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(54) **NASAL CAVITY CLEANER AND ORAL CAVITY CLEANER**

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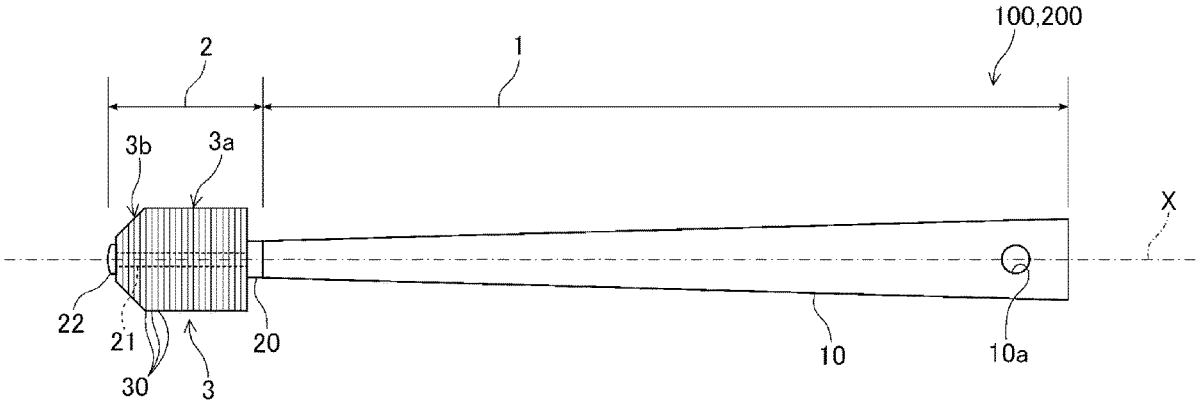
CPC ..... ***A46B 15/0055*** (2013.01); ***A47K 7/02*** (2013.01)

(57) **ABSTRACT**

A nasal cavity cleaner is an instrument to be inserted into the nasal cavity for cleaning the nasal cavity. The nasal cavity cleaner includes a grip section to be gripped by a user, a shaft-shaped brush holding section extending from the grip section, and a plurality of brush pieces stacked on each other and held by the brush holding section. Each of the plurality of brush pieces has an annular section and a plurality of brush bristles provided on an outer peripheral surface of the annular section. Further, each of the plurality of brush pieces is held by the brush holding section inserted through the annular section. The brush holding section has a locking section that is locked to the inner peripheral surface of the annular section of the brush piece held by the brush section, thereby suppressing a rotation of the brush piece.



