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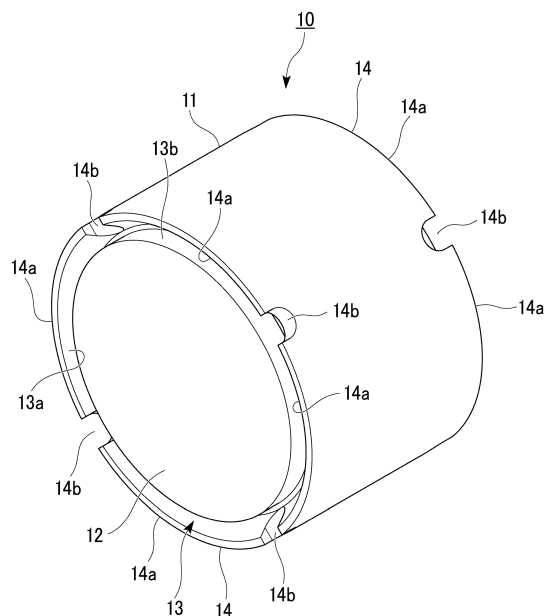
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(54) **KEYBOARD WEIGHT, KEY UNIT, AND METHOD FOR MANUFACTURING KEY UNIT**

(57) A keyboard weight includes a weight body formed in a cylindrical shape. A groove is formed in a peripheral edge portion of an end face of the weight body, the groove extending along a peripheral edge of the end face, the end face being perpendicular to an axial direction of the weight body, and an outward inner surface of the groove among inner surfaces of the groove slopes

toward outside of the weight body from a bottom portion of the groove toward an opening in the axial direction, the outward inner surface facing toward inside of the weight body in the radial direction, and an inclination angle of the outward inner surface is 30° or greater relative to the axial direction.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to a keyboard weight and a key unit used in a keyboard instrument, and a method for manufacturing the key unit.

BACKGROUND ART

[0002] Conventionally, a metal weight (hereinafter also referred to as a keyboard weight) used for weight adjustment of key touch during performance is attached to each key of a keyboard in a keyboard instrument such as a piano. Specifically, the keyboard weight is inserted and fixed in a through hole horizontally penetrating the key.

[0003] For example, the keyboard weight is attached to each key so that the keys on the bass side of the keyboard become heavy and the keys on the treble side become light, thereby enhancing the sense of touch during performance.

[0004] For the keyboard weight, one made of lead formed in a cylindrical shape is widely used. However, from the viewpoint of health and environmental impact, forming the keyboard weight with a metal material other than lead has been studied. It is conceivable to form the keyboard weight with a metal which is harder than lead, such as iron or the like.

[0005] For example, FIG. 1(a), (b) of Patent Document 1 disclose a configuration in which a cylindrical caulking portion protruding in the axial direction of the keyboard weight is formed on the peripheral edge of both end faces of the keyboard weight in the axial direction. In the state of this keyboard weight being inserted in a through hole of the key, a rod-like fixing tool is used from the left and right sides of the key to cause the cylindrical caulking parts at both axial ends in the axial direction to expand and bite into the inner wall of the through hole of the key, and thereby be fixed to the key. In addition, in order to facilitate expansion of the cylindrical caulking part, the keyboard weight of Patent Document 1 has a configuration in which a notched groove into which the caulking part falls into is formed on a facing surface opposed to the inner surface of the through hole of the key.

[Prior Art Documents]

[Patent Documents]

[0006] [Patent Document 1] Japanese Unexamined Patent Application, First Publication No. 2003-177740

SUMMARY OF THE INVENTION

Technical Problem

[0007] The present has as its object to provide a technique for improving the attachment of a keyboard weight

to a key.

Means for Solving the Problem

[0008] In order to solve the aforementioned problems, the present invention provides the following aspects.

[0009] A keyboard weight of a first aspect of the present invention includes a weight body formed in a cylindrical shape. A groove is formed in a peripheral edge portion of an end face of the weight body, the groove extending along a peripheral edge of the end face, the end face being perpendicular to an axial direction of the weight body, and an outward inner surface of the groove among inner surfaces of the groove slopes toward outside of the weight body from a bottom portion of the groove toward an opening in the axial direction, the outward inner surface facing toward inside of the weight body in the radial direction, and an inclination angle of the outward inner surface is 30° or greater relative to the axial direction.

