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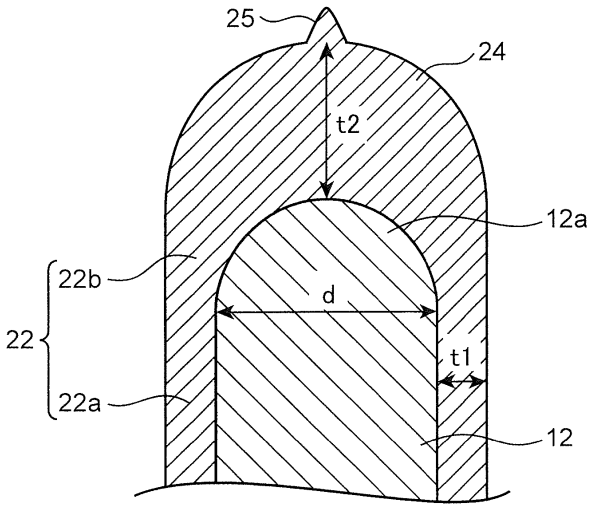
(54) **CLEANING IMPLEMENT**

(57) A cleaning implement equipped with: a shaft part (12) having an insertion end section (12a) and a base end section; and a cleaning part comprising an elastomer and capable of cleaning a gap. The shaft part (12) has a shape that can be flexurally deformed so as to allow displacement of the insertion end section (12a) relative to the base end section in the axially perpendicular direction. The cleaning part has a cleaning-part body (22) and a guide part (24) for projecting farther outward in the axial direction than the insertion end section (12a), and guiding the insertion of the cleaning-part body (22) into a gap. The projection dimension (t2) of the guide part (24) from the insertion end section (12a) is equal to or greater than the thickness (t1) of the cleaning-part body (22), and the guide part (24) has a shape that can be elastically deformed so as to be displaced relative to the insertion end section (12a) in the axially perpendicular direction.

FIG. 2



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Description

Technical field

[0001] The present invention relates to a cleaning implement.

Background Art

[0002] A conventional type of a cleaning implement for cleaning minute gaps such as between keys of a keyboard is known. For example, Patent Literature 1 discloses a cleaning implement including a shaft part and a fiber lump (cleaning part) attached to a tip portion of the shaft part. A cleaning part is formed by compressing a predetermined amount of fibers.

[0003] In the cleaning implement described in Patent Literature 1, due to fluffing of the surface of the cleaning part composed of fibers, it is sometimes difficult to insert the cleaning part into a minute gap formed between mutually adjacent objects to be cleaned (such as between keys of a keyboard). Specifically, when the cleaning part repeatedly collides with the object to be cleaned during the cleaning of the minute gaps, the surface of the cleaning part is fluffed. As a result, it is sometimes difficult to insert the cleaning part into the minute gap.

[0004] Meanwhile, elastomers are known as materials which can be used for molding a cleaning part for cleaning minute gaps without causing the fluffing problem. The cleaning part formed by the elastomer does not generate fluffing and effectively removes contamination from minute gaps by friction generated between the cleaning part and the object to be cleaned.

[0005] However, even when the cleaning part is formed of an elastomer, the improvement of the insertability of the cleaning part into the minute gaps is insufficient. Specifically, where the tip of the cleaning part comes into contact with the object to be cleaned when the cleaning part is inserted into a minute gap, in order to insert the cleaning part further toward the back of the gap, an operation of changing the insertion direction (posture of the shaft part) of the cleaning part into the gap is necessary to allow for the insertion of the cleaning part toward the back of the gap. Since this operation is necessary every time the tip of the cleaning part contacts the object to be cleaned, it is very difficult to insert the cleaning part toward the back of the gap. This problem becomes particularly significant when the adjustment range of the posture of the shaft part is limited, such as during the operation of the shaft part in a narrow space.

Citation list

Patent Literature

[0006] Patent Literature 1: Japanese Unexamined Patent Publication No. 2001-087211

Summary of Invention

[0007] An object of the present invention is to provide a cleaning implement that enables easy insertion of a cleaning part deep into a minute gap.

[0008] A cleaning implement according to one aspect of the present invention is for cleaning a minute gap formed between mutually adjacent objects to be cleaned, the cleaning implement including: a shaft part which has a shape that extends in a specific direction and can be inserted in the gap, and has an insertion end section formed at one end in the specific direction and a base end section formed at the other end in the specific direction; and a cleaning part which is composed of an elastomer having a hardness lower than a hardness of the shaft part, covers a portion of the shaft part, and can clean the gap, the portion including the insertion end section and having a dimension equal to or less than a dimension of the shaft part in an axial direction of the shaft part, wherein the shaft part has a shape that can be flexurally deformed so as to allow displacement of the insertion end section relative to the base end section in an axially perpendicular direction, which is perpendicular to the axial direction; the cleaning part has a cleaning-part body that covers an outer peripheral surface of the shaft part, and a guide part that projects farther outward in the axial direction than the insertion end section and guides the insertion of the cleaning-part body into the gap; and a projection dimension of the guide part from the insertion end section is equal to or greater than a thickness of the cleaning-part body, and the guide part has a shape that can be elastically deformed so as to be displaced relative to the insertion end section in the axially perpendicular direction.

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a front view of a cleaning implement according to one embodiment of the present invention.

[Fig. 2] Fig. 2 is a cross-sectional view taken along a line II-II shown in Fig. 1.

[Fig. 3] Fig. 3 is a diagram showing an outline of a pressure testing machine.

[Fig. 4] Fig. 4 is a view showing an outline of an initial stage of insertion of a cleaning part in a gap between mutually adjacent objects to be cleaned.

[Fig. 5] Fig. 5 is a view showing an outline of a middle stage of insertion of a cleaning part into the gap between mutually adjacent objects to be cleaned.

[Fig. 6] Fig. 6 is a cross-sectional view showing a modified example of the cleaning part.