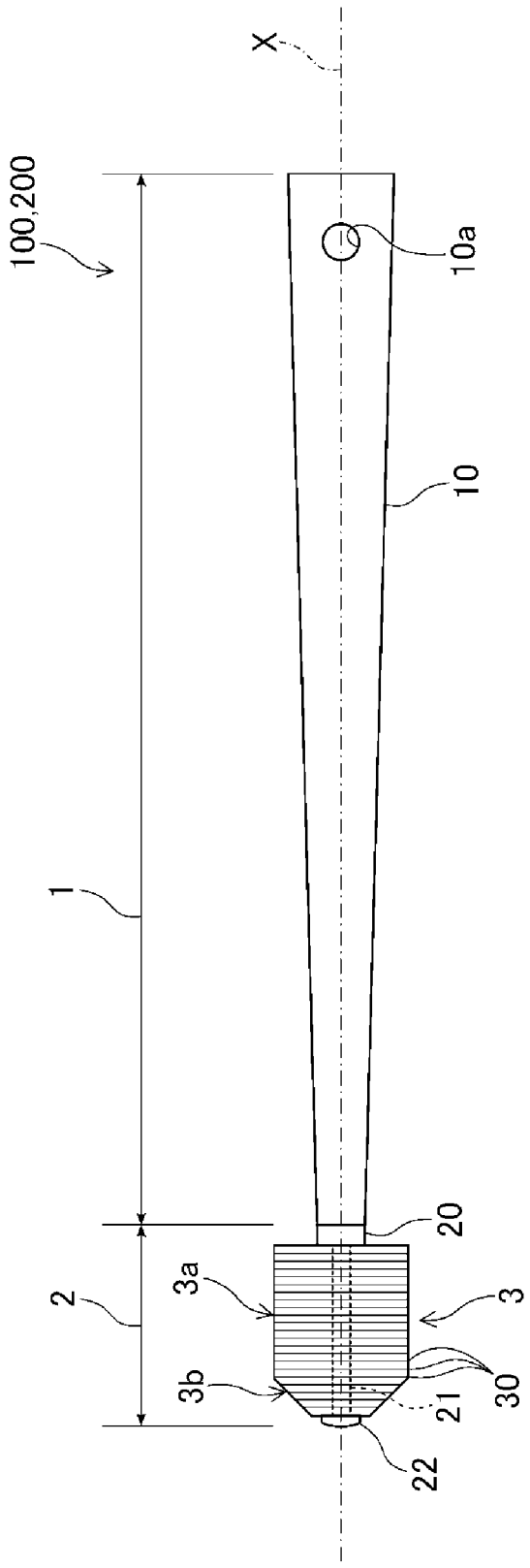



FIG. 1

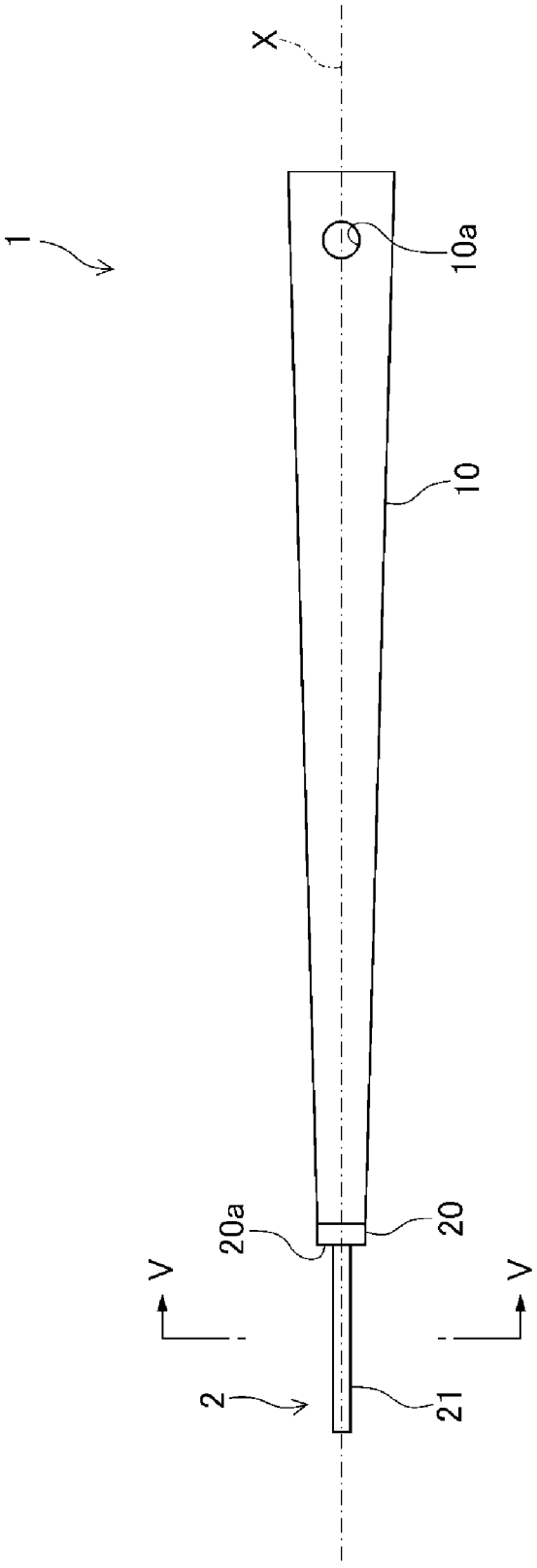



FIG. 2

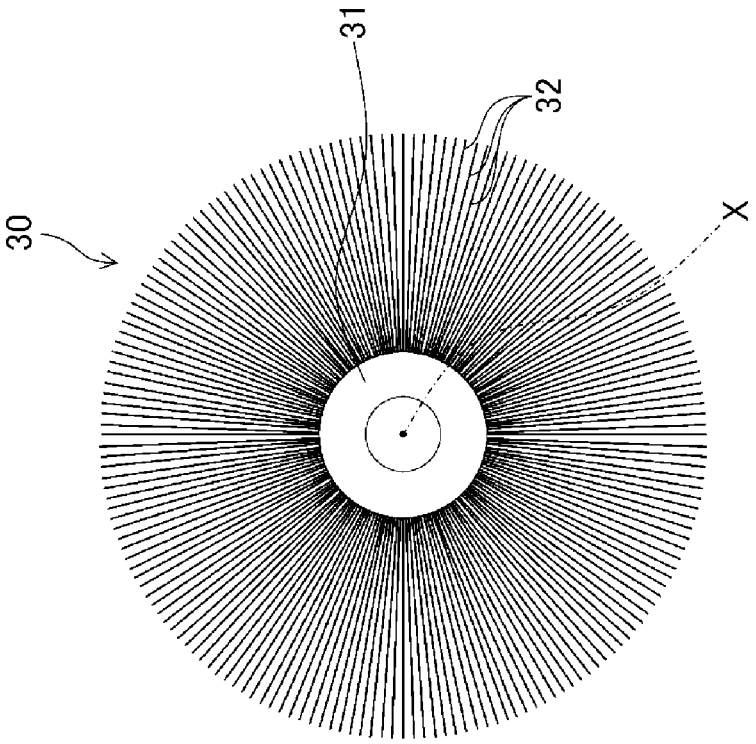



FIG. 3

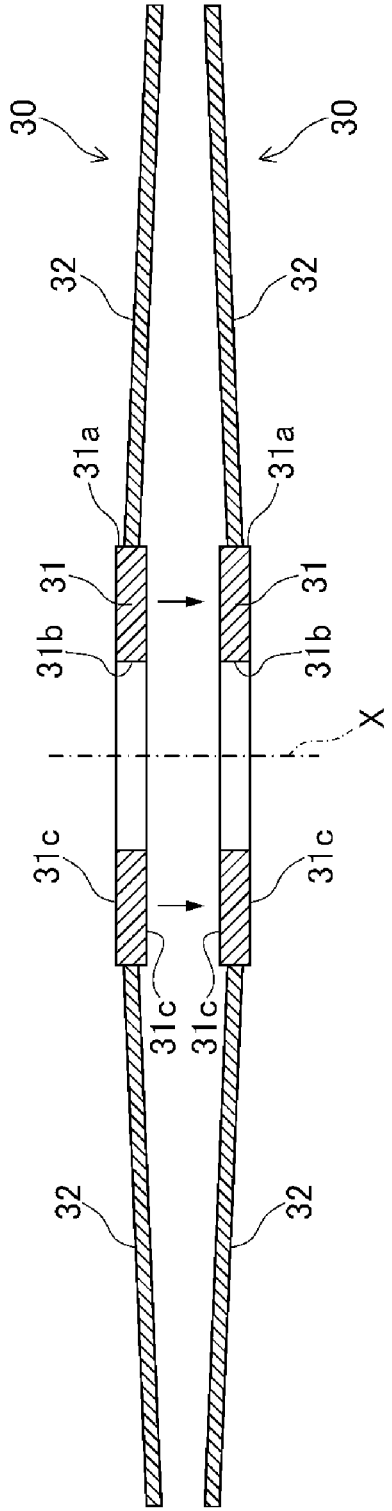



FIG. 4

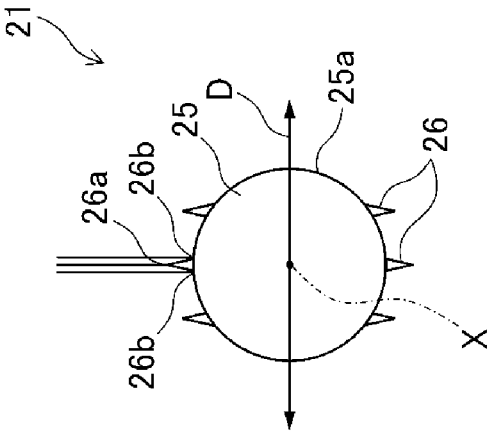



FIG. 5

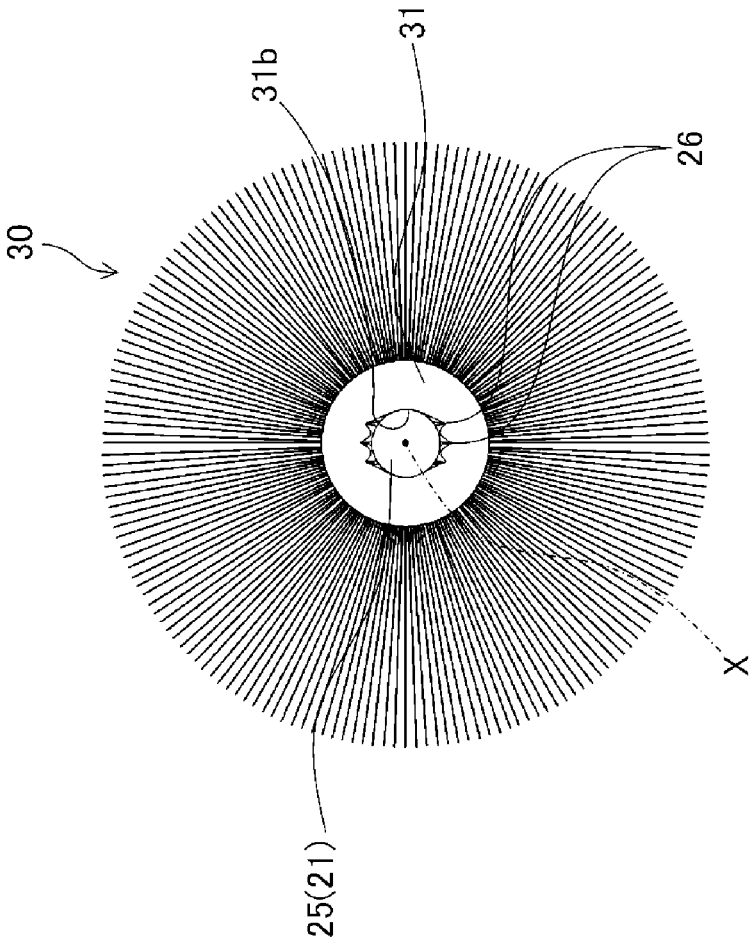



FIG. 6

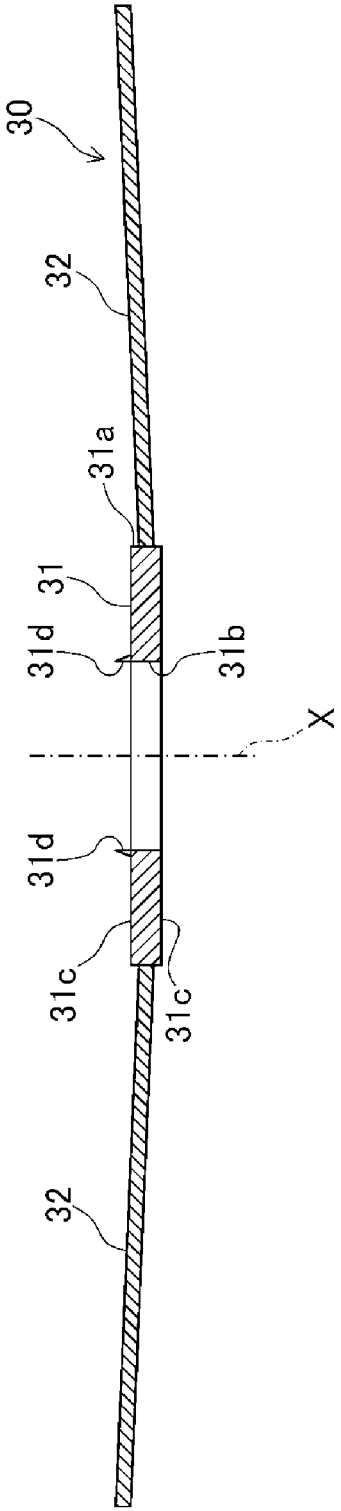



FIG. 7

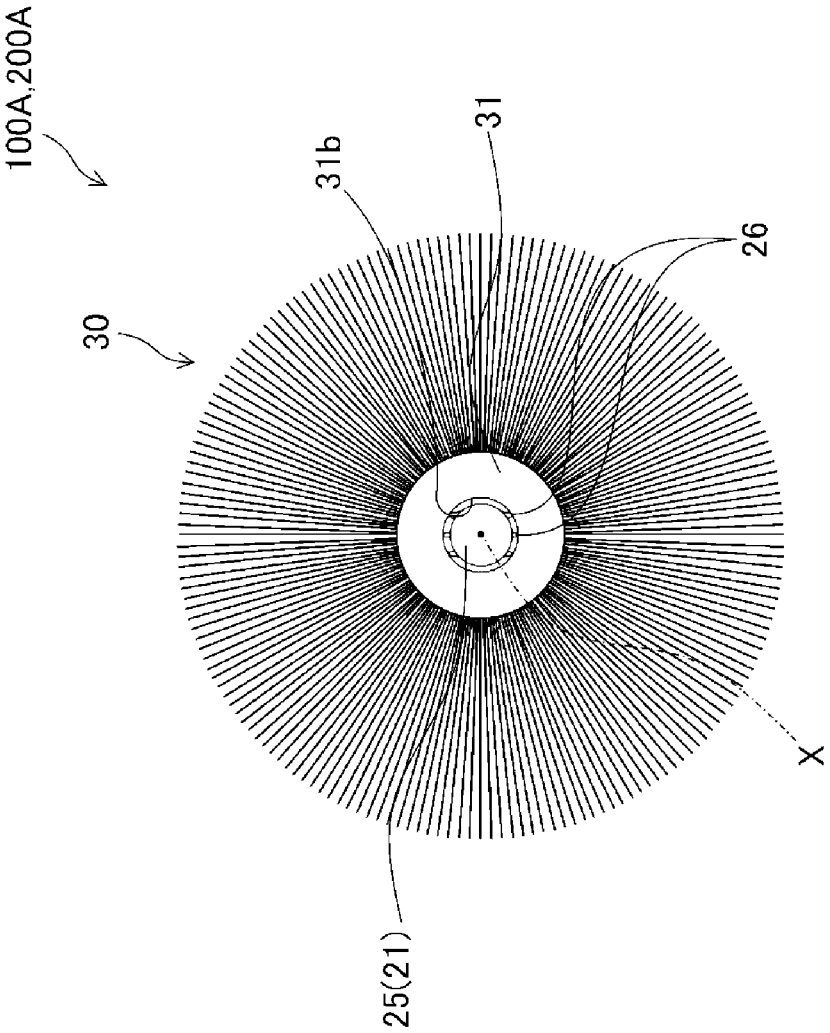



FIG. 8

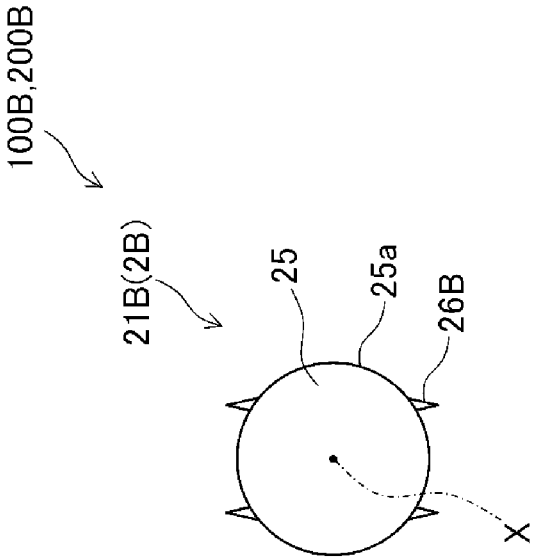



FIG. 9

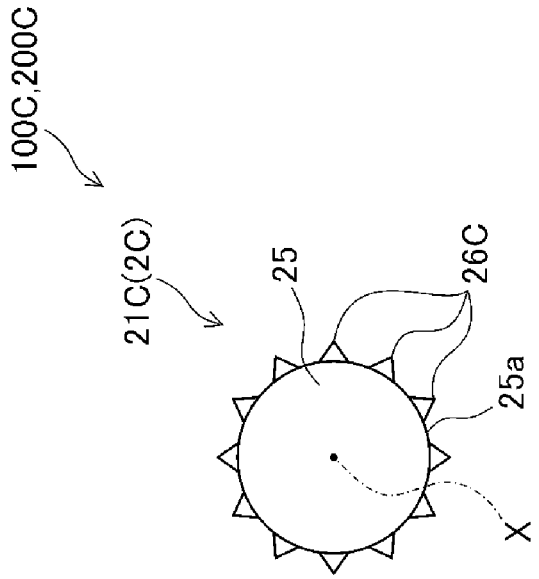



FIG. 10

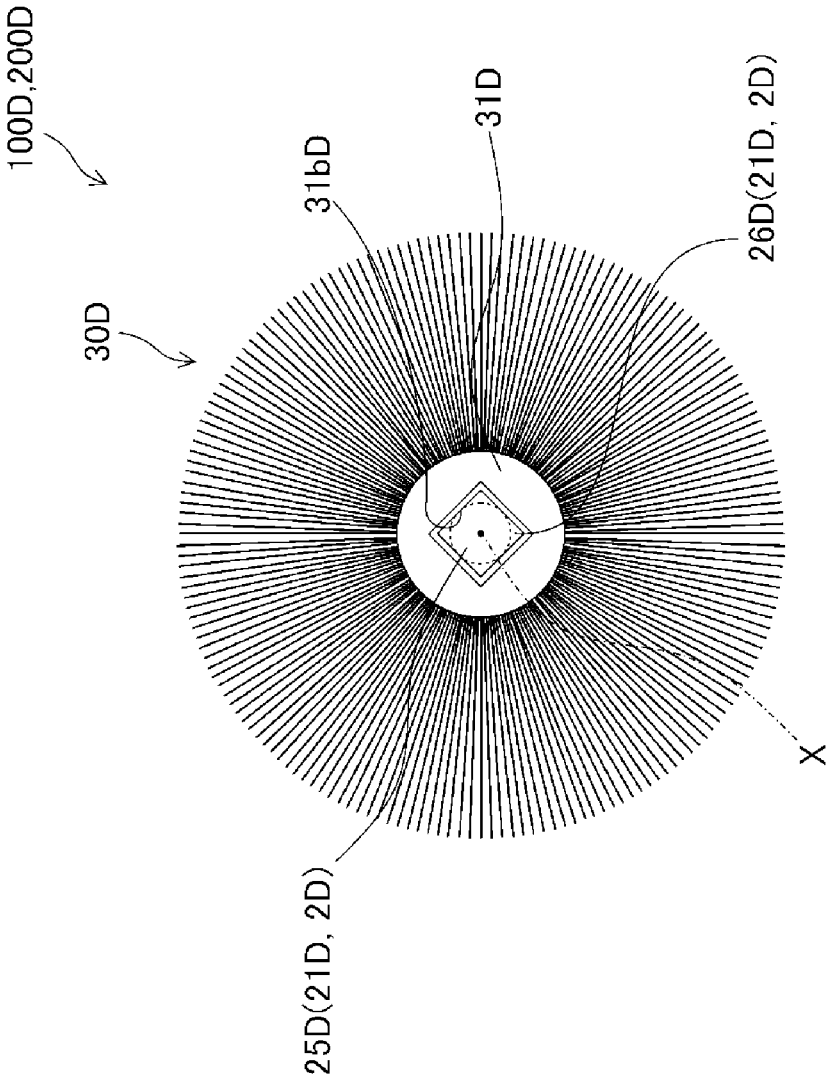



FIG. 11

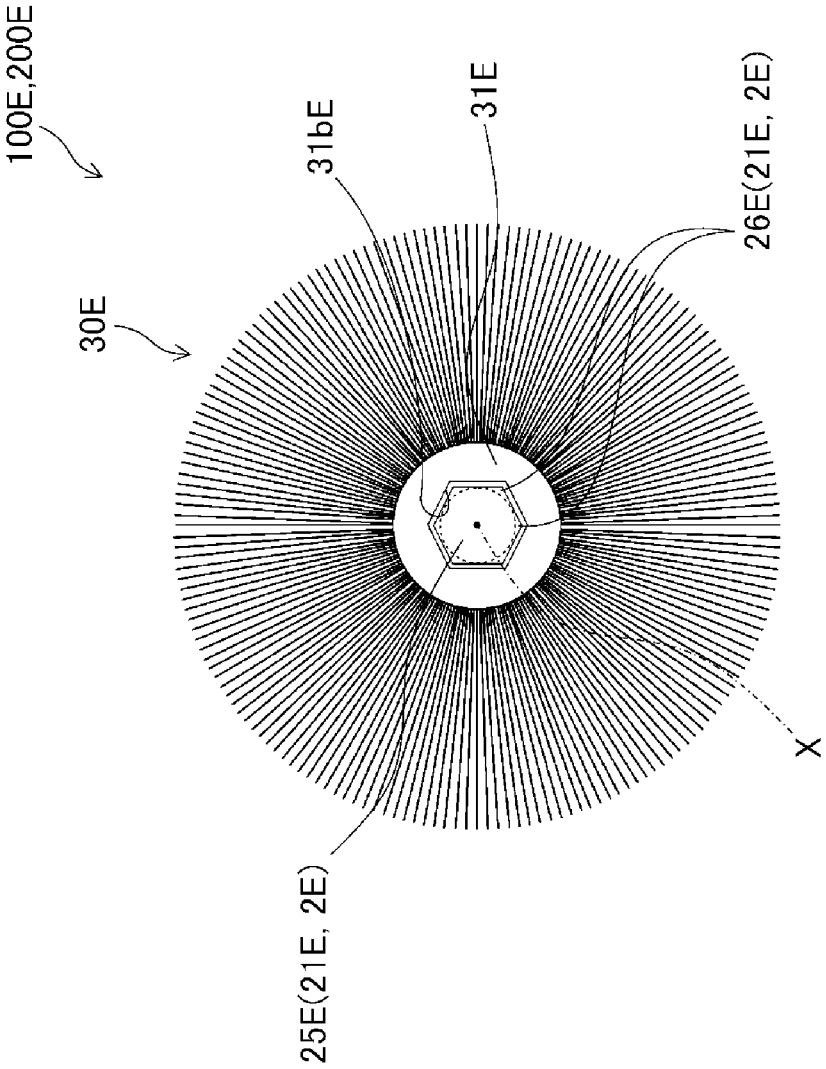



FIG. 12

# NASAL CAVITY CLEANER AND ORAL CAVITY CLEANER

## CROSS REFERENCE TO RELATED APPLICATION

**[0001]** This application takes priority from and claims the benefit of Japanese Patent Application No. Japanese Patent Application No. 2021-204958 filed on Dec. 17, 2021, Japanese Patent Application No. 2022-078693 filed on Dec. 17, 2021 (Divisional application of No. 2021-204958), Japanese Patent Application No. 2022-158632 filed on Dec. 17, 2021 (Divisional application of No. 2022-078693), the contents of which are herein incorporated by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

**[0002]** The present disclosure relates to a nasal cavity cleaner and an oral cavity cleaner.

### Description of the Related Art

**[0003]** Foreign substances such as secretions from a nasal cavity or foreign substances having entered from the outside may accumulate in the nasal cavity. These foreign substances are desired to be removed. For example, when nasal mucus is secreted from the nasal cavity, the removal of the nasal mucus relieves discomfort. Further, according to the results of intensive research made by the inventor of the present disclosure, when an allergen, or an allergenic substance, that can cause an allergic reaction invades the nasal cavity enters the nasal cavity, sufficient removal of the allergen can be expected to alleviate the allergic reaction.

**[0004]** As an instrument for removing foreign substances in the nasal cavity, a nasal cavity cleaner as disclosed in Patent Document 1 is known to public, for example. This nasal cavity cleaner is a so-called 360-degree brush with a plurality of brush pieces including a plurality of radially arranged brush bristles being stacked on each other and held. Each of the plurality of brush pieces has a circular opening in the center, is fitted into a cylindrical shaft-shaped brush holding section formed to have approximately the same diameter as the opening, and accordingly constitutes a brush section to be inserted into the nasal cavity. Moreover, an oral cavity cleaner for cleaning the oral cavity is also known as an instrument similar to this nasal cavity cleaner.

**[0005]** The contents of Utility Model Registration No. 3232109 are incorporated herein by reference in their entirety.

## SUMMARY OF THE INVENTION

### Problems to be Solved by the Invention

**[0006]** When the nasal cavity cleaner as described above is rotated around the central axis line of the brush holding section while the brush section is inserted into the nasal cavity, it removes foreign substances in the nasal cavity with the brush bristles. However, when this nasal cavity cleaner is rotated around the central axis line inside the nasal cavity, the brush holding section may fail to hold the brush pieces due to a friction between the inner wall of the nasal cavity and the brush bristles, and accordingly may rotate idly in relation to the brush pieces. As a result, even if a grip section and the brush holding section are rotated, the brush section may remain stationary in the nasal cavity failing to rotate, which may make it impossible to effectively clean the nasal cavity. Similarly, the brush section of the oral cavity cleaner may remain stationary failing to rotate, which may make it impossible to effectively clean the oral cavity.

**[0007]** Therefore, the nasal cavity cleaner and the oral cavity cleaner according to the present disclosure aim to suppress the idle rotation of the brush holding section in relation to the brush pieces.

### Means of Solving the Problems

**[0008]** A nasal cavity cleaner according to one embodiment of the present disclosure is a nasal cavity cleaner so as to be inserted into a nasal cavity for cleaning the nasal cavity. The nasal cavity cleaner includes a grip section to be gripped by a user and a shaft-shaped brush section extending from the grip section and a plurality of brush pieces stacked on each other and held by the brush holding section. Each of the plurality of brush pieces includes an annular section formed in an annular shape and a plurality of brush bristles provided on an outer peripheral surface of the annular section. Each of the plurality of brush pieces is held by the brush holding section inserted through the annular section. The brush holding section includes a locking section locked to an inner peripheral surface of the annular section of the brush piece held by the brush holding section to suppress a rotation of the brush piece around the central axis line.

**[0009]** According to this nasal cavity cleaner, the shaft-shaped brush holding section is inserted through the annular section of the plurality of brush pieces stacked on each other, thereby configuring the brush section to be inserted into the nasal cavity. Here, the brush holding section is provided with the locking section locked to the annular section of the brush piece. Therefore, when the nasal cavity cleaner is rotated around the central axis line in the nasal cavity, a friction between the inner wall of the nasal cavity and the brush bristles can suppress the failure of the brush holding section to hold the brush pieces, enabling the brush pieces to rotate integrally with the brush holding section. This enables the suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0010]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the plurality of brush bristles may be provided radially outward from the outer peripheral surface of the annular section over the entire circumference of the outer peripheral surface of the annular section. This enables effective removal of foreign substances in the nasal cavity by rotating the nasal cavity cleaner around the central axis line while the brush section is inserted into the nasal cavity.