[0010] A key unit of a second aspect of the present invention includes: a key including an insertion hole that opens to a side surface; and a keyboard weight that is inserted in the insertion hole and is caulked-fixed to the key. The keyboard weight includes a cylindrical weight body that is inserted in the insertion hole, and the weight body includes a caulking portion that is formed on a peripheral edge portion of an end portion in an axial direction and that bites into an inner surface of the insertion hole of the key, and the caulking portion is formed in a region within $\pm 45^\circ$ with respect to a lengthwise direction of the key.

[0011] A key unit of a third aspect of the present invention includes: a key including an insertion hole that opens to a side surface; and a cylindrical keyboard weight that is inserted in the insertion hole and is caulked-fixed to the key. The keyboard weight includes a cylindrical weight body that is inserted in the insertion hole, and the weight body includes a caulking portion that is formed on a peripheral edge portion of an end portion in an axial direction and that bites into an inner surface of the insertion hole of the key, the caulking portion is formed in a region within $\pm 45^\circ$ with respect to a lengthwise direction of the key, and a diameter D of the weight body is equal to or greater than 60% of a thickness of the key.

[0012] In a keyboard weight of a fourth aspect of the present invention, an annular caulking portion is formed on a peripheral edge portion of an end portion of a weight body in an axial direction of the weight body, the weight body being formed in a cylindrical shape, a plurality of slits are formed in the caulking portion, the plurality of slits dividing the caulking portion into three or more caulking divided portions, and lengths of the caulking divided portions in a circumferential direction of the caulking portion are equal to each other.

[0013] In a keyboard weight of a fifth aspect of the present invention, an annular caulking portion is formed on an end portion of a weight body in an axial direction of the weight body, the weight body being formed in a

cylindrical shape, a plurality of slits are formed in the caulking portion, the plurality of slits dividing the caulking portion into a plurality of caulking divided portions, and a width dimension of the slits in a circumferential direction of the caulking portion is 1 mm or more and 3 mm or less.

[0014] A method for manufacturing a key unit of a sixth aspect of the present invention, comprising, by inserting a keyboard weight into an insertion hole of a key and inserting a caulking projection of a caulking tool into a groove of a weight body, bending the caulking portion to an outer side in a radial direction of the keyboard weight and causing the caulking portion to bite into an inner surface of the insertion hole of the key, to thereby fixing the keyboard weight to the key, the keyboard weight having a groove that is formed in a peripheral edge portion of an end face of the weight body, the groove extending along a peripheral edge of the end face, the end face being perpendicular to an axial direction of the weight body, the weight body being formed in a cylindrical shape, the insertion hole opening to a side surface of the key, the caulking portion being positioned on an outer side of the groove in the radial direction of the keyboard weight.

Effect of the Invention

[0015] According to the aspects of the present invention, it is possible to favorably attach a keyboard weight to a key.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

FIG. 1 is a perspective view showing a keyboard weight according to one embodiment of the present invention.

FIG. 2 is a cross-sectional view of the keyboard weight shown in FIG. 1.

FIG. 3 is a cross-sectional view showing a state in which the keyboard weight is inserted into an insertion hole of a key in the operation of inserting and fixing the keyboard weight of FIG. 1 into an insertion hole of a key.

FIG. 4 is a cross-sectional view showing a state in which the keyboard weight of FIG. 3 is caulked-fixed to a key.

FIG. 5 is an enlarged cross-sectional view showing the vicinity of a caulking portion of the keyboard weight of FIG. 4.

FIG. 6 is a side view showing an example of a key unit in which the keyboard weight of FIG. 1 is fixed to a key.

FIG. 7 is a view showing an example of a key unit in which the keyboard weight of FIG. 1 is fixed to a key, in which the plurality of caulking divided portions of the caulking portion of the keyboard weight are all bite into the inner surface of the key insertion hole.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0017] Hereinbelow, one embodiment of the present invention will be described with reference to the appended drawings.

[0018] A keyboard weight 10 of the embodiment shown in FIGS. 1 and 2 includes a weight body 11 formed in a pillar-like shape (cylindrical shape in FIGS. 1 and 2). The keyboard weight 10 is formed entirely of a metal such as iron, for example. The material for forming the keyboard weight 10 is not limited to iron, and for example, copper or the like can also be employed.

