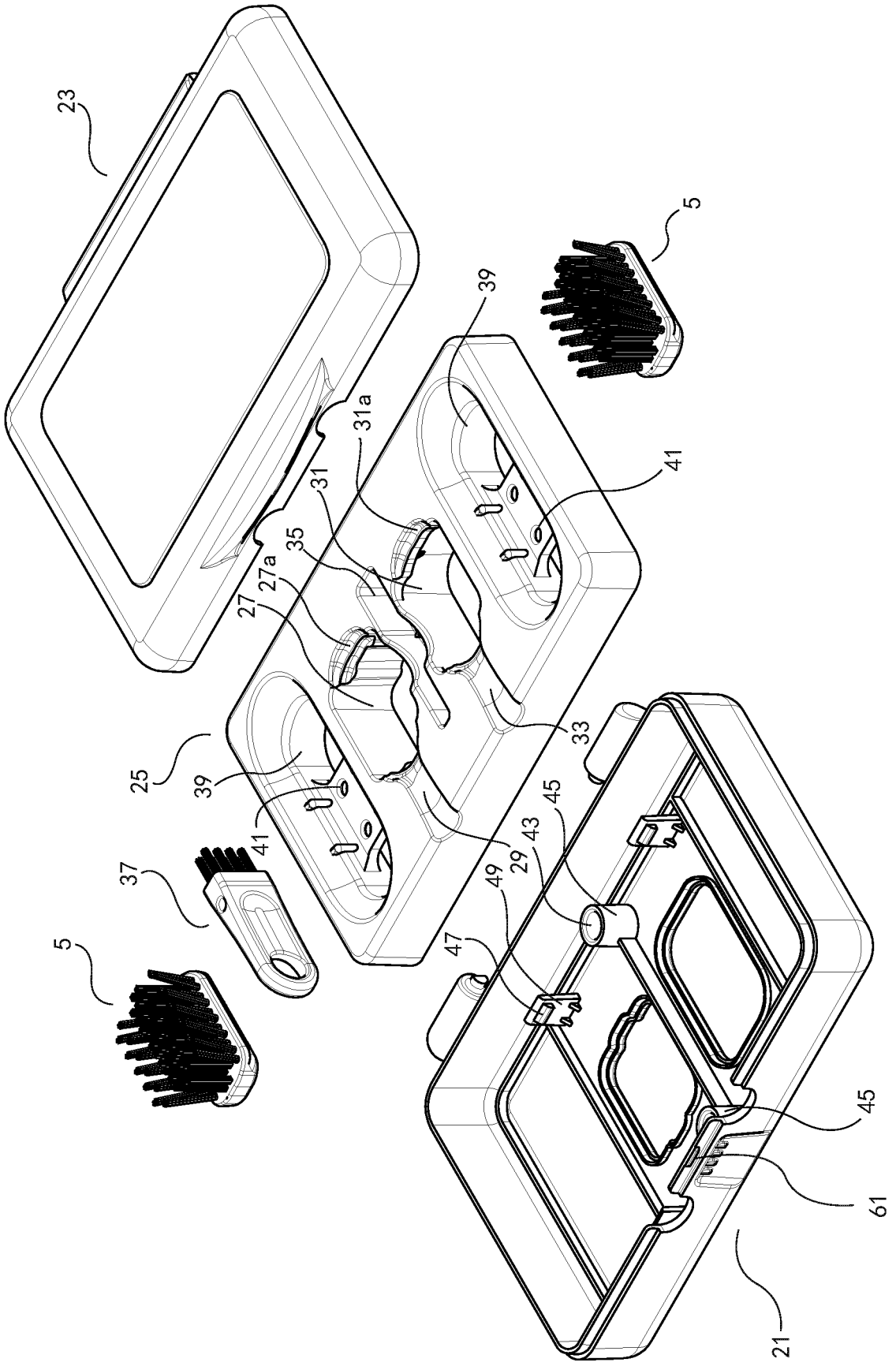


FIG. 25

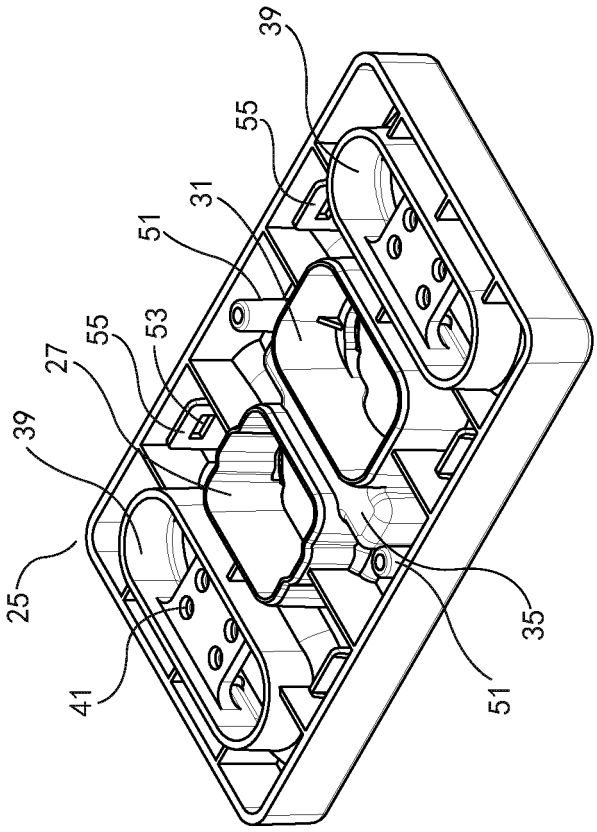


FIG. 26

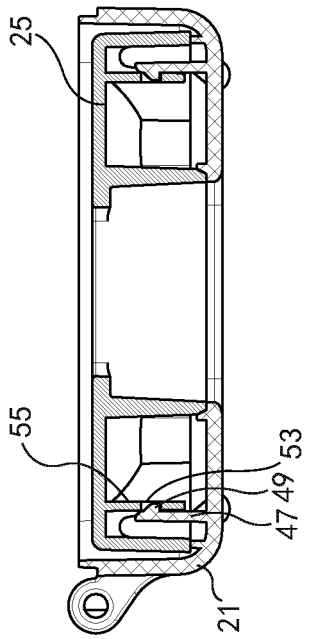


FIG. 27

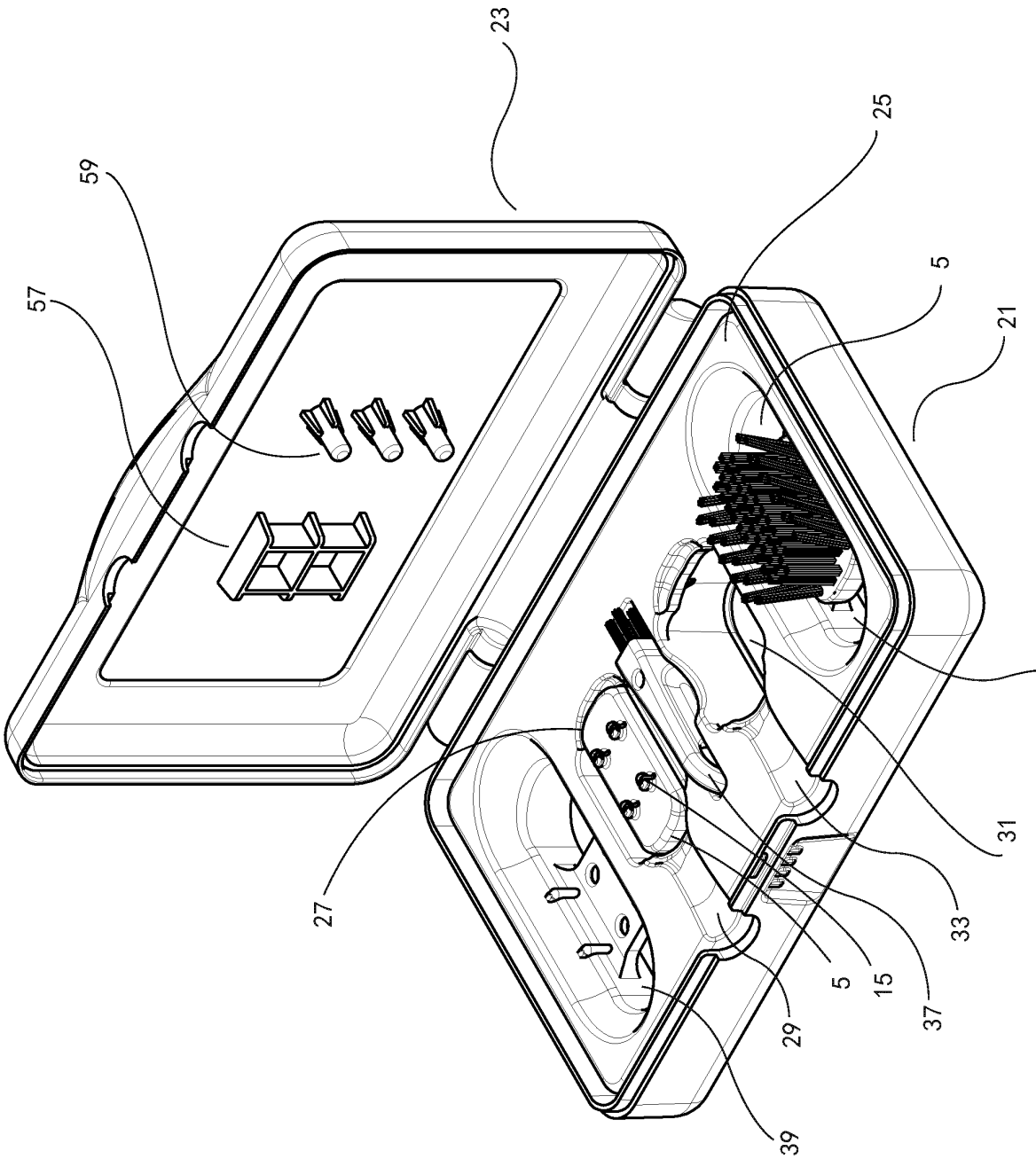


FIG. 28

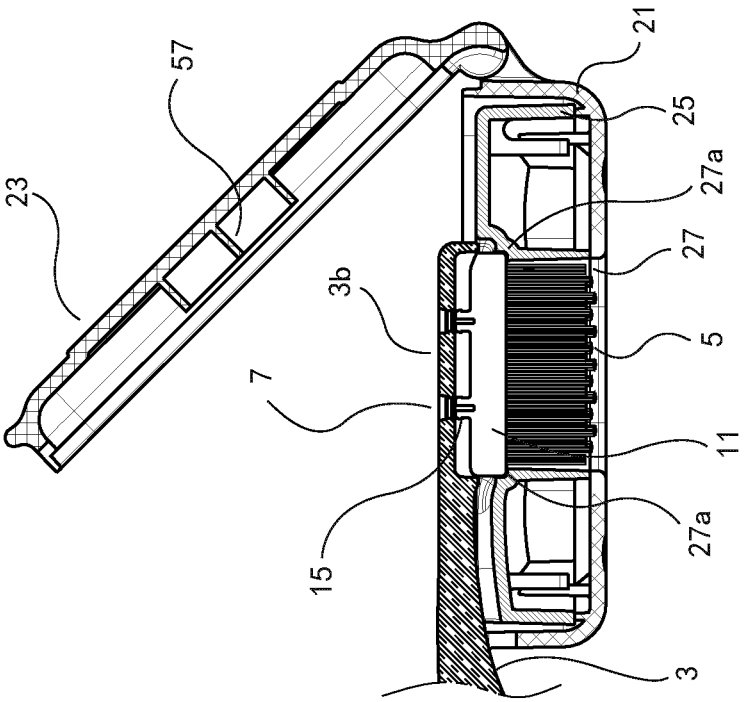


FIG. 29

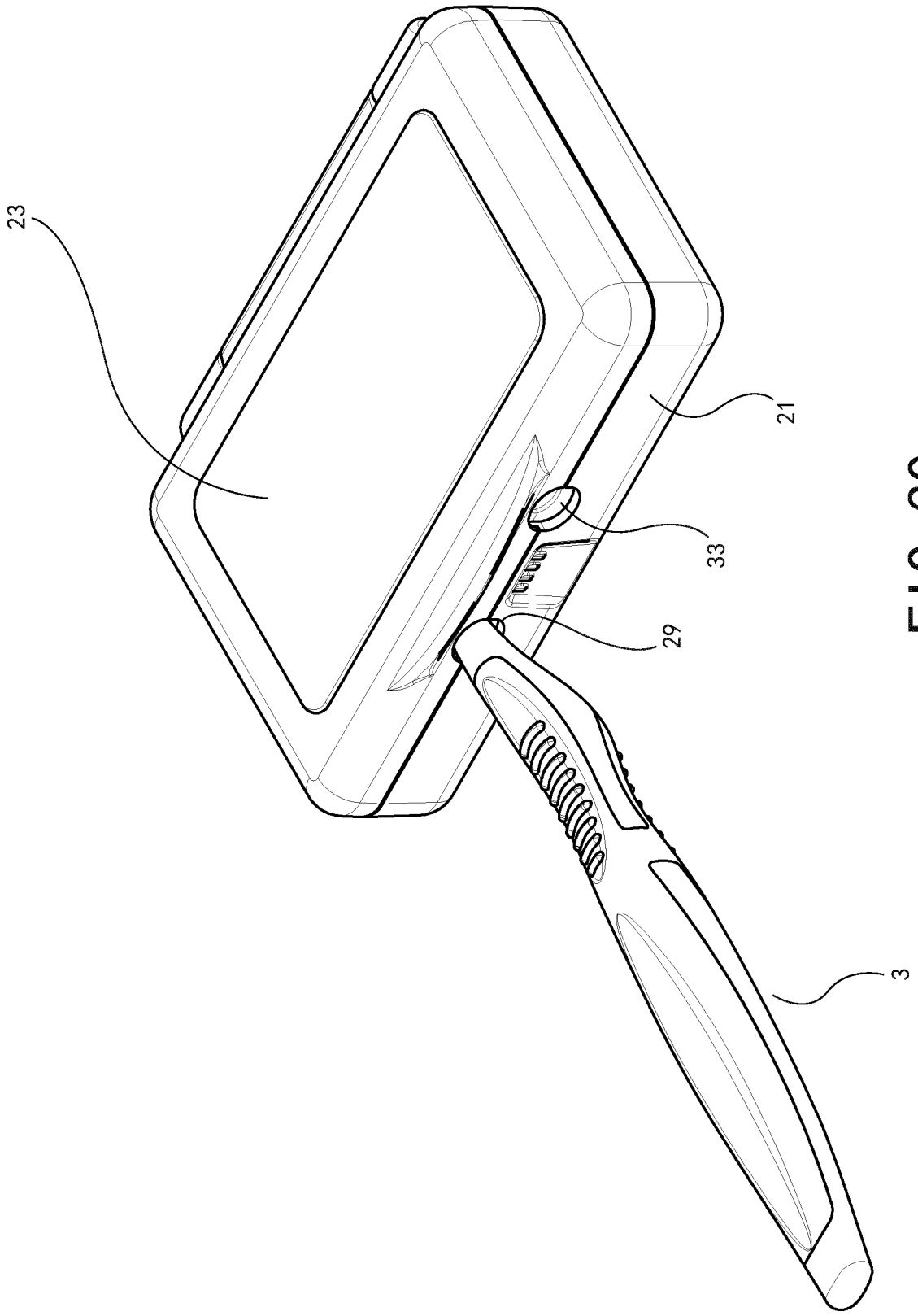