**[0011]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the annular section may be formed in an annular shape. The brush holding section may include a cylindrical base section and a rib-shaped locking section extending on the outer peripheral surface of the base section along the central axis line of the brush holding section and having the outer diameter from the central axis line of the brush holding section to the top of the locking section larger than the inner diameter of the annular section. The brush holding section may be inserted through the annular section by press fitting, thereby locking the locking section to the inner peripheral surface of the annular section. According to this, the brush piece can be locked to the brush holding section more firmly, so that the

idle rotation of the brush holding section in relation to the brush piece can be suppressed more reliably.

**[0012]** In the nasal cavity cleaner according to one embodiment of the present disclosure, on a cross-section perpendicular to the central axis line of the brush holding section, the top of the locking section may be positioned between two interfaces between the locking section and the base section when viewed in at least one direction perpendicular to the central axis line. This facilitates the removal of the brush holding section from the mold when manufacturing the brush holding section, for example, by injection molding.

**[0013]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the inner peripheral surface of the annular section of each of the plurality of brush pieces may be pressed and expanded by the locking section while the brush holding section is inserted through the annular section. This facilitates the manufacturing of the brush piece as there is no need of forming in advance a recess corresponding to the locking section on the inner peripheral surface of the annular section. In addition, a pressing force generated between the locking section and the inner peripheral surface of the annular section can lock the brush piece more firmly to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush piece.

**[0014]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the locking section may be crushed by the inner peripheral surface of the annular section while the brush holding section is inserted through the annular portion. This facilitates the manufacturing of the brush piece as there is no need of forming in advance a recess corresponding to the locking section on the inner peripheral surface of the annular section. In addition, a pressing force generated between the locking section and the inner peripheral surface of the annular section can lock the brush piece more firmly to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush piece.

**[0015]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the annular section may be formed in a polygonal annular shape so that at least the inner peripheral surface has a polygonal shape. The brush holding section may be formed in a polygonal columnar shape fitting into the annular section. The locking section may be corners of a cross-section perpendicular to the central axis line of the brush holding section. According to this, the shapes of the locking section and the inner peripheral surface of the annular section match each other, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0016]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the brush holding section may be loosely fitted into the annular section. This facilitates insertion of the brush holding section into the annular section.

**[0017]** In the nasal cavity cleaner according to one embodiment of the present disclosure, each of the plurality of brush pieces stacked on each other may be in contact with another adjacent one of the brush pieces on the side surfaces of the annular sections of the brush pieces adjacent to each other. According to this, a frictional force generated between the side surfaces of the annular sections of the brush pieces adjacent to each other suppresses the relative rotation of the brush pieces around the central axis line. As a result, the plurality of brush pieces are cooperatively locked to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0018]** In the nasal cavity cleaner according to one embodiment of the present disclosure, each of the plurality of brush pieces may include a convex section formed on the side surface of the annular section. According to this, the side surfaces of the annular sections of the brush pieces adjacent to each other are firmly connected to each other by the convex section to suppress the relative rotation of the brush pieces around the central axis line. As a result, the plurality of brush pieces are cooperatively locked to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0019]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the brush holding section includes a wall section on the grip section side on which the annular section of the brush piece abuts when the brush holding section is first inserted through the annular section, and a pressurizing lid section for pressurizing and holding the annular section of the brush piece along the central axis line toward the grip section when the brush holding section is last inserted through the annular section. According to this, the plurality of brush pieces are pressurized and held by the wall section and the pressurizing lid section of the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0020]** In the nasal cavity cleaner according to one embodiment of the present disclosure, the pressurizing lid section may be formed by ultrasonic welding. This facilitates the manufacturing of the nasal cavity cleaner having the above-described configuration.