[0019] As shown in FIGS. 4 to 6, the keyboard weight 10 is used by being inserted into and fixed in an insertion hole 21 formed in a key 20 of a keyboard instrument. A key unit 20A together with the key 20 are constituted by the keyboard weight 10 being fixed to the key 20.

[0020] As shown in FIGS. 1 and 2, an end face 12 (hereinafter also referred to as a weight body end face 12) perpendicular to the axial direction of the weight body 11 is formed at both axial ends of the weight body 11 in the axial direction.

[0021] A groove 13 extending along a peripheral edge of the weight body end face 12 is formed in the peripheral edge portion of the end face 12 of the weight body 11. The groove 13 is formed in an annular shape along the peripheral edge of the weight body end face 12.

[0022] Among the inner surfaces of the groove 13, an outward inner surface 13a that faces toward the inside of the weight body 11 in the radial direction slopes toward the outside of the weight body 11 in the radial direction as the outward inner surface 13a extends from the bottom portion of the groove 13 toward an opening in the axial direction of the weight body 11.

[0023] An inclination angle θ of the outward inner surface 13a of the groove 13 relative to the axial direction of the weight body 11 is 30° or greater relative to the axial direction of the weight body 11. The inclination angle θ of the outward inner surface 13a of the groove 13 is preferably 30° to 60° .

[0024] In the keyboard weight 10 shown in FIGS. 1 and 2, an inward inner surface 13b facing the outward inner surface 13a in the width direction of the groove 13 (groove width) is formed perpendicular to the radial direction of the weight body 11. The inclination angle of the inward inner surface 13b relative to the axial direction of the weight body 11 is 0° .

[0025] As shown in FIGS. 4 and 5, a portion 14 located outside the groove 13 in the radial direction of the weight body 11 of the keyboard weight 10 shown in FIGS. 1 and 2 is made to bite into an inner surface of the insertion hole 21 of the key 20 to function as a caulking portion for fixing the keyboard weight 10 to the key 20.

[0026] The portion 14 positioned on the outer side of the groove 13 in the radial direction of the weight body 11 of the keyboard weight 10 is hereinafter referred to

as the caulking portion 14.

[0027] The caulking portion 14 is annularly formed in a peripheral edge portion at end portions of the weight body 11 in the axial direction.

[0028] The caulking portion 14 is formed with a plurality of slits 14b that divide the caulking portion 14 into three or more caulking divided portions 14a. In the present embodiment, the lengths of the caulking divided portions 14a in the circumferential direction of the caulking portion 14 are equal to each other. The length of each of the caulking divided portions 14a in the circumferential direction of the caulking portion 14 may also differ from each other and for example be non-uniform.

[0029] The caulking portion 14 shown in FIG. 1 and FIG. 6 is divided into four equally divided caulking divided portions 14a in the circumferential direction by the slits 14b formed at four positions in the circumferential direction of the caulking portion 14 (circumferential direction of the weight body 11).

[0030] It is preferable that the width dimension of the slit 14b of the caulking portion 14 (the dimension in the circumferential direction of the caulking portion 14) be 1 mm or more and 3 mm or less.

[0031] As shown in FIGS. 3 and 6, an insertion hole 21 in the key 20 is formed so as to extend from a side surface of the key 20 in a lateral direction (the vertical direction in FIG. 3, the direction orthogonal to the paper surface in FIG. 6) of the key.

[0032] The insertion hole 21 should be open to at least one of the side surfaces of both sides in the left-right direction of the key 20. The insertion hole 21 of the key 20 shown in FIG. 3 is formed so as to penetrate the key 20 in the left-right direction thereof and thereby opens to the side faces on both sides of the key 20 in the left-right direction.

[0033] As shown in FIG. 3, the keyboard weight 10 that is used is one in which the outer diameter of the cylindrical weight body 11 matches the inner diameter of the insertion hole 21 of the key 20 or one in which the outer diameter of the cylindrical weight body 11 is slightly smaller than the inner diameter of the insertion hole 21.

[0034] The keyboard weight 10 is inserted into the insertion hole 21 so that the axial direction of the weight body 11 matches the depth direction of the insertion hole 21 of the key 20 (the axial direction of the insertion hole 21).

[0035] The insertion hole 21 of the key 20 shown in FIG. 6 is formed at a plurality of positions in the lengthwise direction of the key 20 (the left-right direction in FIG. 6).

[0036] The keyboard weight 10 is inserted into one of the insertion holes 21 selected from the plurality of insertion holes 21 of the key 20 and fixed to the key 20.