FIG. 30

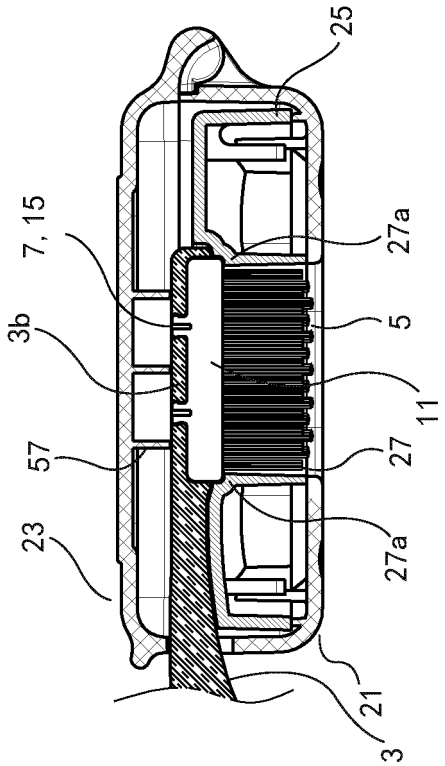


FIG. 31

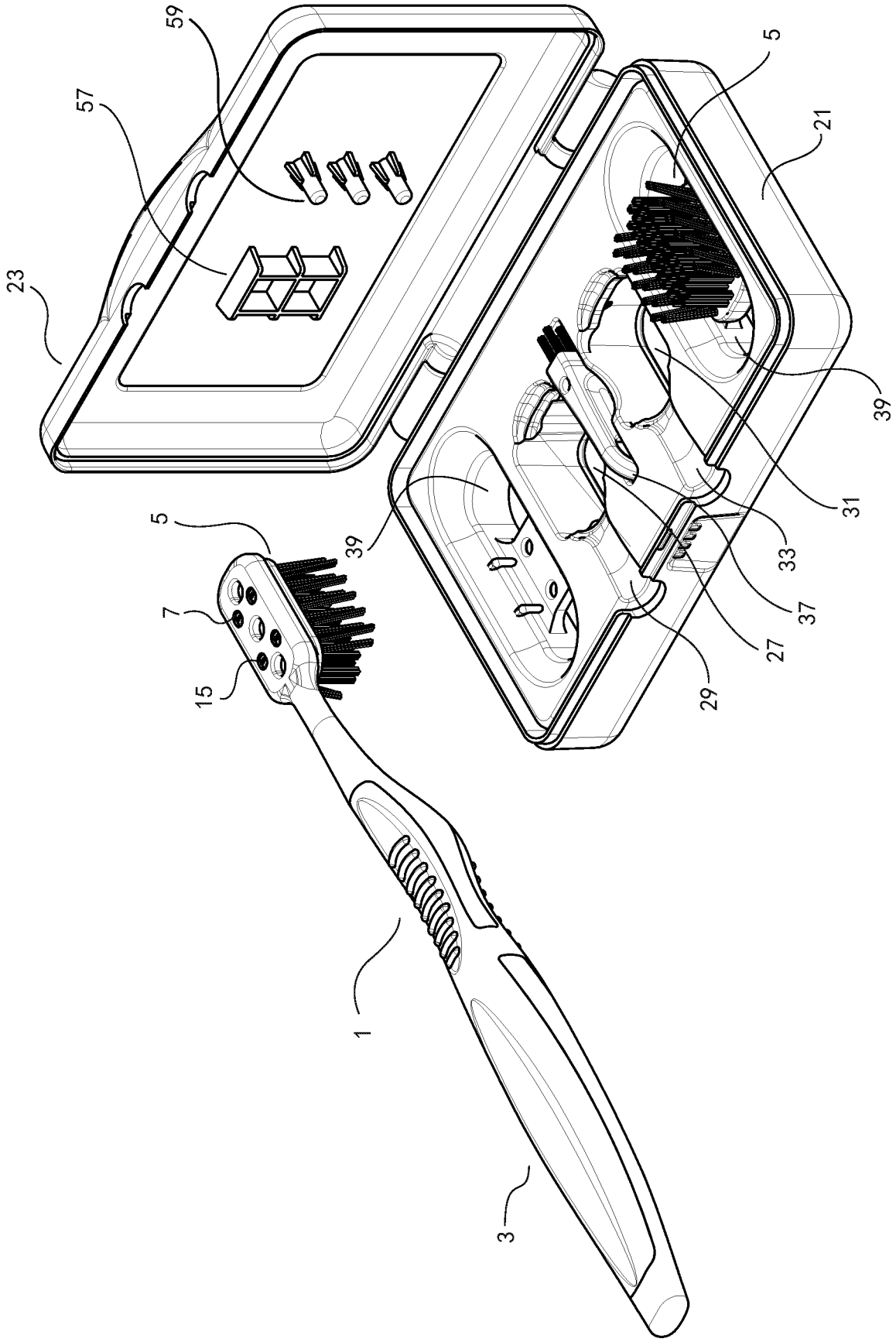


FIG. 32

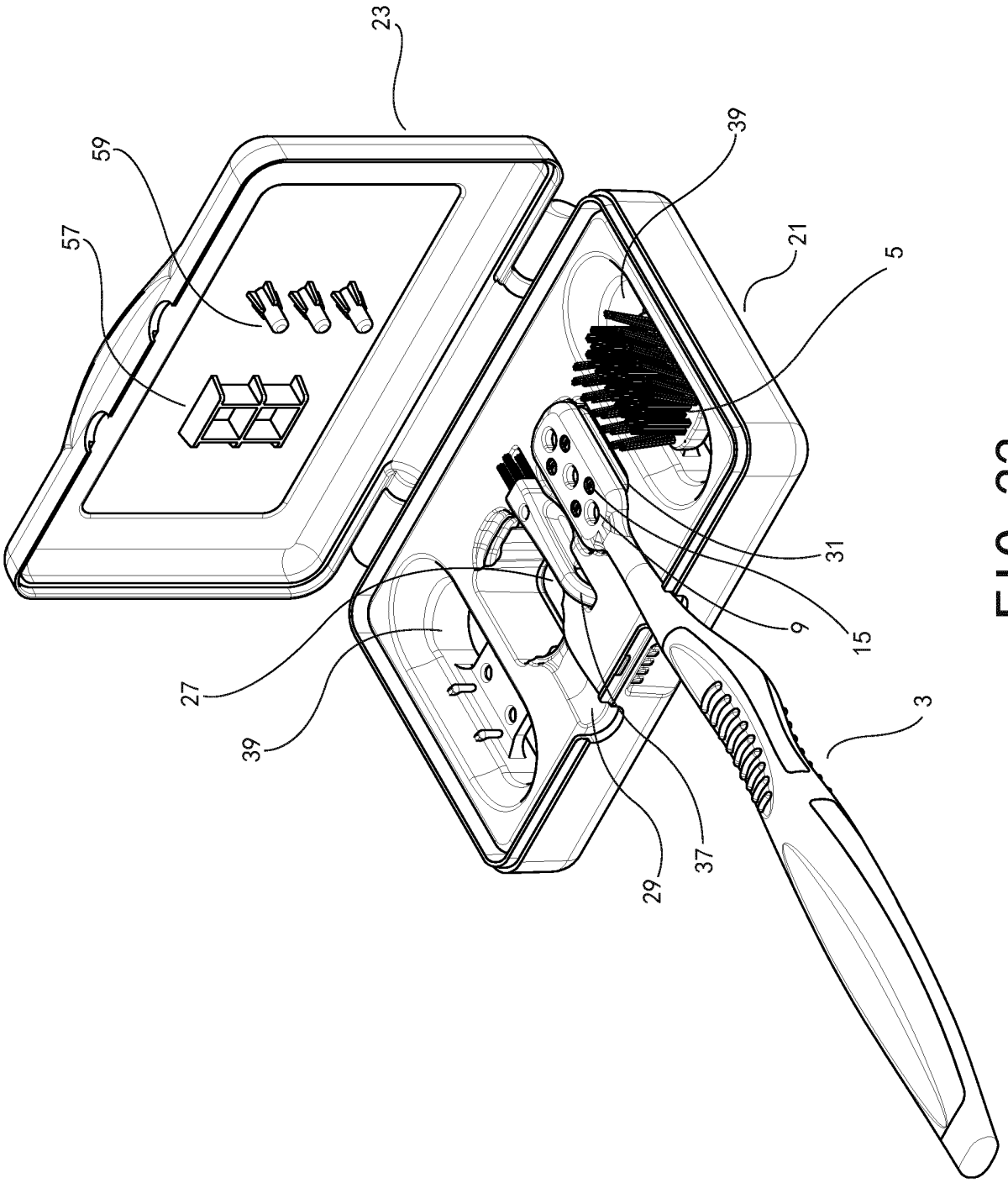


FIG. 33

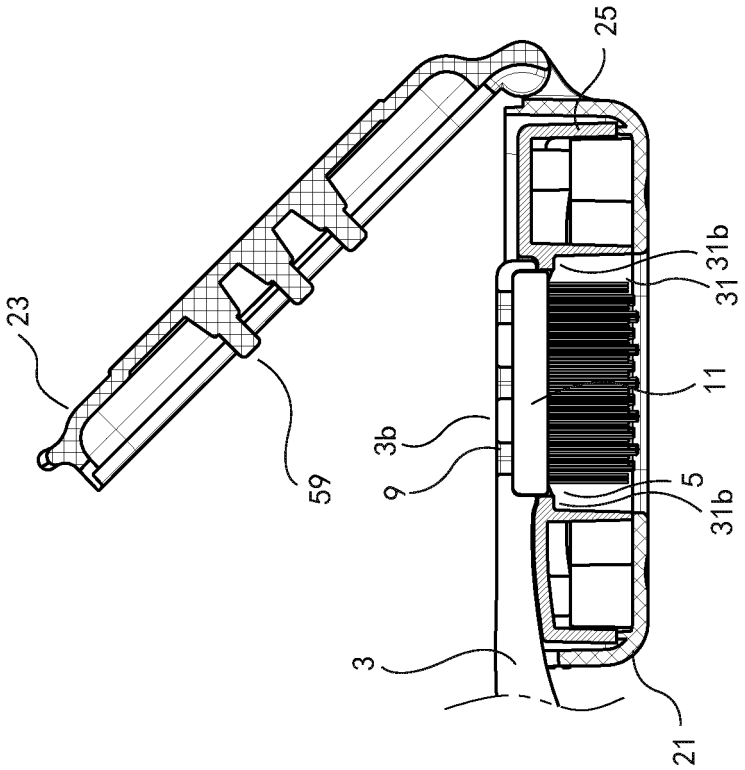


FIG. 34

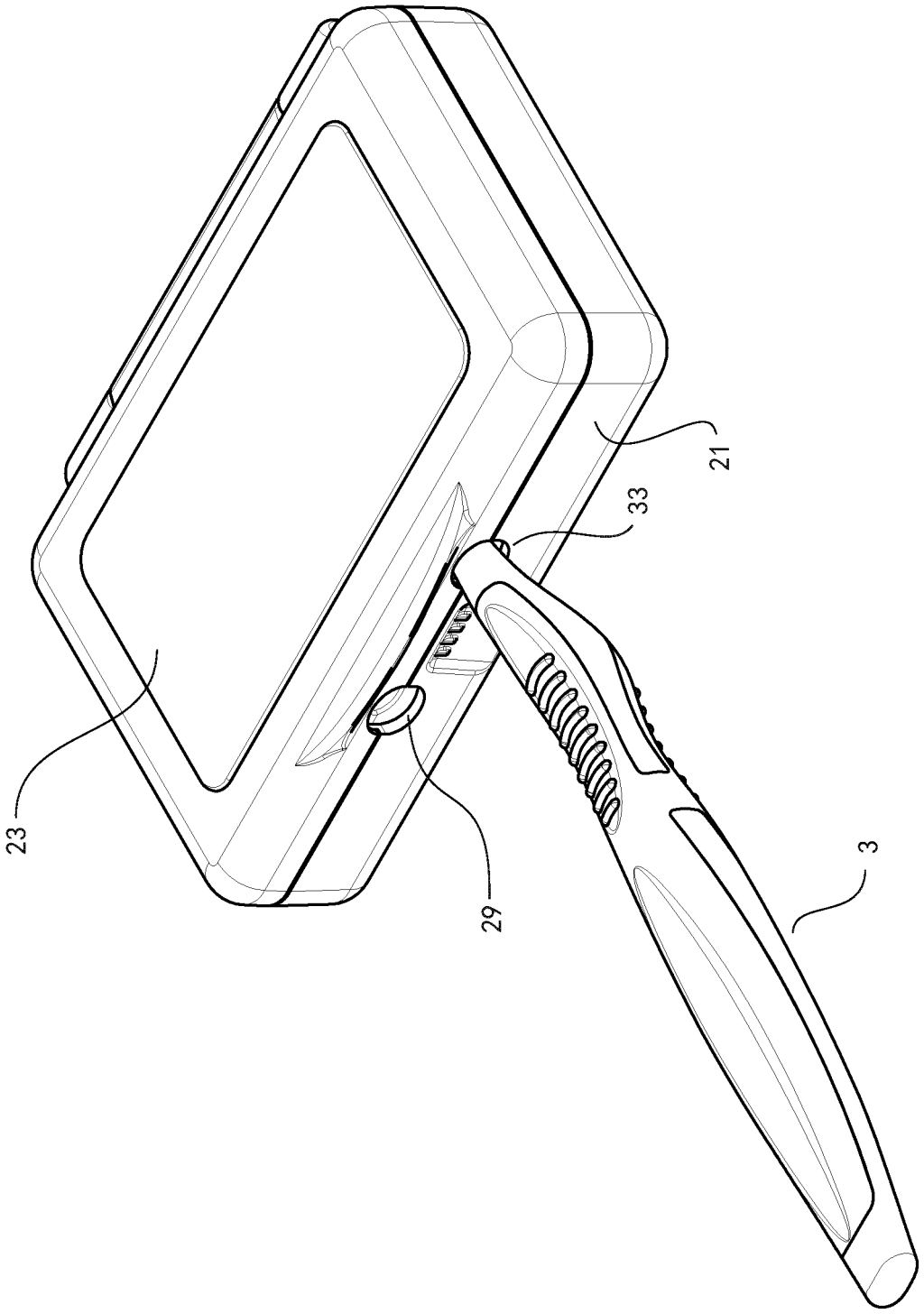


FIG. 35

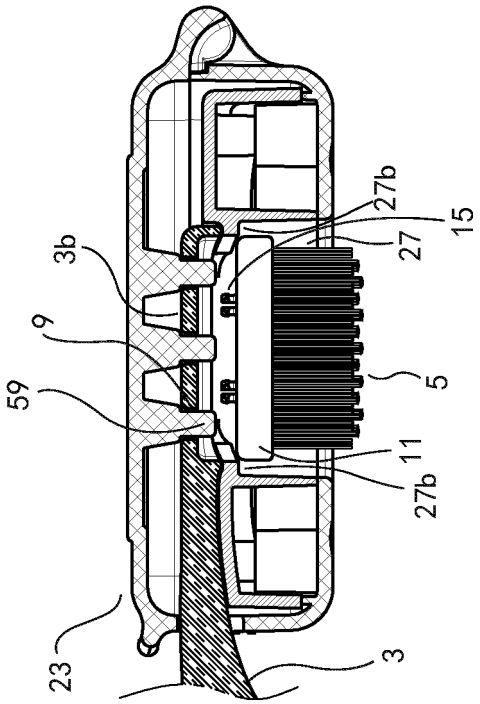