**[0021]** In the nasal cavity cleaner according to one embodiment of the present disclosure, at least at the end opposite to the grip section, the plurality of brush bristles may be formed to include the brush bristles shorter in length from the grip section side toward the side opposite to the grip section. According to this, the brush section is in a tapered shape, thereby facilitating the insertion of the brush section into the nasal cavity. Furthermore, when the brush piece positioned at the end opposite to the grip section is supported by a small-diameter lid section, it is hard to ensure the frictional force between the side surface of the annular section of the brush piece and the lid section. In this case, shortening of the brush bristles of the brush piece in length reduces a torque acting on the brush piece owing to the friction between the inner wall of the nasal cavity and the brush bristles, thereby enabling the suppression of the excess of this torque over the frictional force between the side surface of the annular section and the lid section. This enables more reliable suppression of the idle rotation of the brush holding section in relation to the brush pieces.

**[0022]** An oral cavity cleaner according to one embodiment of the present disclosure is an oral cavity cleaner so as to be inserted into an oral cavity for cleaning the oral cavity. The oral cavity cleaner includes a grip section to be gripped by a user and a shaft-shaped brush section extending from the grip section and a plurality of brush pieces stacked on each other and held by the brush holding section. Each of the plurality of brush pieces includes an annular section formed

in an annular shape and a plurality of brush bristles provided on an outer peripheral surface of the annular section. Each of the plurality of brush pieces is held by the brush holding section inserted through the annular section. The brush holding section has an locking section locked to an inner peripheral surface of the annular section of the brush piece held by the brush holding section to suppress a rotation of the brush piece around the central axis line.

**[0023]** According to this oral cavity cleaner, the shaft-shaped brush holding section is inserted through the annular sections of the plurality of brush pieces stacked on each other, thereby configuring the brush section to be inserted into the oral cavity. Here, the brush holding section is provided with the locking section locked to the annular section of the brush piece. Therefore, when the oral cavity cleaner is rotated around the central axis line in the oral cavity, the friction between the inner wall of the oral cavity and the brush bristles can suppress the failure of the brush holding section to hold the brush pieces, enabling the brush pieces to rotate integrally with the brush holding section. This enables the suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0024]** In the oral cavity cleaner according to one embodiment of the present disclosure, the plurality of brush bristles may be provided radially outward from the outer peripheral surface of the annular section over the entire circumference of the outer peripheral surface of the annular section. This enables effective removal of foreign substances in the oral cavity by rotating the oral cavity cleaner around the central axis line while the brush section is inserted into the oral cavity.

**[0025]** In the oral cavity cleaner according to one embodiment of the present disclosure, the annular section may be formed in an annular shape. The brush holding section may include a cylindrical base section and a rib-shaped locking section extending on the outer peripheral surface of the base section along the central axis line of the brush holding section and having the outer diameter from the central axis line of the brush holding section to the top of the locking section larger than the inner diameter of the annular section. The brush holding section may be inserted through the annular section by press fitting, thereby locking the locking section to the inner peripheral surface of the annular section. According to this, the brush piece can be locked to the brush holding section more firmly, so that the idle rotation of the brush holding section in relation to the brush piece can be suppressed more reliably.

**[0026]** In the oral cavity cleaner according to one embodiment of the present disclosure, on a cross-section perpendicular to the central axis line of the brush holding section, the top of the locking section may be positioned between two interfaces between the locking section and the base section when viewed in at least one direction perpendicular to the central axis line. This facilitates the removal of the brush holding section from the mold when manufacturing the brush holding section, for example, by injection molding.

**[0027]** In the oral cavity cleaner according to one embodiment of the present disclosure, the inner peripheral surface of the annular section of each of the plurality of brush pieces may be pressed and expanded by the locking section while the brush holding section is inserted through the annular section. This facilitates the manufacturing of the brush piece as there is no need of forming in advance a recess corresponding to the locking section on the inner peripheral surface of the annular section. In addition, a pressing force generated between the locking section and the inner peripheral surface of the annular section can lock the brush piece more firmly to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush piece.

**[0028]** In the oral cavity cleaner according to one embodiment of the present disclosure, the locking section may be crushed by the inner peripheral surface of the annular section while the brush holding section is inserted through the annular portion. This facilitates the manufacturing of the brush piece as there is no need of forming in advance a recess corresponding to the locking section on the inner peripheral surface of the annular section. In addition, a pressing force generated between the locking section and the inner peripheral surface of the annular section can lock the brush piece more firmly to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush piece.

**[0029]** In the oral cavity cleaner according to one embodiment of the present disclosure, the annular section may be formed in a polygonal annular shape so that at least the inner peripheral surface has a polygonal shape. The brush holding section may be formed in a polygonal columnar shape fitting into the annular section. The locking section may be corners of a cross-section perpendicular to the central axis line of the brush holding section. According to this, the shapes of the locking section and the inner peripheral surface of the annular section match each other, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0030]** In the oral cavity cleaner according to one embodiment of the present disclosure, the brush holding section may be loosely fitted into the annular section. This facilitates insertion of the brush holding section into the annular portion.

**[0031]** In the oral cavity cleaner according to one embodiment of the present disclosure, each of the plurality of brush pieces stacked on each other may be in contact with another adjacent one of the brush pieces on the side surfaces of the annular sections of the brush pieces adjacent to each other. According to this, a frictional force generated between the side surfaces of the annular sections of the brush pieces adjacent to each other suppresses the relative rotation of the brush pieces adjacent to each other around the central axis line. As a result, the plurality of brush pieces are cooperatively locked to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0032]** In the oral cavity cleaner according to one embodiment of the present disclosure, each of the plurality of brush pieces may include a convex section formed on the side surface of the annular section. According to this, the side surfaces of the annular sections of the brush pieces adjacent to each other are firmly connected to each other by the convex section to suppress the relative rotation of the brush pieces around the central axis line. As a result, the plurality of brush pieces are cooperatively locked to the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0033]** In the oral cavity cleaner according to one embodiment of the present disclosure, the brush holding section

includes a wall section on the grip section side on which the annular section of the brush piece abuts when the brush holding section is first inserted through the annular section, and a pressurizing lid section for pressurizing and then holding the annular section of the brush piece along the central axis line toward the grip section when the brush holding section is last inserted through the annular section. According to this, the plurality of brush pieces are pressurized and then held by the wall section and the pressurizing lid section of the brush holding section, thereby enabling more reliable suppression of idle rotation of the brush holding section in relation to the brush pieces.

**[0034]** In the oral cavity cleaner according to one embodiment of the present disclosure, the pressurizing lid section may be formed by ultrasonic welding. This facilitates the manufacturing of the oral cavity cleaner having the above-described configuration.

**[0035]** In the oral cavity cleaner according to one embodiment of the present disclosure, at least at the end opposite to the grip section, the plurality of brush pieces may be formed to include the brush bristles shorter in length from the grip section side toward the side opposite to the grip section. According to this, the brush section is in a tapered shape, thereby facilitating the insertion of the brush section into the oral cavity. Furthermore, when the brush piece positioned at the end opposite to the grip section is supported by a small-diameter lid section, it is hard to ensure the frictional force between the side surface of the annular section of the brush piece and the lid section. In this case, shortening of the brush bristles of the brush piece in length reduces a torque acting on the brush piece owing to the friction between the inner wall of the nasal cavity and the brush bristles, thereby enabling the suppression of the excess of this torque over the frictional force between the side surface of the annular section and the lid section. This enables more reliable suppression of the idle rotation of the brush holding section in relation to the brush pieces.

## Effects of the Invention

**[0036]** In this manner, the nasal cavity cleaner and the oral cavity cleaner according to the present disclosure can suppress the idle rotation of the brush holding section in relation to the brush pieces.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0037]** FIG. **1** is a view of a nasal cavity cleaner according to a first embodiment;

**[0038]** FIG. **2** is a view of a grip section and a brush holding section before providing a brush section;

**[0039]** FIG. **3** is a view of a brush piece viewed in the central axis line direction;

**[0040]** FIG. **4** is a cross-sectional view of a pair of brush pieces having a concave-to-concave structure, including the central axis;

**[0041]** FIG. **5** is a cross-sectional view of the brush holding section taken along line V-V of FIG. **2** including a locking section as viewed in the central axis line direction;

**[0042]** FIG. **6** is a view of a state where a locking section is locked to an inner peripheral surface of a brush piece;

**[0043]** FIG. **7** is a cross-sectional view of a brush piece including a convex section formed on a side surface of an annular section, including the central axis line;

**[0044]** FIG. **8** is a view of a state where a locking section is locked to a inner peripheral surface of a brush piece in a nasal cavity cleaner according to a second embodiment;

**[0045]** FIG. **9** is a view of a brush holding section including a locking section in a nasal cavity cleaner according to a third embodiment, viewed in the central axis line direction;

**[0046]** FIG. **10** is a view of a brush holding section including a locking section in a nasal cavity cleaner according to a fourth embodiment, viewed in the central axis line direction;

**[0047]** FIG. **11** is a view of a state where a locking section is locked to an inner peripheral surface of a brush piece in a nasal cavity cleaner according to a fifth embodiment; and

**[0048]** FIG. **12** is a view of a state where a locking section is locked to an inner peripheral surface of a brush piece in a nasal cavity cleaner according to a sixth embodiment.

## DESCRIPTION OF THE EMBODIMENTS

**[0049]** Exemplary embodiments will be described below with reference to the accompanying drawings. It should be noted that same reference numerals are given to the same or corresponding parts in each figure, and overlapping explanations will be omitted. Further, as will be described later, nasal cavity cleaners **100** to **100**E will be exemplified below, but a configuration provided by each of these nasal cavity cleaners **100** to **100**E is the same as a configuration provided by each of oral cavity cleaners **200** to **200**E. In other words, in the following description, each of the nasal cavity cleaners **100** to **100**E can be read as each of the corresponding oral cavity cleaners **200** to **200**E.

### First Embodiment

[Overall Configuration]

**[0050]** FIG. **1** is a view of a nasal cavity cleaner **100** according to a first embodiment. FIG. **2** is a view of a grip section **1** and a brush holding section **2** before a brush section **3** is provided. FIG. **3** is a view of brush pieces **30** viewed in the central axis line X direction. FIG. **4** is a cross-sectional view of a pair of the brush pieces **30** having a concave-to-concave structure, including the central axis line X. In the following description, the "central axis line" refers to an imaginary line passing through the center of the brush holding section **2** of the nasal cavity cleaner **100**. In addition, the central axis line X in the brush section **3** before attached to the brush holding section **2** is an imaginary line passing through the center of the brush holding section **2** when the brush section **3** is attached to the brush holding section **2**.