[0037] As shown in FIGS. 3 and 4, the keyboard weight 10 inserted into the insertion hole 21 of the key 20 is fixed to the key 20 by using a caulking tool 30 to bend the caulking divided portions 14a of the caulking portion 14 on both sides of the weight body 11 in the axial direction to the outer side in the radial direction of the weight body

11 so as to bite into the inner surface of the insertion hole 21 of the key 20.

[0038] The caulking tool 30 is constituted with a caulking projection 32 projecting out at a distal outer periphery of a rod-like tool body 31. The caulking projection 32 is for bending the caulking divided portions 14a of the keyboard weight 10 toward the outer side in the radial direction of the weight body 11.

[0039] By pushing the caulking projection 32 of the caulking tool 30 into the groove 13 of the keyboard weight 10 along the outward inner surface 13a of the caulking divided portion 14a, the caulking divided portion 14a pressed by the caulking projection 32 is bent to the outer side of the weight body 11 in the radial direction.

[0040] The key unit 20A can be manufactured by the following method for manufacturing a key unit using the caulking tool 30 mentioned above.

[0041] When manufacturing the key unit 20A, firstly, as shown in FIG. 3, the keyboard weight 10 is inserted into the insertion hole 21 of the key 20. Next, as shown in FIGS. 4 and 5, the caulking projections 32 of the caulking tool 30 are pushed into the groove 13 of the keyboard weight 10, and the caulking portions 14 on both sides in the axial direction of the weight body 11 of the keyboard weight 10 (specifically the caulking divided portions 14a) are bent outward in the radial direction of the weight body 11 to bite into the inner surface of the insertion hole 21 of the key 20, thereby fixing the keyboard weight 10 to the key 20. Thereby, the key unit 20A can be manufactured.

[0042] The bending of the caulking divided portions 14a to the outer side in the radial direction of the weight body 11 by the caulking projections 32 of the caulking tool 30 is not necessarily uniform over the of the caulking divided portions 14a in the circumferential direction of the caulking portion 14, with the existence of variations being possible. The deformation of the caulking divided portions 14a when bending the caulking divided portions 14a outward in the radial direction of the weight body 11 by the caulking tool 30 does not necessarily proceed uniformly and simultaneously over the entirety of the caulking divided portions 14a in the circumferential direction of the caulking portion 14.

[0043] If the width dimension of the slit 14b in the caulking portion 14 is 1 mm or more, when using the caulking tool 30 to bend the caulking division portion 14a outward in the radial direction of the weight body 11, it is possible to reliably avoid abutting of caulking divided portions 14a that are adjacent via the slit 14b and thereby bending of caulking divided portions 14a not to be bent (co-bending).

[0044] In addition, the width dimension of the slit 14b of the caulking portion 14 is preferably 3 mm or less from the viewpoint of minimizing the amount of processing by machining and ease of formation.

[0045] In the keyboard weight 10 of the key unit 20A shown in FIG. 6, only the caulking divided portions 14a formed in a region within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20 are made to bite into the inner

surface of the insertion hole 21 of the key 20 to be fixed to the key 20. The caulking divided portions 14a that bite into the inner surface of the insertion hole 21 of the key 20 are those positioned in regions in which the entirety in the circumferential direction of the caulking portions 14 is within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20.

[0046] The caulking divided portion 14a in which the entirety in the circumferential direction of the caulking portion 14 is positioned in a region within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20 is herein-after also referred to as a key lengthwise direction caulking divided portion.

[0047] In the keyboard weight 10, the key lengthwise direction caulking divided portion is positioned on both sides via the center axis of the weight body 11.

[0048] In the keyboard weight 10 of the key unit 20A shown in FIG. 6, of the four caulking divided portions 14a, specifically only the two positioned on both sides via the center axis of the weight body 11 are arranged in regions within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20, with the other two being arranged outside regions within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20. In the keyboard weight 10 of the key unit 20A shown in FIG. 6, only the two caulking divided portions 14a (key lengthwise direction caulking divided portions) arranged in regions within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20 are made to bite into the inner surface of the insertion hole 21 of the key 20 to be fixed to the key 20.

[0049] As shown in FIG. 6, a constitution in which only two caulking divided portions 14a arranged in regions within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20 are made to bite into the inner surface of the insertion hole 21 of the key 20 to fix (caulking-fix) the keyboard weight 10 to the key 20 is advantageous in that it prevents minute deformation of the key 20 due to caulking-fixing from affecting the upper surface 22 of the key 20 (hereinafter also referred to as the key upper surface 22).