Description of Embodiments

[0010] A cleaning implement 1 according to one em-

bodiment of the present invention will be described with reference to Figs. 1 to 5.

[0011] The present cleaning implement 1 is for cleaning a minute gap (such as a gap between keys of a keyboard or between back teeth, etc.) formed between adjacent objects T to be cleaned (see Figs. 4 and 5). As shown in Fig. 1, the cleaning implement 1 of the present embodiment includes a base part 10 and a cleaning part 20 made of an elastomer having a hardness lower than the hardness of the base part 10. The base part 10 is formed of a synthetic resin such as polypropylene. The base part 10 is preferably formed of polypropylene to obtain elasticity suitable for the base part 10 and improve insertability into the gap, but may be also formed of a synthetic resin such as ABS, a polycarbonate, polybutylene terephthalate, polyethylene terephthalate, polystyrene, and a polyacetal. As the elastomer, a styrene elastomer is preferably used. However, a silicone, an olefin elastomer, a polyester elastomer or the like may also be used as the elastomer.

[0012] The base part 10 has a shaft part 12 having a shape extending linearly along a specific direction (vertical direction in Fig. 1) and a grip part 14.

[0013] The shaft part 12 has a shape that can be inserted into a minute gap S (see Fig. 4). The shaft part 12 has an insertion end section 12a formed at one end in the specific direction and a base end section 12b formed at the other end in the specific direction. The shaft part 12 has such a shape that the insertion end section 12a can be flexurally deformed so as to be displaced in an axially perpendicular direction (a lateral direction in Fig. 1) which is perpendicular to an axial direction of the shaft part 12, with the base end section 12b as a fulcrum. In the present embodiment, the shaft part 12 is formed in a substantially cylindrical shape. Specifically, the shaft part 12 has a shape such that the outer diameter of the shaft part 12 gradually reduces from the base end section 12b toward the insertion end section 12a. The insertion end section 12a is formed into a hemispherical shape which is curved so as to be convex outward in the axial direction. In the present embodiment, the axial dimension of the shaft part 12 is set to 29 mm, and the diameter of the base end section 12b is set to 1.2 mm. Further, the radius of the insertion end section 12a is set to 0.27 mm.

[0014] The grip part 14 is a portion gripped by a person. The grip part 14 is connected to the base end section 12b of the shaft part 12. In the present embodiment, the grip part 14 is formed in a cylindrical shape having an outer diameter that is somewhat larger than the outer diameter of the shaft part 12. However, this shape of the grip part 14 is not limiting.

[0015] The cleaning part 20 covers a portion of the shaft part 12 including the insertion end section 12a and having a dimension equal to or less than the dimension of the shaft part 12 in the axial direction, and has a shape capable of cleaning a gap S. Specifically, the cleaning part 20 has a shape that covers a portion of the shaft part 12 that continuously extends from the insertion end section 12a along a direction from the insertion end section 12a to the base end section 12b. In the present embodiment, the dimension of the cleaning part 20 in the axial direction is set to 15.4 mm. The cleaning part 20 has a cleaning-part body 22 and a guide part 24.

[0016] The cleaning-part body 22 has a shape covering the outer peripheral surface of the shaft part 12 including the insertion end section 12a. The cleaning-part body 22 has a cylindrical outer peripheral surface. As shown in Fig. 2, the cleaning-part body 22 includes a first covering section 22a that covers the outer peripheral surface of a portion of the shaft part 12 other than the insertion end section 12a, and a second covering section 22b that covers the outer peripheral surface of the insertion end section 12a. The thickness t1 (dimension in the lateral direction in Fig. 2) of the first covering section 22a is set to 0.10 mm. The second covering section 22b has a shape that gradually increases in thickness with the distance in the axially outward direction from the first covering section 22a.

[0017] The guide part 24 has a shape projecting outward in the axial direction from the insertion end section 12a and guiding the insertion of the cleaning-part body 22 into the gap S. The guide part 24 has a shape that is elastically deformable in the axially perpendicular direction with respect to the insertion end section 12a. As shown in Fig. 2, the projection dimension t2 of the guide part 24 from the insertion end section 12a is set larger than the thickness t1 of the first covering section 22a. It is preferable that the projection dimension t2 be set to 3 times or more and 10 times or less the thickness t1 of the first covering section 22a. It is more preferable that the projection dimension t2 be set to be 3 times or more and 5 times or less the thickness t1 of the first covering section 22a. Furthermore, it is preferable that the projection dimension t2 be set to 0.6 times or more and 4 times or less of the diameter d of the insertion end section 12a (1.1 times or more and 8 times or less the radius of the insertion end section 12a). In the present embodiment, the projection dimension t2 is set to 4 times the thickness t1 of the first covering section 22a, that is, to 0.40 mm. This value is about 1.5 times the radius of the insertion end section 12a.

[0018] The cross section of the portion of the guide part 24 which is in contact with the insertion end section 12a in the plane perpendicular to the axial direction is formed in a circular shape having the same radius as the radius of the tip portion of the second covering section 22b. In the present embodiment, the guide part 24 is formed in a hemispherical shape which is curved so as to be convex outward in the axial direction. Thus, the projection dimension t2 is set to a value equal to the radius of the guide part 24.

[0019] In the present embodiment, as shown in Fig. 2, a fine protrusion 25 is connected to the tip of the guide part 24. The fine protrusion 25 has a shape protruding outward in the axial direction from the tip of the guide part 24. In the present embodiment, the fine protrusion

25 is formed in a conical shape. Specifically, the outer diameter of the connecting portion between the fine protrusion 25 and the guide part 24 is set to be smaller than the outer diameter (the radius of the guide part 24) of the connection portion between the guide part 24 and the second covering section 22b. The dimension of the fine protrusion 25 in the axial direction is set to be smaller than the projection dimension t2 of the guide part 24. Incidentally, fine protrusion 25 may be omitted.