**[0051]** As shown in FIGS. **1** to **4**, the nasal cavity cleaner **100** is an instrument to be inserted into the nasal cavity for use of cleaning the nasal cavity. Specifically, the nasal cavity cleaner **100** is configured as a so-called 360-degree brush to be inserted into the nasal cavity and then rotated, thereby enabling removal of foreign substances accumulated in the nasal cavity. The "nasal cavity" refers to the internal space of the nose, and may be, for example, the space from the nostril (that is, the opening corresponding to the air inlet and outlet) to the nasal turbinate (that is, the folds at the back of the nose). "Foreign substances" may refer to secretions from the nasal cavity or intruding objects from the outside to be removed from the nasal cavity. Secretions from the nasal cavity may be, for example, nasal discharge. In addition,

intruding objects from the outside may be, for example, various allergens that can cause allergic reactions. The nasal cavity cleaner **100** may also be referred to as a nasal brush, a nasal cavity brush, or the like, or may be referred to as a nasal washer, a nasal cavity washer, or the like.

**[0052]** First, an overall configuration of the nasal cavity cleaner **100** will be described. The nasal cavity cleaner **100** includes the grip section **1**, the brush holding section **2** and the brush section **3**.

**[0053]** The grip section **1** is a part to be gripped by a user. The "user" refers to a person who operates the nasal cavity cleaner **100**. This person may be a person having a nasal cavity to be cleaned with the nasal cavity cleaner **100** or another person other than the person having a nasal cavity to be cleaned with the nasal cavity cleaner **100**. The grip section **1** includes a main body section **10**.

**[0054]** The main body section **10** is a part to be held by the user. The main body section **10** is an elongated member extending along the central axis line X. From the viewpoint of operability of the nasal cavity cleaner **100**, the main body section **10** may preferably have a length of 8 cm or longer and 18 cm or shorter, more preferably 10 cm or longer and 13 cm or shorter, and even more preferably 11 cm or longer and 12 cm or shorter. The main body section **10** may be made, for example, of hard plastic. The main body section **10** may be formed, for example, by injection molding.

**[0055]** Here, the main body section **10** extends linearly along the central axis line X and has a circular cross-section perpendicular to the central axis line X. As a result, the user can rotate the nasal cavity cleaner **100** around the central axis line X by reciprocating his or her fingers in a direction perpendicular to the central axis line X while holding the main body section **10** in his or her hand. In other words, the main body section **10** is formed to be rotatable in the user's hand. The main body section **10** is reduced in diameter toward a tip end of the nasal cavity cleaner **100** (that is, toward an end on the side of the brush holding section **2** and the brush section **3** opposite to the grip section **1** in the central axis line X direction). In other words, the main body section **10** is in the shape of a truncated cone reduced in diameter toward the tip end of the nasal cavity cleaner **100**.

**[0056]** The main body section **10** has a through-hole **10***a* penetrating in the direction perpendicular to the central axis line X near a base end of the nasal cavity cleaner **100** (that is, near an end on the grip section **1** side opposite to the brush holding section **2** and the brush section **3**, or on the side opposite to the tip end in the direction of the central axis line X). The through-hole **10***a* may be used, for example, for passing a string or the like therethrough.

**[0057]** The brush holding section **2** is a shaft-shaped part extending from the main body section **10** of the grip section **1**. The brush holding section **2** is inserted through (or to be accurate, inserted into and passed through) the brush piece **30**, which will be described later, thereby holding the brush piece **30**. The brush holding section **2** may be formed integrally with the grip section **1**, or may be formed separately from the grip section **1** and then connected to the grip section **1** by any method. The brush holding section **2** includes a base end block section **20**, a shaft section **21** and a pressurizing lid section **22**.

**[0058]** The base end block section **20** is a part provided adjacent to the main body section **10** of the grip section **1**. The base end block section **20** may be made, for example, of hard plastic. The base end block section **20** may be formed, for example, by injection molding. The base end block section **20** includes a wall section **20***a* that is a surface perpendicular to the central axis line X on the tip end side of the nasal cavity cleaner **100**. The wall section **20***a* is the surface on which an annular section **31** of the brush piece **30** abuts when the brush holding section **2** is first inserted though the annular section **31**. This will be described later in detail. Here, the wall section **20***a* is configured as the surface perpendicular to the central axis line X.

**[0059]** The shaft section **21** is a part inserted through the brush piece **30**. In other words, the shaft section **21** is a part functioning as the central axis of the brush section **3** when the brush section **3** is composed of a plurality of the brush pieces **30** through which the shaft section **21** is inserted. The shaft section **21** is an elongated part extending along the central axis line X. The shaft section **21** is formed to be smaller in diameter than the base end block section **20**. The shaft section **21** has the same diameter over its entire length from the end of the shaft section **21** on the base end side of the nasal cavity cleaner **100** to the end of the shaft section **21** on the tip end side of the nasal cavity cleaner **100**. The shaft section **21** may be made, for example, of hard plastic. The shaft section **21** may be formed, for example, by injection molding.

**[0060]** On one hand, the shaft section **21** is provided with no specific configuration on the tip end before the brush section **3** is provided to the brush holding section **2** in the manufacturing process of the nasal cavity cleaner **100** (see FIG. **2**). On the other hand, after the brush section **3** is provided to the brush holding section **2** in the manufacturing process of the nasal cavity cleaner **100**, the shaft section **21** is crushed at the end on the tip end side of the nasal cavity cleaner **100** to form a lid section to form a lid part.

**[0061]** The pressurizing lid section **22**, which is the above-mentioned lid part, is fixed while pressurizing the brush pieces **30** of the brush section **3** toward the grip section **1** side. That is to say, the pressurizing lid section **22** pressurizes and thus holds the annular section **31** of the brush piece **30** along the central axis line X toward the grip section **1** side when the brush holding section **2** is last inserted through the annular section **31**. This will be described later in detail. The pressurizing lid section **22** is formed by applying ultrasonic welding from the tip end side of the nasal cavity cleaner **100** after inserting the brush holding section **2** through all the brush pieces **30**. Specifically, the pressurizing lid section **22** is formed by bringing a curved concave member into contact with the tip end of the shaft section **21** to melt the shaft section **21**. The pressurizing lid section **22** is larger in outer diameter than the shaft section **21**. The pressurizing lid section **22** may be larger in outer diameter than the shaft section **21** by 0.5 mm or more and 2 mm or less, 0.7 mm or more and 1.5 mm or less, or 0.9 mm or more and 1.2 mm or less. On one hand, the larger in outer diameter the pressurizing lid section **22** is as compared to the shaft section **21**, the less likely the brush pieces **30** are to come off and rotate idly. On the other hand, the smaller in outer diameter the pressurizing lid section **22** is, the less uncomfortable feeling such as being caught in the nasal cavity there is in the nasal cavity.

**[0062]** The brush section **3** is a part to be inserted into the nasal cavity for cleaning the nasal cavity. The brush section **3** is a so-called 360-degree brush part. Specifically, the brush section **3** is configured in a manner that a large number of brush bristles **32** of the brush piece **30** are provided radially

outward in the entire circumferential direction around the central axis line X. From the viewpoint of efficiency of cleaning the nasal cavity, the brush section **3** may be preferably provided with 10,000 or more brush bristles **32**, more preferably 30,000 or more brush bristles **32**, and even more preferably 60,000 or more brush bristles **32**. Here, the brush section **3** is provided with 70,000 brush bristles **32**. The greater number of the brush bristles **32** the brush section **3** is provided with (that is, the higher the density is), the better the ability to clean the nasal cavity is improved. Therefore, it is preferable to increase the number of the brush bristles **32** (that is, to increase the density). It should be noted that, from the viewpoint of efficiency of cleaning the nasal cavity, the number of brush bristles **32** provided to the brush section **3** may be 100,000 or more, while from the viewpoint of facilitating washing-off of foreign substances adhering to the brush section **3**, the number of the brush bristles **32** provided to the brush section **3** may be 100,000 or less.

**[0063]** The brush section **3** includes a plurality of brush pieces **30** stacked on each other and held by the brush holding section **2**. Further, the brush section **3** includes a same-diameter section **3***a* and a reduced-diameter section **3***b* in its overall shape. The same-diameter section **3***a* is a part having a cylindrical outer shape with a same diameter along the central axis line X direction. On one hand, each of the brush pieces **30** constituting the-same diameter section **3***a* has a same outer diameter such as any numerical value of 10 mm or larger and 21 mm or smaller, 16 mm or larger and 20 mm or smaller, and 17 mm or larger and 19 mm or smaller. On the other hand, the reduced-diameter section **3***b* is a part being a truncated cone in outer shape reduced in diameter toward the tip end of the nasal cavity cleaner **100** along the central axis line X direction. Of the plurality of brush pieces **30** constituting the reduced-diameter section **3***b*, the brush piece **30** closest to the tip end of the nasal cavity cleaner **100** has an outer diameter smaller than the other brush pieces **30** such as an outer diameter of any numerical value of 7 mm or more and 14 mm or less, 10.5 mm or more and 13.5 mm or less, and 11 mm or more and 13 mm or less. On the cross-section including the central axis line X, the angle between the outer shape of the reduced-diameter section **3***b* (that is, the envelope of tip ends of the brush bristles **32**) and the central axis line X may be 35 degrees or more and 50 degrees or less, or 40 degrees or more and 45 degrees or less.

**[0064]** Each of the brush pieces **30** includes the annular section **31** and a plurality of brush bristles **32**. On one hand, the annular sections **31** of the brush pieces **30** are the same in shape and size. On the other hand, the brush bristles **32** of the brush pieces **30** are not necessarily the same in length, thereby realizing the same-diameter section **3***a* and the reduced-diameter section **3***b*.

**[0065]** The annular section **31** is the central part of the brush piece **30**. The annular section **31** is formed in annular shape. While "annular" means "of a closed ring" including "of a circular ring", "of a rectangular ring" and "of a polygonal ring", the annular section **31** is formed specifically in the shape of circular ring. More specifically, the annular section **31** is formed annularly so that at least an inner peripheral surface **31***b* is circular in shape when viewed in the central axis line X direction, and here, an outer peripheral surface **31***a* is also circular in shape when viewed in the central axis line X direction. The annular section **31** may be larger in outer diameter than the pressurizing lid section **22**. The annular section **31** may be made, for example, of nylon or polybutylene terephthalate resin. Each of the brush pieces **30** is held by the brush holding section **2** by inserting the shaft section **21** of the brush holding section **2** through the annular section **31**.

**[0066]** The brush bristle **32** is a part for scraping out foreign substances in the nasal cavity and formed in the shape of flexible and elastic bristles. The brush bristle **32** is provided in plurality on the outer peripheral surface **31***a* of the annular section **31**. Each of the brush bristles **32** is provided radially outward from the outer peripheral surface **31***a* of the annular section **31** over the entire circumference of the outer peripheral surface **31***a* of the annular section **31**. In other words, the plurality of brush bristles **32** are provided on the outer peripheral surface **31***a* of the annular section **31** over 360 degrees. The brush bristle **32** may be made, for example, of nylon or polybutylene terephthalate resin. In this case, if the brush bristle **32** is immersed in hot water or the like, the flexibility of the brush bristle **32** is enhanced to improve the feeling of use. Each of the brush bristles **32** may be formed to be approximately 0.05 mm in thickness.

**[0067]** On one hand, the brush pieces **30** constituting the same-diameter section **3***a* are the same in length. On the other hand, the brush pieces **30** constituting the reduced-diameter section **3***b* are shorter in length toward the tip end side of the nasal cavity cleaner **100**. In other words, at least at the end opposite to the grip section **1** (that is, at the end on the tip end side of the nasal cavity cleaner **100**), the brush pieces **30** are formed to include the brush bristles **32** shorter in length from the grip section **1** side toward the side opposite to the grip section **1**. In this manner, the brush pieces **30** constitute the reduced-diameter section **3***b* of the brush section **3**.