[0050] In order to avoid a minute deformation of the key due to caulking-fixing of the keyboard weight having an effect on the key upper surface, it was conventionally common to use a keyboard weight whose diameter is less than 60% of the thickness of the key.

[0051] On the other hand, in the configuration in which only the key lengthwise direction caulking divided portions on both sides via the center axis of the weight body 11 are made to bite into the inner surface of the insertion hole 21 of the key 20 to fix the keyboard weight 10 to the key 20, even if the keyboard weight 10 is used having a weight body with a larger diameter than a conventional configuration, it is possible to avoid the caulking-fixing of the keyboard weight 10 having an effect on the key upper surface 22.

[0052] Therefore, in the key unit 20A in which only the key lengthwise direction caulking divided portions on both sides via the center axis of the weight body 11 are

made to bite into the inner surface of the insertion hole 21 of the key 20 to fix the keyboard weight 10 to the key 20 as shown in FIG. 6, it is possible to use the keyboard weight 10 in which the diameter D of the weight body 11 (weight body outer diameter) is equal to or greater than 60% of the thickness of the key 20 (vertical dimension in FIG. 6).

[0053] As described above, according to the keyboard weight 10 of the present embodiment, the outward inner surface 13a of the groove 13 formed in the peripheral edge portion of the end face 12 of the weight body 11 slopes to the outside of the weight body 11 in the radial direction heading from the bottom portion of the groove 13 toward an opening in the axial direction of the weight body 11, the inclination angle of the outward inner surface 13a being 30° or greater relative to the axial direction of the weight body 11. For this reason, simply by applying a pressing force in the axial direction of the weight body 11 to the outward inner surface 13a causes the portion (caulking portion 14) positioned outside the groove 13 of the weight body 11 to bend outward in the radial direction of the weight body 11 to bite into the inner surface of the insertion hole 21 of the key 20, and thereby it is possible to fix (caulking-fix) the keyboard weight 10 to the key 20.

[0054] Moreover, the keyboard weight 10 of the present embodiment is one that enables a reduction in the cutting amount when for example being formed from a metal member by machining compared with the keyboard weight of FIGS. 1 (a) and 1 (b) of Patent Document 1. For this reason, in the keyboard weight 10 of the present embodiment, it is possible to reduce the amount of material discarded when forming by machining, and to shorten the forming time.

[0055] Further, according to the key unit 20A of the present embodiment, in the caulking portion 14 of the keyboard weight 10, only the portions formed in a region within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20 are made to bite into the inner surface of the insertion hole 21 of the key 20. For this reason, it is possible to easily avoid the caulking-fixing having an effect on the key upper surface 22.

[0056] According to the key unit 20A of the present embodiment, in the caulking portion 14 of the keyboard weight 10, only the portions formed in a region within $\pm 45^\circ$ with respect to the lengthwise direction of the key 20 are made to bite into the inner surface of the insertion hole 21 of the key 20, and the keyboard weight 10 is adopted in which the diameter of the weight body 11 is equal to or greater than 60% of the thickness of the key 20. For this reason, it is possible to expand the adjustment range of key touch weight adjustment with the keyboard weight 10.

[0057] According to the keyboard weight 10 of the present embodiment, the plurality of slits 14b that divide the caulking portion 14 into three or more caulking divided portions 14a are formed in the annular caulking portion 14 at end portions of the weight body 11 in the axial direction, with the length of each of the caulking divided

portions 14a in the circumferential direction of the caulking portion 14 being equal to one another among the plurality of caulking divided portions 14a. For this reason, compared to an annular caulking portion that does not have slits and is not divided, the force for bending the caulking portion outward in the radial direction of the weight body 11 to bite into the inner surface of the insertion hole 21 of the key 20 is smaller, and so the work of bending the caulking portion outward in the radial direction of the weight body 11 to caulk-fix the weight body 11 to the key 20 can be performed easily.

[0058] According to the keyboard weight 10 of the present embodiment, the width dimension of the slit 14b in the circumferential direction of the annular caulking portion 14 is 1 mm or more and 3 mm or less. Thereby, when bending the caulking divided portion 14a outward in the radial direction of the weight body 11, bending (co-bending) of the caulking divided portions 14a not to be bent can be reliably avoided. Moreover, this keyboard weight 10 enables the machining for forming the slit 14b to be minimized to a small amount.