[0020] In the present embodiment, the Shore hardness of the elastomer is set such that the pressing force necessary for pressing the guide part 24 from the insertion end section 12a side toward the base end section 12b side until the guide part 24 is displaced by 5.0 mm in the axial direction, while the guide part 24 is elastically deformed and the shaft part 12 is flexurally deformed, is 1.0 N or more and 8.0 N or less in a state in which the portion of the cleaning implement 1 which is 10 mm apart from the tip of the guide part 24 on the base end section side is fixed. More preferably, the Shore hardness of the elastomer is set such that the pressing force is 3.0 N or more and 7.0 N or less, and even more preferably such that the pressing force is 4.0 N or more and 7.0 N or less. An elastomer having a Shore hardness of A0 to A50 can be used, and in this embodiment, an elastomer having a Shore hardness of A40 is used.

[0021] The pressing force is measured with the pressure testing machine 30 shown in Fig. 3. The pressure testing machine 30 has a fixing base 32 capable of fixing the cleaning implement 1 and a pressing part 34 capable of pressing the cleaning implement 1 fixed to the fixing base 32. The pressing part 34 is disposed vertically above the fixing base 32 and is configured to be able to press the cleaning implement 1, which is fixed to the fixing base 32, downward in the vertical direction.

[0022] Next, a method for measuring the pressing force using the pressure testing machine 30 will be described.

[0023] First, the cleaning implement 1 is fixed to the fixing base 32 in a posture in which the direction from the grip part 14 to the guide part 24 is oriented vertically upward. Specifically, as shown in Fig. 3, the entire portion of the cleaning implement 1, at a distance of 10 mm or more from the tip of the guide part 24 toward the base end section 12b side, is fixed by the fixing base 32.

[0024] Next, the pressing part 34 presses the cleaning implement 1 vertically downward. Specifically, from the state in which the lower surface of the pressing part 34 is in contact with the guide part 24, the pressing part 34 is displaced by 5.0 mm vertically downward toward the fixing base 32. As the pressing part 34 is pressed, the guide part 24 displaces by 5.0 mm in the axial direction while the guide part 24 is elastically deformed and the shaft part 12 is flexurally deformed. Then, the pressing force is measured at the time the pressing part 34 is displaced by 5.0 mm.

[0025] A method for using the present cleaning implement 1 explained above will be explained with reference to Figs. 4 and 5. Figs. 4 and 5 show a cross section in the vicinity of the tip of the cleaning implement 1.

[0026] First, the present cleaning implement I is inserted toward the gap S between the objects T to be cleaned with the guide part 24, which is positioned at the tip of the cleaning part 20, as the head. After the guide part 24 contacts the object T to be cleaned, the shaft part 12 is inserted as it is along the insertion direction. Then, as shown in Fig. 5, as the shaft part 12 is inserted along the insertion direction, the guide part 24 is elastically deformed so as to be displaced in the axially perpendicular direction toward the back of the gap S with respect to the insertion end section 12a, and the shaft part 12 is flexurally deformed so that the insertion end section 12a is displaced in the same direction as the displacement direction of the guide part 24 with respect to the base end section 12b. Therefore, as a result of further inserting the shaft part 12 along the insertion direction in the present posture thereof, the cleaning part 20 is inserted toward the back of the gap S.

[0027] As described above, with the present cleaning implement 1, when the cleaning part 20 is inserted into the gap S, the cleaning-part body 22 is guided by the guide part 24 having a relatively low hardness so as to be inserted into the gap S, and during subsequent insertion of the cleaning part 20 after such guidance, the gap S and the object T to be cleaned are effectively cleaned by the cleaning-part body 22 covering the outer peripheral surface of the shaft part 12 having a relatively high hardness.

[0028] As described above, with the present cleaning implement 1, as a result of inserting the shaft part 12 in the present posture thereof after the guide part 24 contacts the object T to be cleaned, the cleaning part 20 is inserted toward the back of the gap S while the guide part 24 is elastically deformed and the shaft part 12 is flexurally deformed. Therefore, with the present cleaning implement 1, it is not necessary to perform the operation of adjusting the insertion direction of the cleaning part 20 into the gap S, that is, the operation of adjusting the posture of the shaft part 12 so that the longitudinal direction of the cleaning part 20 coincides with the direction in which the gap S extends, when the tip of the cleaning part 20 comes into contact with the object T to be cleaned. This is particularly effective when inserting the cleaning part 20 into the gap S between the mutually adjacent back teeth, that is, when the object T to be cleaned is a back tooth. Specifically, since the back teeth are located in a relatively narrow space within the oral cavity, the operation of adjusting the posture of the shaft part 12 so that the longitudinal direction of the cleaning part 20 coincides with the direction in which the gap S extends in this space is restricted by the lips. Therefore, the present cleaning implement 1 is particularly effective for cleaning the gap S between the back teeth.

[0029] Further, in the present embodiment, since the projection dimension t2 of the guide part 24 is set to 4 times the thickness t1 of the first covering section 22a, the insertion of the cleaning part 20 into the gap S is

further facilitated. Specifically, as a result of setting the projection dimension t2 of the guide part 24 to be 3 times or more the thickness t1 of the first covering section 22a, a sufficient amount of displacement of the guide part 24 when the guide part 24 is elastically deformed is ensured. Therefore, the guide part 24 is effectively guided toward the back of the gap S as the shaft part 12 is inserted after the guide part 24 comes into contact with the object T to be cleaned. Meanwhile, as a result of setting the projection dimension t2 of the guide part 24 to be 10 times or less the thickness t1 of the first covering section 22a, the decrease in strength of the guide part 24, that is, the decrease in the insertability of the guide part 24 into the gap S, which is caused by an excessively large relative projection dimension t2 of the guide part 24, is suppressed.