**[0068]** The brush pieces **30** configured in this manner are held by the shaft section **21** of the brush holding section **2**, stacked on each other so that positions of the annular sections **31** align with each other, or in other words, the shaft section **21** of the brush holding section **2** is inserted through annular sections **31**. Each of the brush pieces **30** stacked on each other is in contact with another adjacent one of the brush pieces **30** on the side surfaces **31***c* of the annular sections **31** of the bush pieces adjacent to each other. It should be noted that the side surfaces **31***c* of the annular section **31** are the surfaces on both sides of the annular section **31** in the central axis line X direction.

**[0069]** In addition, each of the brush bristles **32** is provided with a slight inclination to the surface perpendicular to the central axis line X in either one of directions toward the grip section **1** side and toward the tip end side opposite to the grip section **1** when viewed in the central axis line X. In other words, the brush piece **30** is not perfectly planar in shape but slightly funnel-shaped. In addition, each two of the brush pieces **30** form a concave-to-concave structure in pairs. The "concave-to-concave structure" refers to a structure in which a pair of the brush pieces **30** are combined with each other so that concave sides of the funnel-shaped brush pieces **30** face each other (see FIG. **4**). This enables the side surfaces **31***c* of the pair of the brush pieces **30** facing each other to contact each other, and tip ends of the brush bristles **32** to contact or cross each other. The brush section **3** is configured by stacking a large number of the pairs of the brush pieces **30** having the concave-to-concave structure on each other. As a consequence, when the nasal cavity cleaner **100** is used, foreign substances in the nasal cavity can be

gathered in a mass and trapped in a gap between the concave-to-concave structures adjacent to each other, thereby improving the efficiency of cleaning the nasal cavity. Moreover, foreign substances are less likely to enter the roots of the brush bristles **32**, thereby facilitating washing-off of foreign substances adhering to the brush section **3**. In addition, while the brush bristles **32** used in the nasal cavity cleaner **100** are ultrafine, the concave-to-concave structure realizes the brush section **3** of sufficient stiffness even with the ultrafine brush bristles **32**.

**[0070]** [Idle Rotation Suppression Structure]

**[0071]** Next, an idle rotation suppression structure for suppressing idle rotation of the brush holding section **2** in relation to the brush pieces **30** in the nasal cavity cleaner **100** will be described.

**[0072]** FIG. **5** is a cross-sectional view of the brush holding section **2** taken along line V-V of FIG. **2** including a locking section **26** as viewed in the central axis line X direction. FIG. **6** is a view of the locking section **26** locked to the inner peripheral surface **31***b* of the brush piece **30**. As shown in FIGS. **5** and **6**, the locking section **26** provided to the brush holding section **2** of the nasal cavity cleaner **100** suppresses idle rotation of the brush holding section **2** in relation to the brush piece **30**. The brush holding section **2** includes a base section **25** and the locking section **26**.

**[0073]** The base section **25** is a main part of the shaft section **21** of the brush holding section **2**. The base section **25** has a cylindrical shape with an outer diameter equal to or slightly larger than the inner diameter of the annular section **31**. On one hand, the outer diameter of the base section **25** may be larger than the inner diameter of the annular section **31** by, for example, 0 mm or more and 0.3 mm or less, 0.03 mm or more and 0.2 mm or less, or 0.05 mm or more and 0.1 mm or less. This suggests that even without any locking section **26** provided, the base section **25** is press-fitted into the annular section **31** while expanding the inner peripheral surface **31***b* of the annular section **31**. On the other hand, the base section **25** may have a cylindrical shape with an outer diameter smaller than the inner diameter of the annular section **31**. In this case, the base section **25** is loosely fitted into the annular section **31** of the brush piece **30** without any locking section **26** provided.

**[0074]** The locking section **26** is locked to the inner peripheral surface **31***b* of the annular section **31** of the brush piece **30** held by the brush holding section **2** (or by the shaft section **21**), thereby suppressing the rotation of the brush piece **30** (namely, asynchronous rotation in relation to the brush holding section **2** around the central axis line X). "Locking" means that any structures are related to each other, and more specifically, that asynchronous rotation around the central axis line X above a certain level is suppressed. "Locking" may include at least one of, for example, hooking, biting into, pressurizing, and the like.

**[0075]** The locking section **26** is a rib-shaped structural part extending along the central axis line X of the brush holding section **2** on an outer peripheral surface **25***a* of the base section **25**. Here, the brush holding section **2** includes six locking sections **26**. The locking sections **26** are provided symmetrically in relation to a predetermined direction intersecting the central axis line X and perpendicular to the central axis line X (here, the reference direction D in FIG. **5**). More particularly, the locking sections **26** are provided symmetrically in relation to a plane including the central axis line X and the reference direction D. The locking section **26** is formed so that an outer diameter from the central axis line X of the brush holding section **2** to a top **26***a* of the locking section **26** (namely, the highest part of the rib constituting the locking section **26**) is larger than the inner diameter of the annular section **31**. The outer diameter of the locking section **26** (namely, the outer diameter from the central axis line X to the top **26***a*) may be larger than the inner diameter of the annular section **31** by, for example, 0.05 mm or more and 0.6 mm or less, or 0.1 mm or more and 0.5 mm or less, or 0.15 mm or more and 0.4 mm or less. However, the outer diameter of the locking section **26** should take a value larger than the outer diameter of the base section **25**.

**[0076]** The brush holding section **2** including such locking section **26** is inserted through the annular section **31** by press fitting, thereby locking the locking section **26** to the inner peripheral surface **31***b* of the annular section **31**. The inner peripheral surface **31***b* of the annular section **31** of each of the brush pieces **30** is pressed and expanded by the locking section **26** while the brush holding section **2** is inserted through the annular section **31**. In other words, the locking section **26** is formed to have a higher strength than the inner peripheral surface **31***b* of the annular section **31**. Pressing and expanding the inner peripheral surface **31***b* of the annular section **31** by using the locking section **26** in this manner can suppress a rotational movement of the locking section **26** around the central axis line X due to a portion of the inner peripheral surface **31***b* left unpressed and unexpanded between the locking sections **26** adjacent to each other. Moreover, a repulsive force from the inner peripheral surface **31***b* pressed and expanded by the locking section **26** increases the frictional force acting between the locking section **26** and the inner peripheral surface **31***b*, enabling further suppression of the rotational movement of the locking section **26** around the central axis line X.

**[0077]** It should be noted that on the cross-section perpendicular to the central axis line X of the brush holding section **2**, the locking section **26** is formed so that the top **26***a* of the locking section **26***a* is positioned between two interfaces **26***b* between the locking section **26** and the base section **25** when viewed in at least one direction perpendicular to the central axis line X (here, in the reference direction D in FIG. **5**). Refer to the positional relationship of three parallel lines shown in FIG. **5**. In other words, on the cross-section perpendicular to the central axis line X of the brush holding section **2**, one of the interfaces **26***b*, the top **26***a* and the other of the interfaces **26***b* are arranged in this order when viewed in the reference direction D. Here, the "interface" is a boundary between the base section **25** and the locking section **26**, found on both sides of each of the locking sections **26**. Therefore, to sum up, of the three parallel lines shown in FIG. **5**, the part indicated by the central line is the top **26***a*, and the parts indicated by the left and right lines are the interfaces **26***b*. And, at least one reference direction such as the reference direction D in FIG. **5** in which one of the interfaces **26***b*, the top part **26***a*, and the other of the interfaces **26***b* are arranged in this order is found. It should be noted that when viewed in the reference direction D on the cross-section perpendicular to the central axis line X of the brush holding section **2**, the locking section **26** has a simple inclination from one of the interfaces **26***b* toward the top **26***a* (that is, an inclination to only one of the left and right sides along the reference direction D in FIG. **5**). Further, the locking section **26** has a simple inclination

from the top **26***a* toward the other of the interfaces **26***b* when viewed in the reference direction D on the cross-section perpendicular to the central axis line X of the brush holding section **2** (that is, an inclination to only the other of the left and right sides along the reference direction D in FIG. **5**). In other words, the locking section **26** has a so-called draft angle facilitating the removal of the brush holding section **2** from a mold when manufacturing the brush holding section, for example, by injection molding.

**[0078]** FIG. **7** is the cross-sectional view of the brush piece **30** including a convex section **31***d* formed on the side surface **31***c* of the annular section **31**, including the central axis line X. As shown in FIG. **7**, the convex section **31***d* is formed on the side surface **31***c* of the annular section **31** of each brush piece **30**. Therefore, between each of the brush pieces **30** and another adjacent one of the brush pieces **30** stacked on each other, the convex section **31***d* formed on the side surface **31***c* of the annular section **31** (or in other words, an increase in frictional force due to the convex section **31***d*) suppresses relative rotation around the central axis line X. It should be noted that while in FIG. **7**, the convex section **31***d* is formed only on one side surface **31***c* of the annular section **31**, the convex section **31***d* may be formed on both side surfaces **31***c* of the annular section **31**. The convex section **31***d* may be a burr formed in the manufacturing process of the brush pieces **30**, for example.

**[0079]** The shaft section **21** of the brush holding section **2** is inserted through each of the brush pieces **30**. Thus, the brush pieces **30** are stacked on each other to configure the brush section **3**. At this time, when the shaft section **21** of the brush holding section **2** is first inserted through the annular section **31** of the brush piece **30**, the annular section **31** abuts the wall section **20***a* of the base end block section **20**. Further, when the shaft section **21** of the brush holding section **2** is last inserted through the annular section **31** of the brush piece **30**, the annular section **31** is pressurized along the central axis line X toward the grip section **1** side and held by the pressurizing lid section **22**. As a result, a frictional force is generated between the side surfaces **31***c* of the annular sections **31** of the brush pieces **30** adjacent to each other. Further, when it comes to the brush pieces **30** at both ends, a frictional force is generated between the side surface **31***c* of the annular section **31** and the wall section **20***a* of the base end block section **20** or the pressurizing lid section **22**. As a result, the plurality of brush pieces **30** are cooperatively locked to the brush holding section **2**.

**[0080]** [Functions and Effects]

**[0081]** As described above, the nasal cavity cleaner **100** is an instrument to be inserted into the nasal cavity for cleaning the nasal cavity. The nasal cavity cleaner **100** includes the grip section **1** to be gripped by a user, the shaft-shaped brush holding section **2** extending from the grip section **1**, and the plurality of brush pieces **30** stacked on each other and held by the brush holding section **2**. Each of the plurality of brush pieces **30** includes the annular section **31** formed in an annular shape and the plurality of brush bristles **32** provided on the outer peripheral surface **31***a* of the annular section **31**. The shaft section **21** of the brush holding section **2** is inserted through the annular section **31**, whereby each of the plurality of brush pieces **30** is held by the brush holding section **2**. The brush holding section **2** includes the locking section **26** locked to the inner peripheral surface **31***b* of the annular section **31** of the brush piece **30** held by the brush holding section **2**, thereby suppressing the rotation of the brush piece **30** around the central axis line X.