[0059] According to the method for manufacturing the key unit of the present embodiment, just by inserting the keyboard weight 10 into the insertion hole 21 of the key 20 and pushing the caulking projection 32 of the caulking tool 30 into the groove 13 of the weight body 11, the caulking portion 14 of the weight body 11 of the keyboard weight 10 can be bent outward in the radial direction of the weight body 11 to be made to bite into the inner surface of the insertion hole 21 of the key 20. Therefore, the fixing of the keyboard weight 10 to the key 20 can be performed easily and efficiently.

[0060] Although this invention was demonstrated in detail in the foregoing, this invention is not limited to the above embodiment, and it is possible to make various changes in the range that does not depart from the gist of this invention.

[0061] For example, as shown in FIG. 7, in the keyboard weight 10 that is inserted into the insertion hole 21 of the key 20, all of the plurality of caulking divided portions 14a of each caulking portion 14 at both end portions of the weight body 11 in the axial direction may be bent outward in the radial direction of the weight body 11 to bite into the inner surface of the insertion hole 21 of the key 20 and thereby be fixed to the key 20.

[0062] In FIG. 7, the reference numeral of the key unit is 20B.

[0063] In the keyboard weight and the key unit according to the present invention, the groove may not be formed, and the caulking portion may be formed to project from the end faces of the weight body.

[0064] In the keyboard weight and the key unit according to the present invention, the caulking divided portion (caulking portion) is not limited to an arc when viewed from the axial direction, and may be formed into any shape such as a circle, a triangle, or a fan shape.

Reference Symbols

[0065]

5	10:	Keyboard weight
	11:	Weight body
	12:	End face
	13:	Groove
	13a:	Outward inner surface
10	14:	Caulking portion
	14a:	Caulking divided portion
	14b:	Slit
	20A, 20B:	Key unit
	20:	Key
15	21:	Insertion hole
	22:	Key upper surface

Claims

1. A keyboard weight comprising:

a weight body formed in a cylindrical shape, wherein a groove is formed in a peripheral edge portion of an end face of the weight body, the groove extending along a peripheral edge of the end face, the end face being perpendicular to an axial direction of the weight body, and an outward inner surface of the groove among inner surfaces of the groove slopes toward outside of the weight body from a bottom portion of the groove toward an opening in the axial direction, the outward inner surface facing toward inside of the weight body in the radial direction, and an inclination angle of the outward inner surface is 30° or greater relative to the axial direction.

2. A key unit comprising:

a key comprising an insertion hole that opens to a side surface; and
a keyboard weight that is inserted in the insertion hole and is caulked-fixed to the key, wherein the keyboard weight comprises a cylindrical weight body that is inserted in the insertion hole, and the weight body comprises a caulking portion that is formed on a peripheral edge portion of an end portion in an axial direction and that bites into an inner surface of the insertion hole of the key, and
the caulking portion is formed in a region within $\pm 45^\circ$ with respect to a lengthwise direction of the key.

3. A key unit comprising:

a key comprising an insertion hole that opens to

- a side surface; and
 a cylindrical keyboard weight that is inserted in the insertion hole and is caulked-fixed to the key, wherein the keyboard weight comprises a cylindrical weight body that is inserted in the insertion hole, and the weight body comprises a caulking portion that is formed on a peripheral edge portion of an end portion in an axial direction and that bites into an inner surface of the insertion hole of the key,
 the caulking portion is formed in a region within $\pm 45^\circ$ with respect to a lengthwise direction of the key, and
 a diameter D of the weight body is equal to or greater than 60% of a thickness of the key.
4. A keyboard weight, wherein
 an annular caulking portion is formed on a peripheral edge portion of an end portion of a weight body in an axial direction of the weight body, the weight body being formed in a cylindrical shape,
 a plurality of slits are formed in the caulking portion, the plurality of slits dividing the caulking portion into three or more caulking divided portions, and
 lengths of the caulking divided portions in a circumferential direction of the caulking portion are equal to each other.
5. A keyboard weight, wherein
 an annular caulking portion is formed on an end portion of a weight body in an axial direction of the weight body, the weight body being formed in a cylindrical shape,
 a plurality of slits are formed in the caulking portion, the plurality of slits dividing the caulking portion into a plurality of caulking divided portions, and
 a width dimension of the slits in a circumferential direction of the caulking portion is 1 mm or more and 3 mm or less.
6. A method for manufacturing a key unit, comprising,
 by inserting a keyboard weight into an insertion hole of a key and inserting a caulking projection of a caulking tool into a groove of a weight body, bending the caulking portion to an outer side in a radial direction of the keyboard weight and causing the caulking portion to bite into an inner surface of the insertion hole of the key, to thereby fixing the keyboard weight to the key, the keyboard weight having a groove that is formed in a peripheral edge portion of an end face of the weight body, the groove extending along a peripheral edge of the end face, the end face being perpendicular to an axial direction of the weight body, the weight body being formed in a cylindrical shape, the insertion hole opening to a side surface of the key, the caulking portion being positioned on an outer side of the groove in the radial direction of the keyboard weight.