[0030] Further, in the present embodiment, since the projection dimension t2 is set to be in the range of 0.6 times or more and 4 times or less the diameter d of the insertion end section 12a, the insertion of the cleaning part 20 into the gap S is further facilitated. Specifically, as a result of setting the projection dimension t2 of the guide part 24 to be 0.6 times or more the diameter d of the insertion end section 12a, it is possible to ensure a sufficiently large proportion of the displacement amount of the guide part 24 when the guide part 24 is elastically deformed with respect to the diameter d of the insertion end section 12a. Therefore, the guide part 24 is effectively guided toward the back of the gap S as the shaft part 12 is inserted after the guide part 24 comes into contact with the object T to be cleaned. Meanwhile, as a result of setting the projection dimension t2 of the guide part 24 to be 4 times or less the diameter d of the insertion end section 12a, the decrease in strength of the guide part 24, that is, the decrease in the insertability of the guide part 24 into the gap S, which is caused by an excessively large relative projection dimension t2 of the guide part 24, is suppressed.

[0031] Further, in the present embodiment, an elastomer having a Shore hardness of A40 is used as the elastomer in order to obtain the pressing force (force necessary for pressing the guide part 24 from the insertion end section 12a side toward the base end section 12b side until the guide part 24 is displaced by 5.0 mm in the axial direction, while the guide part 24 is elastically deformed and the shaft part 12 is flexurally deformed, in a state in which the portion of the cleaning implement 1 which is 10 mm apart from the tip of the guide part 24 on the base end section 12b side is fixed) of 1.0 N or more and 8.0 N or less. Therefore, when the shaft part 12 is further inserted from the state in which the guide part 24 is in contact with the object T to be cleaned, the cleaning part 20 is more easily inserted into the gap S. Specifically, as a result of setting the Shore hardness of the elastomer to obtain the pressing force of 1.0 N or more, so that the pressing force includes the force necessary for elastically deforming the guide part 24 composed of the elastomer in addition to the force necessary for flexurally deforming the shaft part 12, the strength of the guide part 24 is sufficiently ensured. As a consequence, when the shaft part 12 is further inserted from the state in which the guide part 24 is in contact with the object T to be cleaned, the guide part 24 is effectively elastically deformed toward the back of the gap S. Meanwhile, by setting the Shore hardness of the elastomer so that the pressing force is 8.0 N or less, it is possible to suppress the inadequate deformation of the guide part 24 (impairment of guidance of the cleaning-part body 22 toward the back of the gap S by the guide part 24) when the shaft part 12 is further inserted from a state in which the guide part 24 is in contact with the object T to be cleaned.

[0032] Further, the fine protrusion 25 provided at the tip of the guide part 24 improves the insertability of the cleaning part 20 into the gap S. Specifically, when the fine protrusion 25 is in contact with the object T to be cleaned, the fine protrusion 25 guides the displacement direction of the guide part 24 so that the guide part 24 is elastically deformed toward the back of the gap S, thereby further facilitating the insertion of the cleaning part 20 into the gap S.

[0033] It is to be understood that the presently disclosed embodiment is exemplary rather than restrictive in all the aspects thereof. The scope of the present invention is represented by the claims, rather than by the description of the embodiment described hereinabove, and is inclusive of meanings and scopes equivalent to those of the claims.

[0034] The shape of the insertion end section 12a is not limited to the example described in the embodiment, that is, the hemispherical shape. The insertion end section 12a may be formed in a columnar shape, a truncated cone shape, or a polygonal column shape. Further, the portion of the shaft part 12 other than the insertion end section 12a may be formed into a polygonal prism shape.

[0035] Further, as shown in Fig. 6, the cleaning part 20 may have a group of brush bristles composed of a plurality of brush bristles 27. The brush bristles 27 are integrally formed of the same material as that of the cleaning-part body 22, protrude outward in the axially perpendicular direction from the outer peripheral surface of the cleaning-part body 22, and have a shape such that the outer shape of the brush bristles 27 gradually decreases with the distance from the outer peripheral surface of the cleaning-part body 22. When the brush bristles 27 are inserted into the gap S, the brush bristles 27 come into contact with the object T to be cleaned and collapse. In this case, from the viewpoint of enhancing the insertability into the gap S, it is preferable that the collapsed brush bristles 27 hardly overlap or do not overlap at all the adjacent brush bristles 27. Further, the brush bristle group may include first curved brush bristles 27a and second curved brush bristles 27b. The first curved brush bristles 27a have a shape that curves gradually from the base end section 12b side toward the insertion end section 12a side with a transition outward from the cleaning-part body 22 in the axially perpendicular direction. The second

curved brush bristles 27b have a shape that curves gradually from the insertion end section 12a side to the base end section 12b side with a transition outward from the cleaning-part body 22 in the axially perpendicular direction. In this way, it is possible to clean effectively the gap S or the object T during both of the insertion of the cleaning part 20 into the gap S and the removal thereof from the gap S. Specifically, since the brush bristle group includes both the first curved brush bristles 27a and the second curved brush bristles 27b, the first curved brush bristles 27a effectively clean the gap S or the object T at the time of insertion, whereas the second curved brush bristles 27b effectively clean the gap S or the object T during the removal.

[0036] Furthermore, since the brush bristle group includes both the first curved brush bristles 27a and the second curved brush bristles 27b, the insertion resistance felt by the operator when inserting the cleaning part 20 into the gap S and the pull-out resistance felt by the operator when the cleaning part 20 is pulled out from the gap S become substantially uniform as compared with the case in which the brush bristle group includes only the first curved brush bristles 27a or the second curved brush bristles 27b. Therefore, the cleaning operation performed by the operator is facilitated.

[0037] Here, the above embodiment will be outlined.