**[0082]** According to the nasal cavity cleaner **100**, the shaft-shaped brush holding section **2** is inserted through the annular sections **31** of the plurality of brush pieces **30** stacked on each other, so that the brush section **3** to be inserted into the nasal cavity is configured. Here, the brush holding section **2** is provided with the locking section **26** locked to the annular section **31** of the brush piece **30**. Therefore, when the oral cavity cleaner **100** is rotated around the central axis line X in the oral cavity, the friction between the inner wall of the oral cavity and the brush bristles **32** can suppress the failure of the brush holding section **2** to hold the brush pieces **30**, enabling the brush pieces **30** to rotate integrally with the brush holding section **2**. This enables the suppression of idle rotation of the brush holding section **2** in relation to the brush pieces **30**. Moreover, the nasal cavity cleaner **100** can easily achieve a large amount of brush bristles **32** that is hard to be achieved by conventionally known twisted brushes and flocked brushes. On one hand, the twisted brush is a brush including twisted wires or other members as a main shaft and a brush section formed by pinching brush bristles when twisting the wires or the like. On the other hand, the flocked brush is a brush including a brush section formed by implanting bristles on a main shaft. Despite the difficulty in increasing the amount of bristles, these twisted brush and flocked brush have no problem of idle rotation of the brush holding section **2** in relation to the brush pieces **30** as the present disclosure generally has.

**[0083]** In the nasal cavity cleaner **100**, the plurality of brush bristles **32** are provided radially outward from the outer peripheral surface **31***a* of the annular section **31** over the entire circumference of the outer peripheral surface **31***a* of the annular section **31**. This enables effective removal of foreign substances in the nasal cavity by rotating the nasal cavity cleaner around the central axis line X while the brush section **3** is inserted into the nasal cavity.

**[0084]** In the nasal cavity cleaner **100**, the annular section **31** is formed in an annular shape. The brush holding section **2** includes the cylindrical base section **25** and the rib-shaped locking section **26** extending on the outer peripheral surface **25***a* of the cylindrical base section **25** along the central axis line X of the brush holding section **2** and having an outer diameter from the central axis line X of the brush holding section **2** to the top **26***a* larger than the inner diameter of the annular section **31**. The brush holding section **2** is inserted through the annular section **31** by press fitting, thereby locking the locking section **26** to the inner peripheral surface **31***b* of the annular section **31**. This enables the brush piece **30** to be locked to the brush holding section **2** more firmly, thereby more reliably suppressing the idle rotation of the brush holding section **2** in relation to the brush pieces **30**.

**[0085]** In the nasal cavity cleaner **100**, on the cross-section perpendicular to the central axis line X of the brush holding section **2**, the top **26***a* of the locking section **26***a* is positioned between the two interfaces **26***b* between the locking section **26** and the base section **25** when viewed in at least one direction perpendicular to the central axis line X (here, in the reference direction D in FIG. **5**). This facilitates the removal of the brush holding section **2** from the mold when manufacturing the brush holding section **2**, for example, by injection molding.

**[0086]** In the nasal cavity cleaner **100**, the inner peripheral surface **31***b* of the annular section **31** of each of the brush

pieces **30** is pressed and expanded by the locking section **26** while the brush holding section **2** is inserted through the annular section **31**. This facilitates the manufacturing of the brush piece **30** as there is no need of forming in advance a recess corresponding to the locking section **26** on the inner peripheral surface **31***b* of the annular section **31**. Moreover, a pressing force generated between the locking section **26** and the inner peripheral surface **31***b* of the annular section **31** can lock the brush pieces **30** more firmly to the brush holding section **2**, thereby enabling more reliable suppression of idle rotation of the brush holding section **2** in relation to the brush piece **30**.

**[0087]** In the nasal cavity cleaner **100**, each of the plurality of brush pieces **30** stacked on each other is in contact with another adjacent one of the brush pieces **30** on the side surfaces **31***c* of the annular sections **31** of the bush pieces adjacent to each other. According to this, a frictional force generated between the side surfaces **31***c* of the annular sections **31** of the brush pieces **30** adjacent to each other suppresses the relative rotation of the brush pieces **30** around the central axis line X. As a result, the plurality of brush pieces **30** are locked to the brush holding section **2** in cooperation with each other, thereby enabling more reliable suppression of idle rotation of the brush holding section **2** in relation to the brush pieces **30**.

**[0088]** In the nasal cavity cleaner **100**, each of the plurality of brush pieces **30** includes the convex section **31***d* formed on the side surface **31***c* of the annular section **31**. According to this, the side surfaces **31***c* of the annular sections **31** of the brush pieces **30** adjacent to each other are firmly connected to each other by the convex sections **31***d*, thereby suppressing the relative rotation of the brush pieces **30** around the central axis line X. As a result, the plurality of brush pieces **30** are locked to the brush holding section **2** in cooperation with each other, thereby enabling more reliable suppression of idle rotation of the brush holding section **2** in relation to the brush pieces **30**.

**[0089]** In the nasal cavity cleaner **100**, the brush holding section **2** includes the wall section **20***a* of the base end block section **20** on which the annular section **31** of the brush piece **30** abuts when the brush holding section **2** is first inserted through the annular section **31**, and the pressurizing lid section **22** pressurizing and holding the annular section **31** of the brush piece **30** along the central axis line X toward the grip section **1** side when the brush holding section **2** is last inserted through the annular section **31**. According to this, the plurality of brush pieces **30** are pressurized and held by the wall section **20***a* and the pressurizing lid section **22** of the brush holding section **2**, thereby enabling more reliable suppression of idle rotation of the brush holding section **2** in relation to the brush pieces **30**.

**[0090]** In the nasal cavity cleaner **100**, the pressurizing lid section **22** is formed by ultrasonic welding. This facilitates the manufacturing of the nasal cavity cleaner **100** provided with the above-described configuration.

**[0091]** In the nasal cavity cleaner **100**, the plurality of brush pieces **30** are formed to include the brush bristles **32** shorter in length from the grip section **1** side toward the side opposite to the grip section **1** at least at the end opposite to the grip section **1**. According to this, the brush section **3** is in a tapered shape, thereby facilitating the insertion of the brush section **3** into the nasal cavity. Furthermore, when the brush piece **30** positioned at the end opposite to the grip section **1** is supported by a small-diameter lid section, it is hard to ensure the frictional force between the side surface **31***c* of the annular section **31** of the brush piece **30** and the lid section. In this case, shortening of the brush bristles **32** of the brush piece **30** in length reduces a torque acting on the brush piece **30** owing to the friction between the inner wall of the nasal cavity and the brush bristles **32**, thereby enabling the suppression of the excess of this torque over the frictional force between the side surface **31***c* of the annular section **31** and the lid section. This enables more reliable suppression of the idle rotation of the brush holding section **2** in relation to the brush pieces **30**.

## Second Embodiment

**[0092]** FIG. **8** is a view of a state where the locking section **26** is locked to the inner peripheral surface **31***b* of the brush piece **30** in a nasal cavity cleaner **100**A according to the second embodiment. As shown in FIG. **8**, as compared to the nasal cavity cleaner **100** according to the first embodiment, the nasal cavity cleaner **100**A according to the second embodiment differs mainly in the state of a contact between the inner peripheral surface **31***b* of the brush piece **30** and the locking section **26** and is common thereto in other respects.

**[0093]** In the nasal cavity cleaner **100**A, the locking section **26** is crushed by the inner peripheral surface **31***b* of the annular section **31** in the state where the brush holding section **2** is inserted through the annular section **31**. That is, the locking section **26** is formed to have a lower strength than the inner peripheral surface **31***b* of the annular section **31**. The locking section **26** is crushed by the inner peripheral surface **31***b* of the annular section **31** in this manner, so that a repulsive force from the crushed locking section **26** causes increase in the frictional force acting between the locking section **26** and the inner peripheral surface **31***b* and enables even better suppression of the rotational movement of the locking section **26** around the central axis line X. In addition, when the brush holding section **2** is inserted through the annular section **31**, the locking section **26** may press and expand the inner peripheral surface **31***b* of the annular section **31**, and at the same time, the inner peripheral surface **31***b* of the annular section **31** may crush the locking section **26**.

**[0094]** In this manner, in the nasal cavity cleaner **100**A, the locking section **26** is crushed by the inner peripheral surface **31***b* of the annular section **31** in the state where the brush holding section **2** is inserted through the annular section **31**. This facilitates the manufacturing of the brush piece **30** as there is no need of forming in advance a recess corresponding to the locking section **26** on the inner peripheral surface **31***b* of the annular section **31**. Moreover, a pressing force generated between the locking section **26** and the inner peripheral surface **31***b* of the annular section **31** can lock the brush pieces **30** more firmly to the brush holding section **2**, thereby enabling more reliable suppression of idle rotation of the brush holding section **2** in relation to the brush piece **30**.

## Third Embodiment

**[0095]** FIG. **9** is a view of a brush holding section **2**B including a locking section **26**B in a nasal cavity cleaner **100**B according to the third embodiment, viewed in the central axis line X direction. As shown in FIG. **9**, the nasal cavity cleaner **100**B according to the third embodiment differs mainly in the number of locking sections **26**B pro-

vided to a shaft section **21**B as compared to the nasal cavity cleaner **100** according to the first embodiment or the nasal cavity cleaner **100**A according to the second embodiment, and is common thereto in other respects.

**[0096]** Four locking sections **26**B are provided on the outer peripheral surface **25***a* of the base section **25** in the nasal cavity cleaner **100**B. In other words, the brush holding section **2**B includes four locking sections **26**B. In this regard, the brush holding section **2**B may include other than four (or six) locking sections **26**B.

## Fourth Embodiment

**[0097]** FIG. **10** is a view of a brush holding section **2**C including a locking section **26**C in a nasal cavity cleaner **100**C according to the fourth embodiment, viewed in the central axis line X direction. As shown in FIG. **10**, the nasal cavity cleaner **100**C according to the fourth embodiment differs mainly in the direction in which the top of the locking section **26**C faces as compared to the nasal cavity cleaner **100** according to the first embodiment or the nasal cavity cleaner **100**A according to the second embodiment, and is common thereto in other respects.

**[0098]** In the nasal cavity cleaner **100**C, on the cross-section perpendicular to the central axis line X of the brush holding section **2**C, when viewed in at least one direction perpendicular to the central axis line X, the locking section **26***c* is not formed so that the top of the locking section **26**C is positioned between two interfaces between the locking section **26**C and the base section **25**. It should be noted that in FIG. **10**, the locking sections **26**C are provided at point-symmetrical positions around the central axis line X.

## Fifth Embodiment

**[0099]** FIG. **11** is a view of a state where a locking section **26**D is locked to an inner peripheral surface **31***b*D of a brush piece **30**D in a nasal cavity cleaner **100**D according to the fifth embodiment. As shown in FIG. **11**, the nasal cavity cleaner **100**D according to the fifth embodiment differs in the shape of an annular section **31**D of the brush piece **30**D and the shape of a shaft section **21**D of a brush holding section **2**D as compared to the nasal cavity cleaner **100** according to the first embodiment, and is common thereto in other respects.