FIG. 1

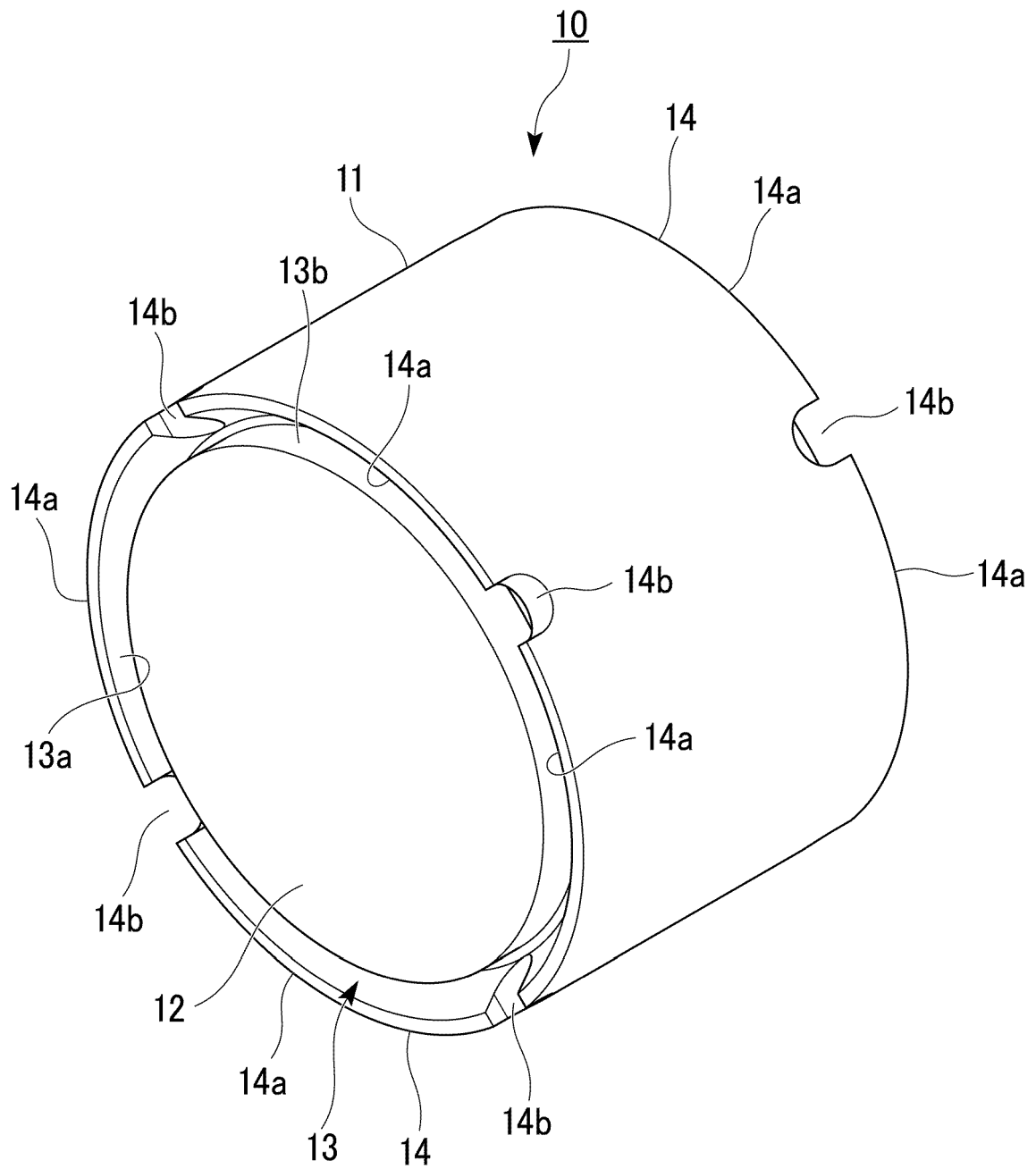