[0038] The cleaning implement of the present embodiment is a cleaning implement for cleaning a minute gap formed between mutually adjacent objects to be cleaned, the cleaning implement including: a shaft part which has a shape that extends in a specific direction and can be inserted in the gap, and has an insertion end section formed at one end in the specific direction and a base end section formed at the other end in the specific direction; and a cleaning part which is composed of an elastomer having a hardness lower than a hardness of the shaft part, covers a portion of the shaft part, including the insertion end section, having a dimension equal to or less than a dimension of the shaft part in an axial direction of the shaft part, and can clean the gap, wherein the shaft part has a shape that can be flexurally deformed so as to allow displacement of the insertion end section relative to the base end section in an axially perpendicular direction which is perpendicular to the axial direction; the cleaning part has a cleaning-part body that covers the outer peripheral surface of the shaft part, and a guide part that projects farther outward in the axial direction than the insertion end section and serves for guiding the insertion of the cleaning-part body into the gap; and the projection dimension of the guide part from the insertion end section is equal to or greater than the thickness of the cleaning-part body, and the guide part has a shape that can be elastically deformed so as to be displaced relative to the insertion end section in the axially perpendicular direction.

[0039] With the present cleaning implement, when the cleaning part is inserted into the minute gap formed between the mutually adjacent objects to be cleaned, after the guide part located at the tip of the cleaning part in the insertion direction comes into contact with the object to be cleaned, the guide part is elastically deformed so as to be displaced in the axially perpendicular direction toward the back of the gap with respect to the insertion end section, and the shaft part is flexurally deformed so that the insertion end section of the shaft part is displaced in the same direction as the displacement direction of the guide part with respect to the base end section. Therefore, with the present cleaning implement, as a result of inserting the shaft part in the present posture thereof after the guide part comes into contact with the object to be cleaned, the cleaning part is inserted toward the back of the gap S while the guide part is elastically deformed and the shaft part is flexurally deformed. In other words, with the present cleaning implement, when the cleaning part is inserted into the gap, the cleaning-part body is guided by the guide part having a relatively low hardness so as to be inserted into the gap, and when the cleaning part is further inserted after such guidance, the gap or the object to be cleaned is effectively cleaned by the cleaning-part body covering the outer peripheral surface of the shaft part having a relatively high hardness. Therefore, with the present cleaning implement, cleaning of small gaps such as between keys of the keyboard and between teeth is facilitated.

[0040] In this case, it is preferable that the projection dimension of the guide part be set 3 times or more and 10 times or less the thickness of the cleaning-part body.

[0041] In this way, the insertion of the cleaning part into a minute gap is further facilitated. Specifically, as a result of setting the projection dimension (the dimension in the axial direction) of the guide part to be 3 times or more the thickness of the cleaning-part body, a sufficient amount of displacement of the guide part when the guide part is elastically deformed is ensured. Therefore, the guide part is effectively guided toward the back of the gap as the shaft part is inserted after the contact of the guide part with the object to be cleaned. Meanwhile, as a result of setting the projection dimension of the guide part to be 10 times or less the thickness of the cleaning-part body, the decrease in strength of the guide part, that is, the decrease in the insertability of the guide part into the gap, which is caused by an excessively large relative projection dimension of the guide part, is suppressed.

[0042] Further, in the present cleaning implement, it is preferable that the projection dimension of the guide part be set to 0.6 times or more and 4 times or less, and more preferably 0.7 times or more and 2 times or more the dimension of the insertion end section in the axially perpendicular direction.

[0043] In this way, the insertion of the cleaning part into the gap is further facilitated. Specifically, as a result of setting the projection dimension of the guide part to be 0.6 times or more the dimension of the insertion end section in the axially perpendicular direction, it is possible to ensure a sufficiently large proportion of the displacement amount of the guide part when the guide part is

elastically deformed with respect to the dimension of the insertion end section in the axially perpendicular direction. Therefore, the guide part is effectively guided toward the back of the gap as the shaft part is inserted after the guide part comes into contact with the object to be cleaned. Meanwhile, as a result of setting the projection dimension of the guide part to be 4 times or less the dimension of the insertion end section in the axially perpendicular direction, the decrease in strength of the guide part, that is, the decrease in the insertability of the guide part into the gap, which is caused by an excessively large relative projection dimension of the guide part, is suppressed.

[0044] Further, in the present cleaning implement, it is preferred that the projection dimension of the guide part be set to 0.10 mm or more and 1.2 mm or less, the dimension of the shaft part in the axial direction be set to 10 mm or more, and the Shore hardness of the elastomer be set such that a pressing force necessary for pressing the guide part from the insertion end section side toward the base end section side until the guide part is displaced by 5.0 mm in the axial direction, while the guide part is elastically deformed and the shaft part is flexurally deformed, is 1.0 N or more and 8.0 N or less in a state in which the portion of the cleaning implement which is 10 mm apart from the tip of the guide part on the base end section side is fixed.

[0045] As a result of setting the Shore hardness of the elastomer to obtain the pressing force of 1.0 N or more and 8.0 N or less, the insertion of the cleaning part into the gap is further facilitated when the shaft part is further inserted from the state in which the guide part is in contact with the object to be cleaned. Specifically, as a result of setting the Shore hardness of the elastomer to obtain the pressing force of 1.0 N or more, so that the pressing force includes the force necessary for elastically deforming the guide part composed of the elastomer in addition to the force necessary for flexurally deforming the shaft part, the strength of the guide part is sufficiently ensured. As a consequence, when the shaft part is further inserted from the state in which the guide part is in contact with the object to be cleaned, the guide part is effectively elastically deformed toward the back of the gap. Meanwhile, by setting the Shore hardness of the elastomer so that the pressing force is 8.0 N or less, it is possible to suppress the inadequate deformation of the guide part (impairment of guidance of the cleaning-part body toward the back of the gap by the guide part) when the shaft part is further inserted from a state in which the guide part is in contact with the object to be cleaned.

[0046] Further, in the present cleaning implement, it is preferable that the cleaning part further have a fine protrusion that is provided at the tip of the guide part and has an outer shape smaller than the outer shape of the guide part.

[0047] In this way, when the fine protrusion comes into contact with the object to be cleaned, the fine protrusion guides the displacement direction of the guide part so that the guide part is elastically deformed toward the back of the gap. As a result, the insertion into the gap is further facilitated.