**[0100]** In the nasal cavity cleaner **100**D, the annular section **31**D is formed in a polygonal annular shape so that at least the inner peripheral surface **31***b*D is in a polygonal shape. Here, "polygonal annular" refers to "of a ring having an inner circumference in a polygonal shape", while an outer circumference may be polygonal or circular in shape. Specifically, the inner peripheral surface **31***b*D of the annular section **31**D has a quadrangular shape. Moreover, in the nasal cavity cleaner **100**D, the shaft section **21**D of the brush holding section **2**D is formed in a polygonal columnar shape so as to fit into the annular section **31**D. Specifically, the shaft section **21**D of the brush holding section **2**D has a quadrangular prism shape. The shaft section **21**D of the brush holding section **2**D is loosely fitted into the annular section **31**D. In other words, the shaft section **21**D of the brush holding section **2**D is formed to have a cross-section smaller than the annular section **31**D. When the shaft section **21**D of the brush holding section **2**D and the annular section **31**D are arranged coaxially (that is, when a circumferential gap is arranged so as to be equal), the size of the gap may be, for example, 0.01 mm or more and 0.3 mm or less, 0.05 mm or more and 0.2 mm or less, or 0.08 mm or more and 0.1 mm or less. On one hand, the smaller the gap size is, the smaller the backlash is and the less water or the like enters the gap. On the other hand, the larger the gap is, the easier the manufacturing is.

**[0101]** The shaft section **21**D includes a base section **25**D and the locking section **26**D. The base section **25**D corresponds to a central cylindrical part of the shaft section **21**D. The locking section **26**D corresponds to four corners on the cross-section (here, in a quadrangular shape) perpendicular to the central axis line X of the brush holding section **2**D. In other words, the brush holding section **2**D has a polygonal shape (here, a quadrangular shape) when viewed in the direction of the central axis line X, and the corners of the brush holding section **2**D are regarded as the locking sections **26**D.

**[0102]** As described above, in the nasal cavity cleaner **100**D, at least the inner peripheral surface **31***b*D of the annular section **31**D is formed in a polygonal columnar shape (here, in a quadrangular prism shape), and the locking section **26**D corresponds to the corners of the cross-section perpendicular to the central axis line X of the brush holding section **2**D. According to this, the shapes of the locking section **26**D and the inner peripheral surface **31***b*D of the annular section **31**D match each other, thereby enabling more reliable suppression of the idle rotation of the brush holding section **2**D in relation to the brush pieces **30**D.

**[0103]** In the nasal cavity cleaner **100**D, the brush holding section **2**D is loosely fitted into the annular section **31**D. This facilitates the insertion of the brush holding section **2**D through the annular section **31**D.

## Sixth Embodiment

**[0104]** FIG. **12** is a view of a state where a locking section **26**E is locked to an inner peripheral surface **31***b*E of a brush piece **30**E in a nasal cavity cleaner **100**E according to the sixth embodiment. As shown in FIG. **12**, as compared to the nasal cavity cleaner **100**D according to the fifth embodiment, the nasal cavity cleaner **100**E according to the sixth embodiment differs mainly in the number of the locking sections **26**E provided on a shaft section **21**E of the brush holding section **2**E and in the shape of the inner peripheral surface **31***b*E of the annular section **31**E corresponding to the locking section **26**E, and is common thereto in other respects.

**[0105]** In the nasal cavity cleaner **100**E, the annular section **31**E is formed in a polygonal annular shape so that at least the inner peripheral surface **31***b*E has a polygonal shape. Specifically, the inner peripheral surface **31***b*E of the annular section **31**E has a hexagonal shape. Further, in the nasal cavity cleaner **100**E, the shaft section **21**E of the brush holding section **2**E is formed in a polygonal columnar shape fitted into the annular section **31**E. Specifically, the shaft section **21**E of the brush holding section **2**E has a hexagonal columnar shape. The shaft section **21**E of the brush holding section **2**E is loosely fitted into the annular section **31**E.

**[0106]** Here, the shaft section **21**E includes a base section **25**E and the locking section **26**E. On one hand, the base section **25**E corresponds to a central cylindrical part of the shaft section **21**E. On the other hand, the locking section **26**E corresponds to six corners of the cross-section (here, in a hexagonal shape) perpendicular to the central axis line X of the brush holding section **2**E. In other words, the brush

holding section **2**E has a polygonal shape (here, a hexagonal shape) when viewed in the direction of the central axis line X, and the corners of the brush holding section **2**E are regarded as locking sections **26**E.

**[0107]** [Modifications]

**[0108]** Each embodiment described above can be implemented in various forms modified or improved based on the knowledge of those skilled in the art.

**[0109]** For instance, in each of the above-described embodiments, a structure included in any one of the nasal cavity cleaners **100**-**100**E may be partially combined with a structure included in the other nasal cavity cleaners **100**-**100**E.

**[0110]** Also, in each of the above-described embodiments, the nasal cavity cleaners **100** to **100**E are assumed to be used for human nasal cavities. However, the nasal cavity cleaners **100**-**100**E may be used for the nasal cavities of non-human animals. In this case, the size of the brush section **3** (for example, the length of the brush section **3** in the central axis line X direction, the outer diameter of the brush section **3**, the length of the brush bristles **32**, etc.) should be preferably optimized for the nasal cavity of the animals.

**[0111]** Moreover, in each of the above-described embodiments, in the nasal cavity cleaners **100** to **100**E, the reduced-diameter section **3***b* is a truncated cone in outer shape reduced in diameter toward the tip end of the nasal cavity cleaner **100** along the central axis line X direction. However, the reduced-diameter section **3***b* may have a dome shape in which an inclined part is configured with a curved surface.

**[0112]** Furthermore, in each of the above-described embodiments, in the nasal cavity cleaners **100** to **100**E, the pressurizing lid section **22** is formed by ultrasonic welding. However, the pressurizing lid section **22** may be formed by a method other than ultrasonic welding.

**[0113]** Also, in each of the above-described embodiments, the nasal cavity cleaners **100** to **100**E are assumed to be used for cleaning the nasal cavity. However, the nasal cavity cleaners **100** to **100**E may be used for purposes such as cleaning teeth as well as the nasal cavity. In this case, the nasal cavity cleaners **100** to **100**E may be formally referred to as oral cleaners, oral brushes, toothbrushes, or the like, or may simply be referred to as cleaners, brushes, or the like.

What is claimed is:

**1**. A nasal cavity cleaner to be inserted into a nasal cavity for cleaning the nasal cavity, the nasal cavity cleaner comprising:

a grip section to be gripped by a user;

a shaft-shaped brush holding section extending from the grip section; and

a plurality of brush pieces stacked on each other and held by the brush holding section,

wherein each of the plurality of brush pieces comprises:

an annular section formed in an annular shape; and

a plurality of brush bristles provided on an outer peripheral surface of the annular section, each of the plurality of brush pieces held by the brush holding section inserted through the annular section,

wherein the brush holding section comprises:

a base section in a cylindrical shape; and

a locking section extending on an outer peripheral surface of the base section along a central axis line of the brush holding section, the locking section formed in a rib shape having an outer diameter from the central axis line of the brush holding section to a top of the locking section, the outer diameter larger than an inner diameter of the annular section, and the locking section locked to an inner peripheral surface of the annular section of the brush piece held by the brush holding section to suppress a rotation of the brush piece around the central axis line,

wherein the brush holding section is inserted through the annular section by press fitting to lock the locking section to the inner peripheral surface of the annular section, and

wherein the locking section is crushed by the inner peripheral surface of the annular section with the brush holding section being inserted through the annular section.

**2**. The nasal cavity cleaner according to claim **1**, wherein the plurality of brush bristles are provided radially outward from the outer peripheral surface of the annular section over an entire circumference of the outer peripheral surface of the annular section.

**3**. The nasal cleaner according to claim **1**, wherein on a cross-section perpendicular to the central axis line of the brush holding section, the top of the locking section is positioned between two interfaces between the locking section and the base section when viewed in at least one direction perpendicular to the central axis line.

**4**. The nasal cleaner according to claim **1**, wherein the inner peripheral surface of the annular section of each of the plurality of brush pieces is pressed and expanded by the locking section with the brush holding section being inserted through the annular section.

**5**. The nasal cleaner according to claim **1**, wherein each of the plurality of brush pieces stacked on each other is in contact with another adjacent one of the brush pieces on side surfaces of the annular sections of the bush pieces adjacent to each other.

**6**. The nasal cavity cleaner according to claim **5**, wherein each of the plurality of brush pieces further comprises a convex section is formed on the side surface of the annular section.

**7**. The nasal cleaner according to claim **1**, wherein the brush holding section further comprises:

a wall section on the grip section side, the wall section on which the annular section of the brush abuts when the brush holding section is first inserted through the annular section; and

a pressurizing lid section pressurizing and holding the annular section of the brush piece along the central axis line toward the grip section when the brush holding section is last inserted through the annular section.

**8**. The nasal cavity cleaner according to claim **7**, wherein the pressurizing lid section is formed by ultrasonic welding.

**9**. The nasal cavity cleaner according to claim **1**, wherein the plurality of brush pieces are formed so that at least at an end opposite to the grip section, the brush bristles are shorter in length from the grip section side toward the side opposite to the grip section.

**10**. An oral cavity cleaner to be inserted into an oral cavity for cleaning the oral cavity, the oral cavity cleaner comprising:

a grip section to be gripped by a user;

a shaft-shaped brush holding section extending from the grip section; and

a plurality of brush pieces stacked on each other and held by the brush holding section,

wherein each of the plurality of brush pieces comprises:
an annular section formed in an annular shape; and
a plurality of brush bristles provided on an outer peripheral surface of the annular section, each of the plurality of brush pieces held by the brush holding section inserted through the annular section,
wherein the brush holding section comprises:
a base section in a cylindrical shape; and
a locking section extending on an outer peripheral surface of the base section along a central axis line of the brush holding section, the locking section formed in a rib shape having an outer diameter from the central axis line of the brush holding section to a top of the locking section, the outer diameter larger than an inner diameter of the annular section, and the locking section locked to an inner peripheral surface of the annular section of the brush piece held by the brush holding section to suppress a rotation of the brush piece around the central axis line,
wherein the brush holding section is inserted through the annular section by press fitting to lock the locking section to the inner peripheral surface of the annular section, and
wherein the locking section is crushed by the inner peripheral surface of the annular section with the brush holding section being inserted through the annular section.

**11**. The oral cavity cleaner according to claim **10**, wherein the plurality of brush bristles are provided radially outward from the outer peripheral surface of the annular section over an entire circumference of the outer peripheral surface of the annular section.

**12**. The oral cavity cleaner according to claim **10**, wherein on a cross-section perpendicular to the central axis line of the brush holding section, the top of the locking section is positioned between two interfaces between the locking section and the base section when viewed in at least one direction perpendicular to the central axis line.

**13**. The oral cavity cleaner according to claim **10**, wherein the inner peripheral surface of the annular section of each of the plurality of brush pieces is pressed and expanded by the locking section with the brush holding section being inserted through the annular section.

**14**. The oral cavity cleaner according to claim **10**, wherein each of the plurality of brush pieces stacked on each other is in contact with another adjacent one of the brush pieces on side surfaces of the annular sections of the bush pieces adjacent to each other.

**15**. The oral cavity cleaner according to claim **14**, wherein each of the plurality of brush pieces further comprises a convex section is formed on the side surface of the annular section.

**16**. The oral cavity cleaner according to claim **10**, wherein the brush holding section further comprises:
a wall section on the grip section side, the wall section on which the annular section of the brush piece abuts when the brush holding section is first inserted through the annular section; and
a pressurizing lid section pressurizing and holding the annular section of the brush piece along the central axis line toward the grip section when the brush holding section is last inserted through the annular section.

**17**. The oral cavity cleaner according to claim **16**, wherein the pressurizing lid section is formed by ultrasonic welding.

**18**. The oral cavity cleaner according to claim **10**, wherein the plurality of brush pieces are formed so that at least at an end opposite to the grip section, the brush bristles are shorter in length from the grip section side toward the side opposite to the grip section.

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