FIG. 36

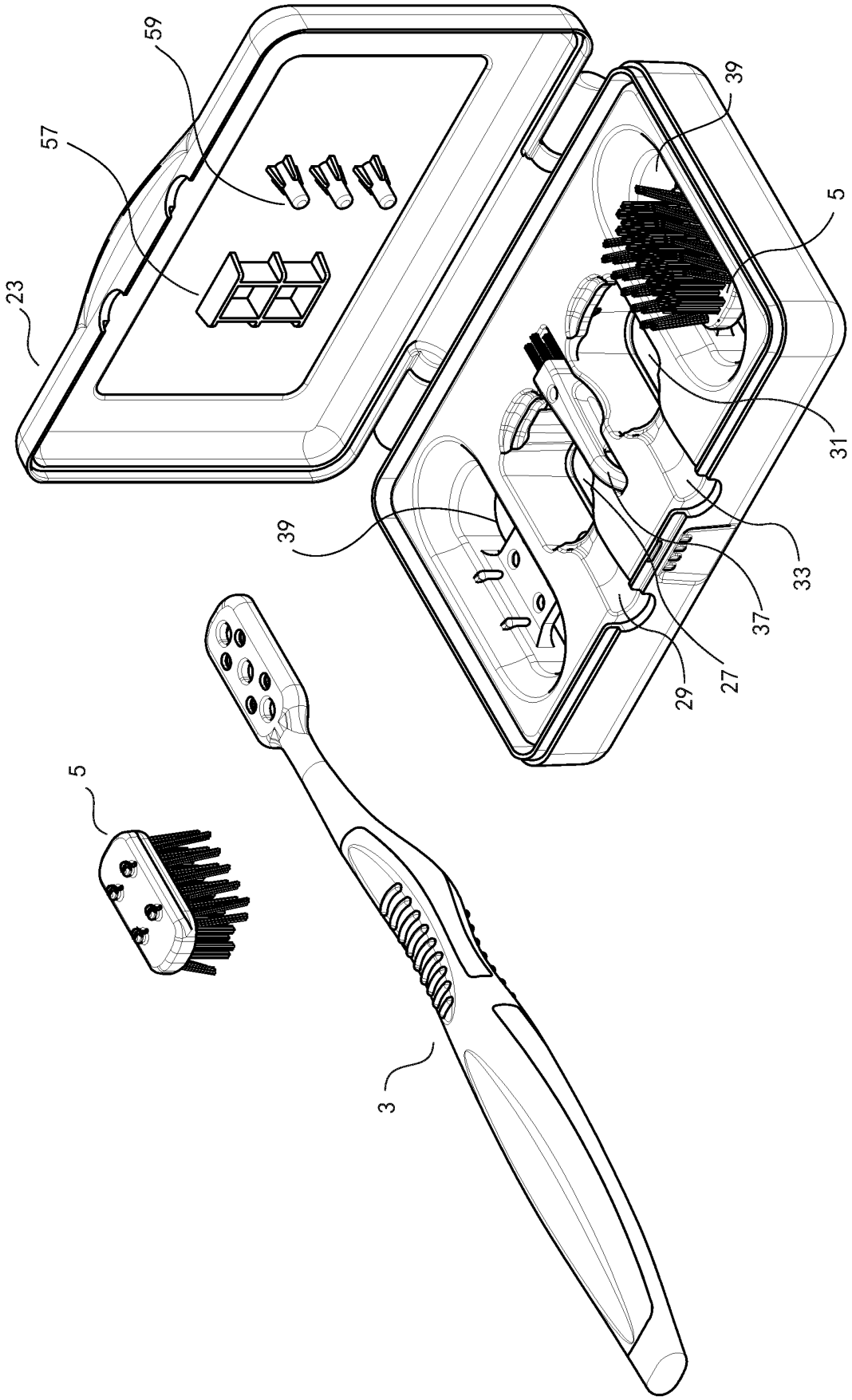


FIG. 37

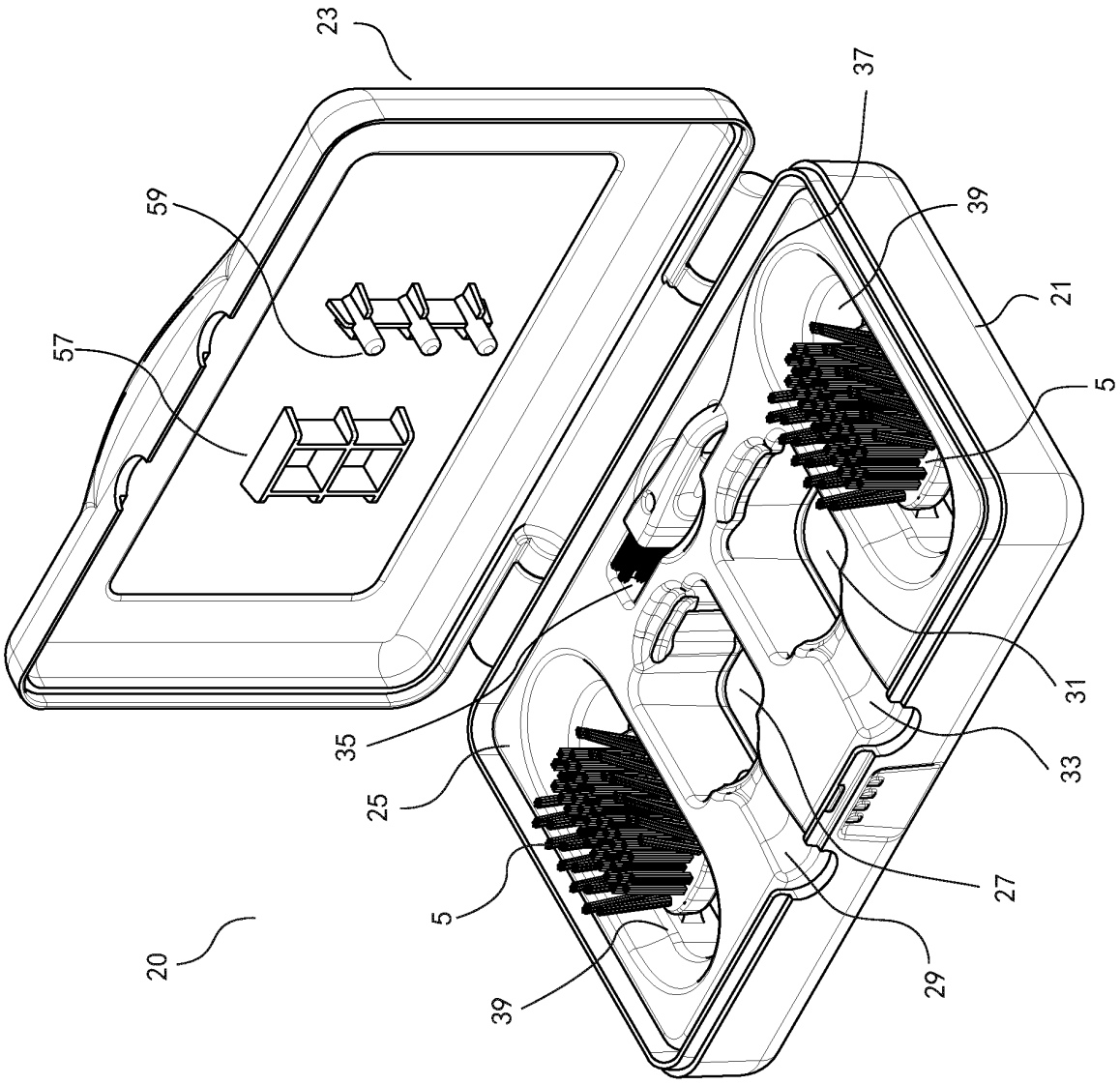


FIG. 38

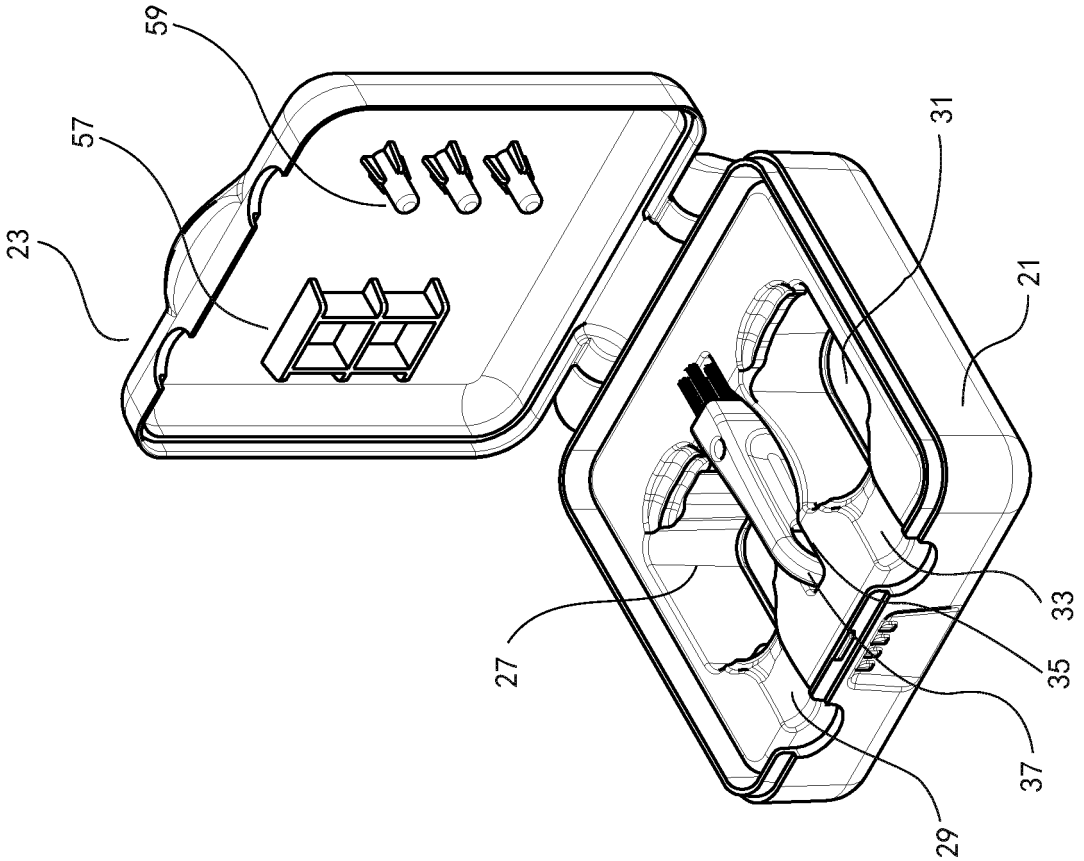


FIG. 39

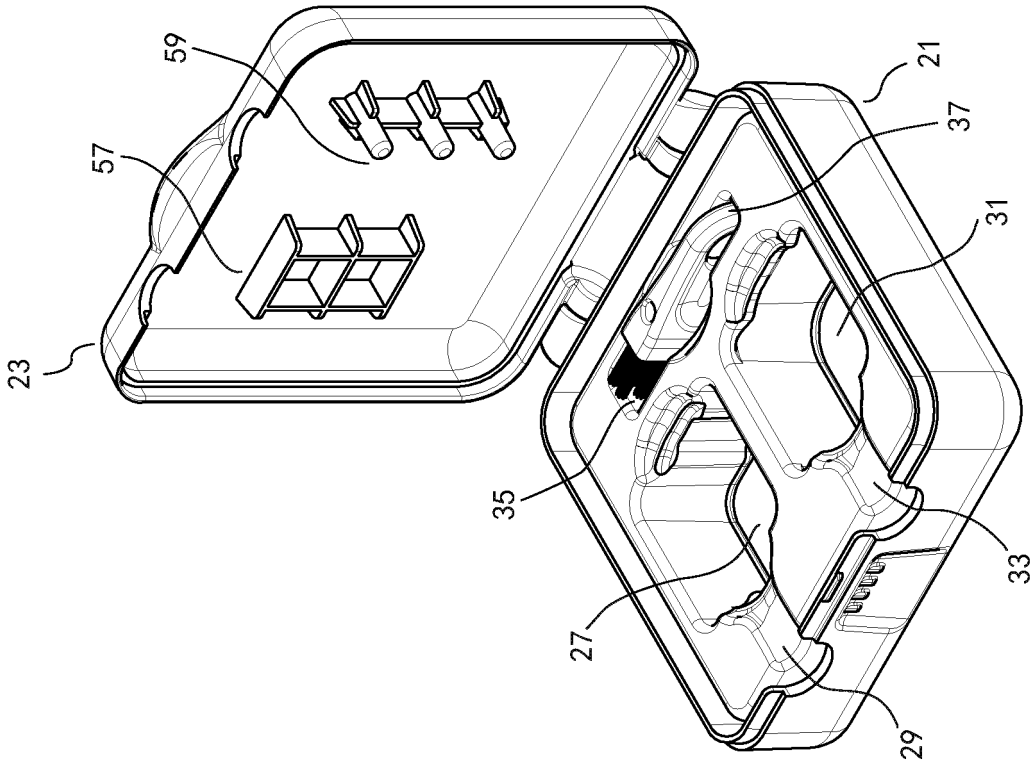


FIG. 40

## INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2019/098321**

**A. CLASSIFICATION OF SUBJECT MATTER**

A46B 7/04(2006.01)i; A46B 15/00(2006.01)i

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)

A46B7, A46B11, A46B15,A46B17, H01R13, B65D6

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)

CNABS, CNTXT, CNKI, VEN, 牙刷, 牙具, 头, 孔, 突起, 凸起, 凸柱, 夹, 凹, 腔, 插接, 拆卸, 安装, 拆装, 更换, 外壳, 盒, 按压, toothbrush, reservoir, head, hole, projection, convexity, jig, concave, cavity, detach, remove, install, replace, shell, box, press

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
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☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **23 March 2020** | **01 April 2020** |
| Name and mailing address of the ISA/CN<br>**China National Intellectual Property Administration (ISA/CN)**<br>**No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088**<br>**China**<br>Facsimile No. **(86-10)62019451** | Authorized officer<br><br>Telephone No. |

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/098321

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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International application No.
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**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
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| Patent document cited in search report | | | Publication date (day/month/year) | Patent family member(s) | | | Publication date (day/month/year) |
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