[0048] Further, in the present cleaning implement, it is preferred that the cleaning part further have a group of brush bristles composed of a plurality of brush bristles, each brush bristle having a shape protruding outward in the axially perpendicular direction from the outer peripheral surface of the cleaning-part body, and that the brush bristles include a first curved brush bristle having a shape that curves gradually from the base end section side toward the insertion end section side with a transition outward from the cleaning-part body in the axially perpendicular direction, and a second curved brush bristles having a shape that curves gradually from the insertion end section side to the base end section side with a transition outward from the cleaning-part body in the axially perpendicular direction.

[0049] In this way, it is possible to clean effectively the gap or the object to be cleaned during both the insertion of the cleaning part into the gap and the removal thereof from the gap. Specifically, since the brush bristle group includes both the first curved brush bristles having a shape that curves gradually from the base end section side toward the insertion end section side with a transition outward from the cleaning-part body in the axially perpendicular direction, and the second curved brush bristles having a shape that curves gradually from the insertion end section side to the base end section side with a transition outward from the cleaning-part body in the axially perpendicular direction, the first curved brush bristles effectively clean the gap or the object to be cleaned at the time of insertion, whereas the second curved brush bristles effectively clean the gap or the object to be cleaned during the removal.

[0050] Furthermore, since the brush bristle group includes both the first curved brush bristles and the second curved brush bristles, the insertion resistance felt by the operator when inserting the cleaning part into the gap and the pull-out resistance felt by the operator when the cleaning part is pulled out from the gap become substantially uniform as compared with the case in which the brush bristle group includes only the first curved brush bristles or the second curved brush bristles. Therefore, the cleaning operation performed by the operator is facilitated.

[0051] Further, the first curved brush bristles and the second curved brush bristles are molded with a die designed to form brush bristles having a shape extending linearly outward in the axially perpendicular direction from the outer peripheral surface of the cleaning-part body, and are inclusive of those having a shape which gradually curves from the base end section side to the insertion end section side or from the insertion end section side toward the base end section side with the distance outward from the cleaning-part body after the bristles are removed from the die.

[0052] Further, in the present cleaning implement, it is

preferable that the insertion end section and the guide part be each formed in a hemispherical shape which is curved so as to be convex outward in the axial direction. It is also preferable that the radius of the guide part be set to 1.1 times or more and 8 times or less, more preferably 1.1 times or more and 4 times or less, and even more preferably 1.2 times or more and 2 times or less the radius of the insertion end portion.

[0053] In this way, the effect of guiding the cleaning-part body into the gap with the guide part when the cleaning part is inserted into the gap is increased over that when the guide part is formed in a substantially triangular pyramid shape or a truncated cone shape.

Claims

1. A cleaning implement for cleaning a minute gap formed between mutually adjacent objects to be cleaned, the cleaning implement comprising:

   a shaft part which has a shape that extends in a specific direction and can be inserted in the gap, and has an insertion end section formed at one end in the specific direction and a base end section formed at the other end in the specific direction; and
   a cleaning part which is composed of an elastomer having a hardness lower than a hardness of the shaft part, covers a portion of the shaft part, and can clean the gap, the portion including the insertion end section and having a dimension equal to or less than a dimension of the shaft part in an axial direction of the shaft part, wherein
   the shaft part has a shape that can be flexurally deformed so as to allow displacement of the insertion end section relative to the base end section in an axially perpendicular direction, which is perpendicular to the axial direction;
   the cleaning part has a cleaning-part body that covers an outer peripheral surface of the shaft part, and a guide part that projects farther outward in the axial direction than the insertion end section and guides the insertion of the cleaning-part body into the gap; and
   a projection dimension of the guide part from the insertion end section is equal to or greater than a thickness of the cleaning-part body, and the guide part has a shape that can be elastically deformed so as to be displaced relative to the insertion end section in the axially perpendicular direction.

2. The cleaning implement according to claim 1, wherein
   the projection dimension of the guide part is 3 times or more and 10 times or less the thickness of the cleaning-part body.

3. The cleaning implement according to claim 1 or 2, wherein
   the projection dimension of the guide part is 0.6 times or more and 4 times or less the dimension of the insertion end section in the axially perpendicular dimension.

4. The cleaning implement according to any of claims 1 to 3, wherein
   the projection dimension of the guide part is set to 0.1 mm or more and 1.2 mm or less;
   the dimension of the shaft part in the axial direction is set to 10 mm or more; and
   a Shore hardness of the elastomer is set such that a pressing force necessary for pressing the guide part from the insertion end section side toward the base end section side until the guide part is displaced by 5.0 mm in the axial direction, while the guide part is elastically deformed and the shaft part is flexurally deformed, is 1.0 N or more and 8.0 N or less in a state in which the portion of the cleaning implement which is 10 mm apart from a tip of the guide part toward the base end section side is fixed.

5. The cleaning implement according to any of claims 1 to 4, wherein
   the cleaning part further has a fine protrusion that is provided at the tip of the guide part and that has an outer shape smaller than an outer shape of the guide part.

6. The cleaning implement according to any of claims 1 to 5, wherein
   the cleaning part further has a group of brush bristles composed of a plurality of brush bristles, each brush bristle having a shape protruding outward in the axially perpendicular direction from the outer peripheral surface of the cleaning-part body; and
   the group of brush bristles includes a first curved brush bristle having a shape that curves outwardly of the cleaning-part body in the axially perpendicular direction gradually from the base end section side to the insertion end section side , and a second curved brush bristles having a shape that curves outwardly of the cleaning-part body in the axially perpendicular direction gradually from the insertion end section side to the base end section side.

7. The cleaning implement according to any of claims 1 to 6, wherein
   the insertion end section and the guide part are each formed in a semispherical shape which is curved so as to be convex outward in the axial direction; and
   the radius of the guide part is set to 1.1 times or more and 8 times or less the radius of the insertion end portion.

FIG. 1

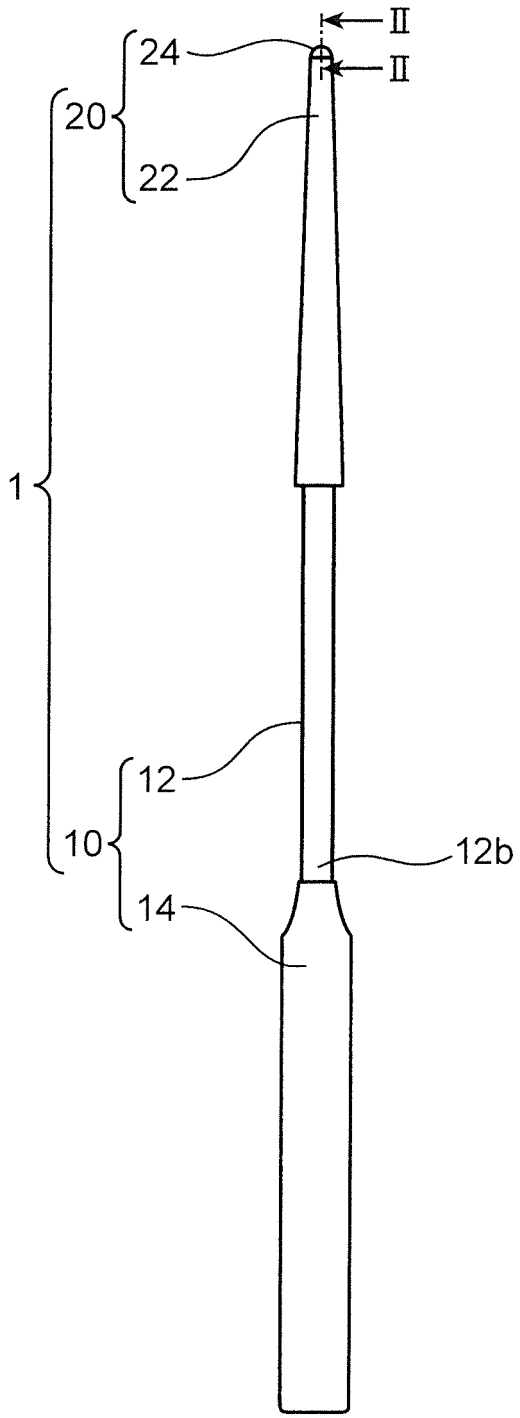


FIG. 2

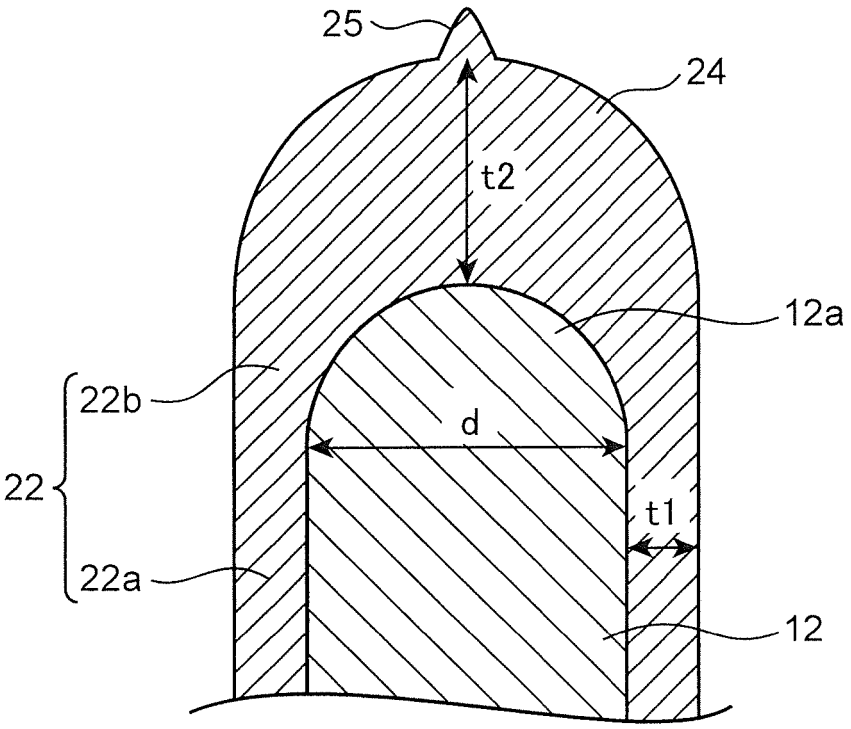


FIG. 3

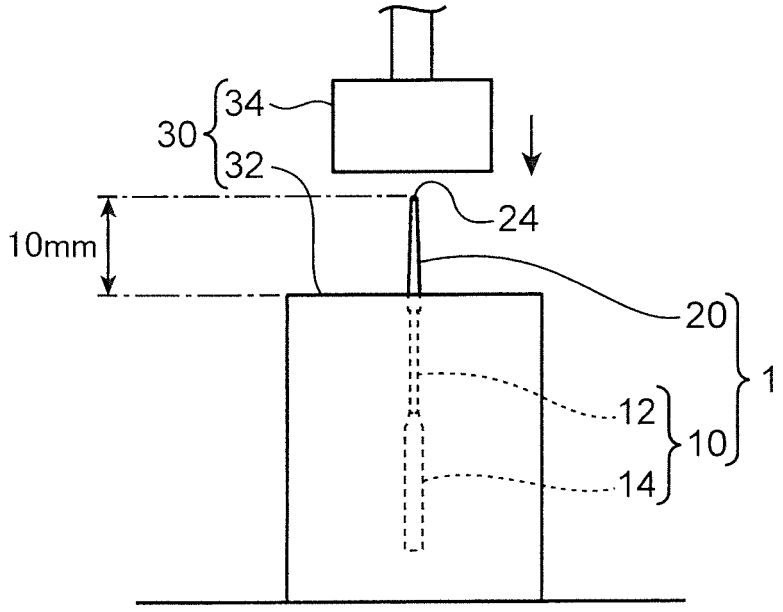


FIG. 4

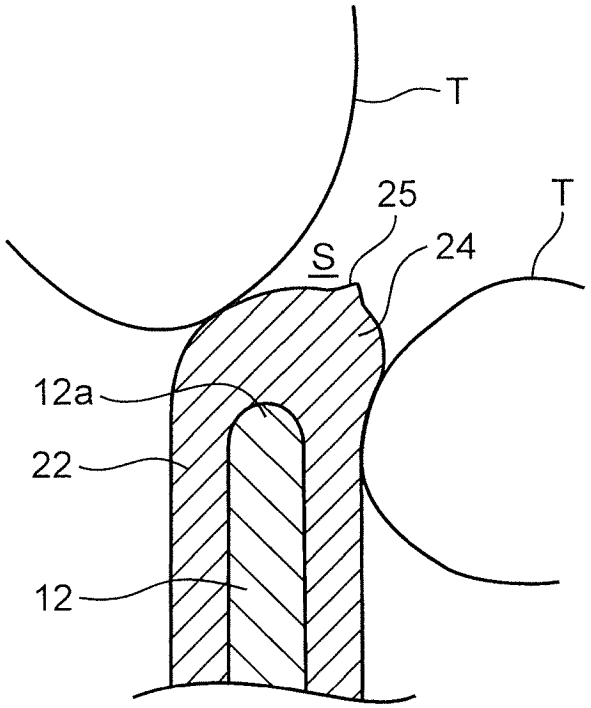


FIG. 5

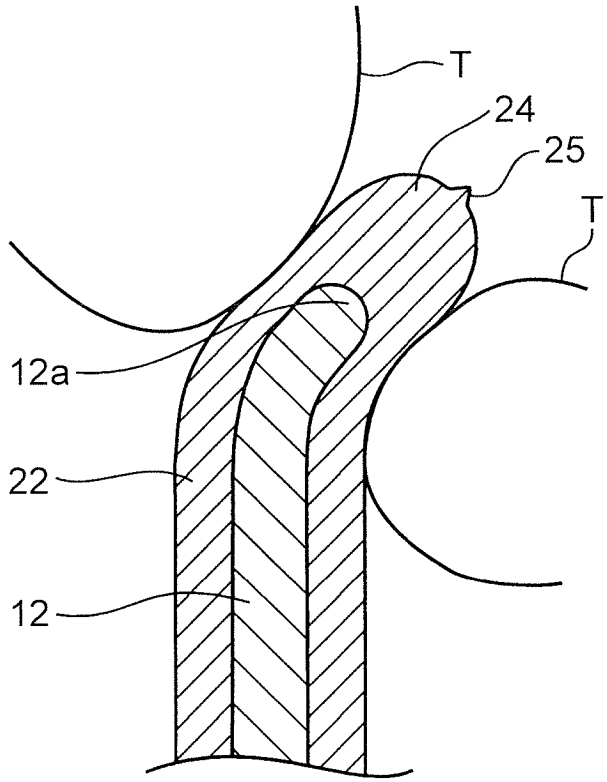
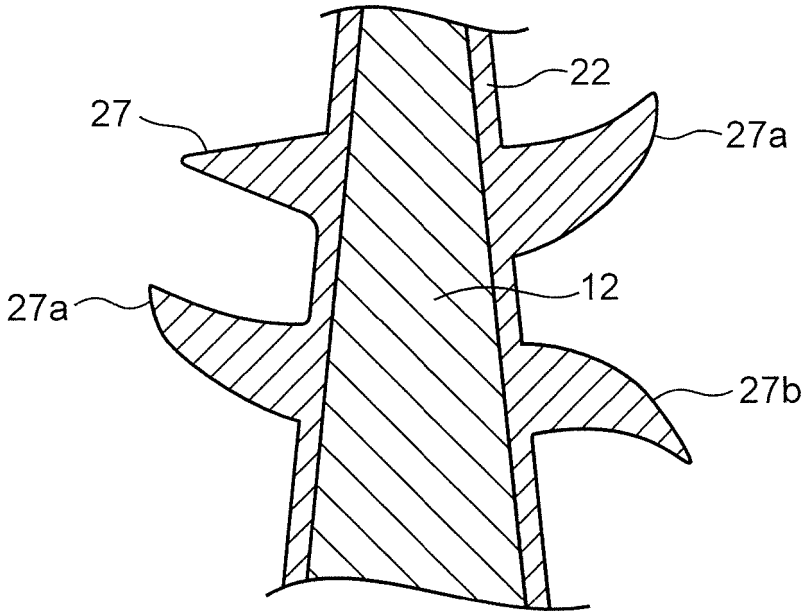


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/068404

A. CLASSIFICATION OF SUBJECT MATTER
B08B1/00(2006.01)i, *A47L25/00*(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)
B08B1/00, A47L25/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015
Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2006-134 A (Atom Kosan Co., Ltd.), 05 January 2006 (05.01.2006), paragraphs [0001] to [0002], [0013]; fig. 5 to 6 (Family: none)	1-7
Y	JP 2003-220014 A (Isshin Sangyo Kabushiki Kaisha), 05 August 2003 (05.08.2003), paragraphs [0001], [0018] to [0022]; fig. 2 to 5 (Family: none)	1-7

☒ 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
27 August 2015 (27.08.15)	08 September 2015 (08.09.15)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2015/068404

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2006-263382 A (Glory Sangyo Kabushiki Kaisha), 05 October 2006 (05.10.2006), paragraphs [0001], [0022]; fig. 5 (Family: none)	6
A	US 4085838 A (James N. PIERCE), 25 April 1978 (25.04.1978), fig. 1 to 3 (Family: none)	5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2001087211 A **[0006]**