FIG. 2

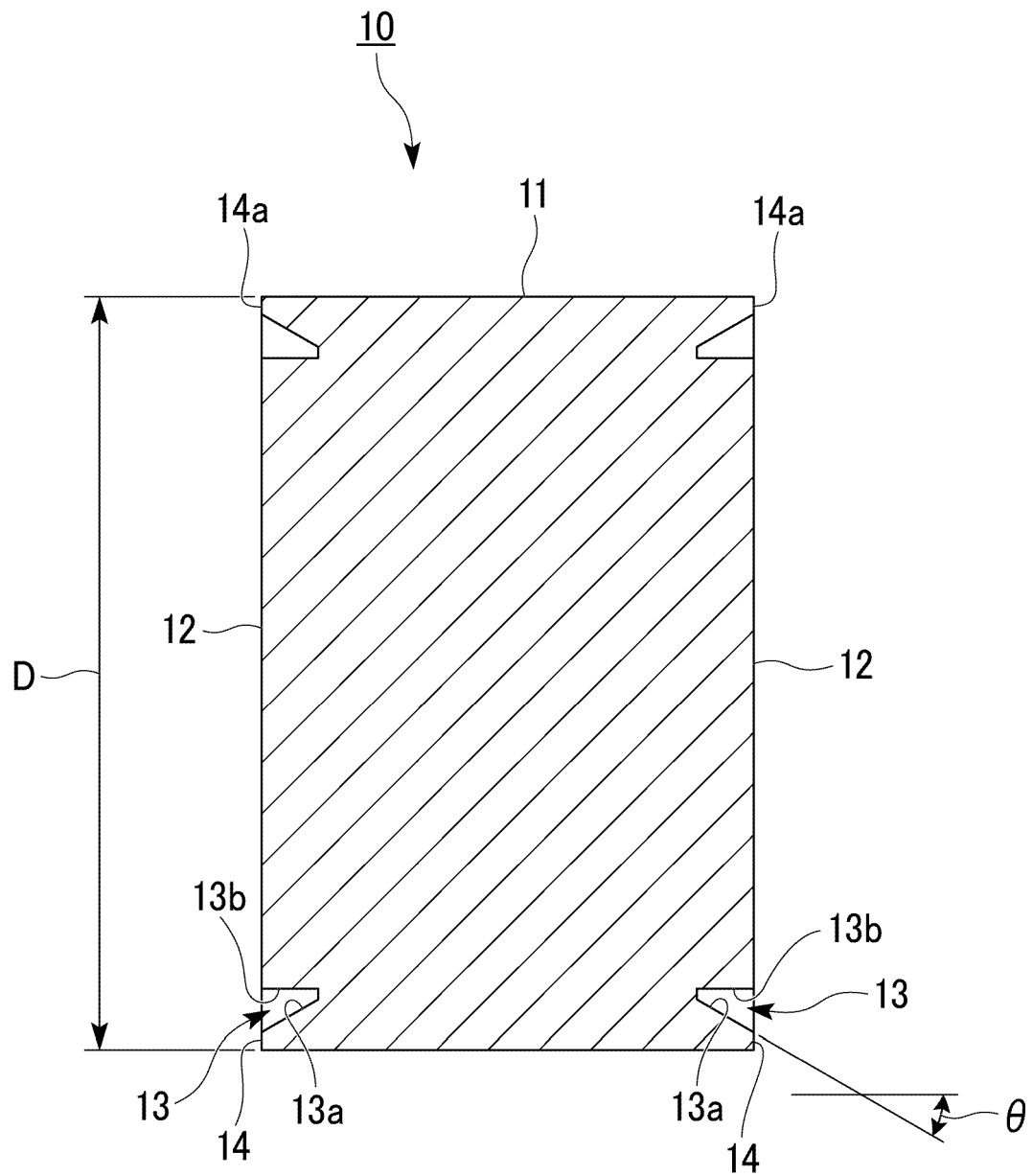


FIG. 3

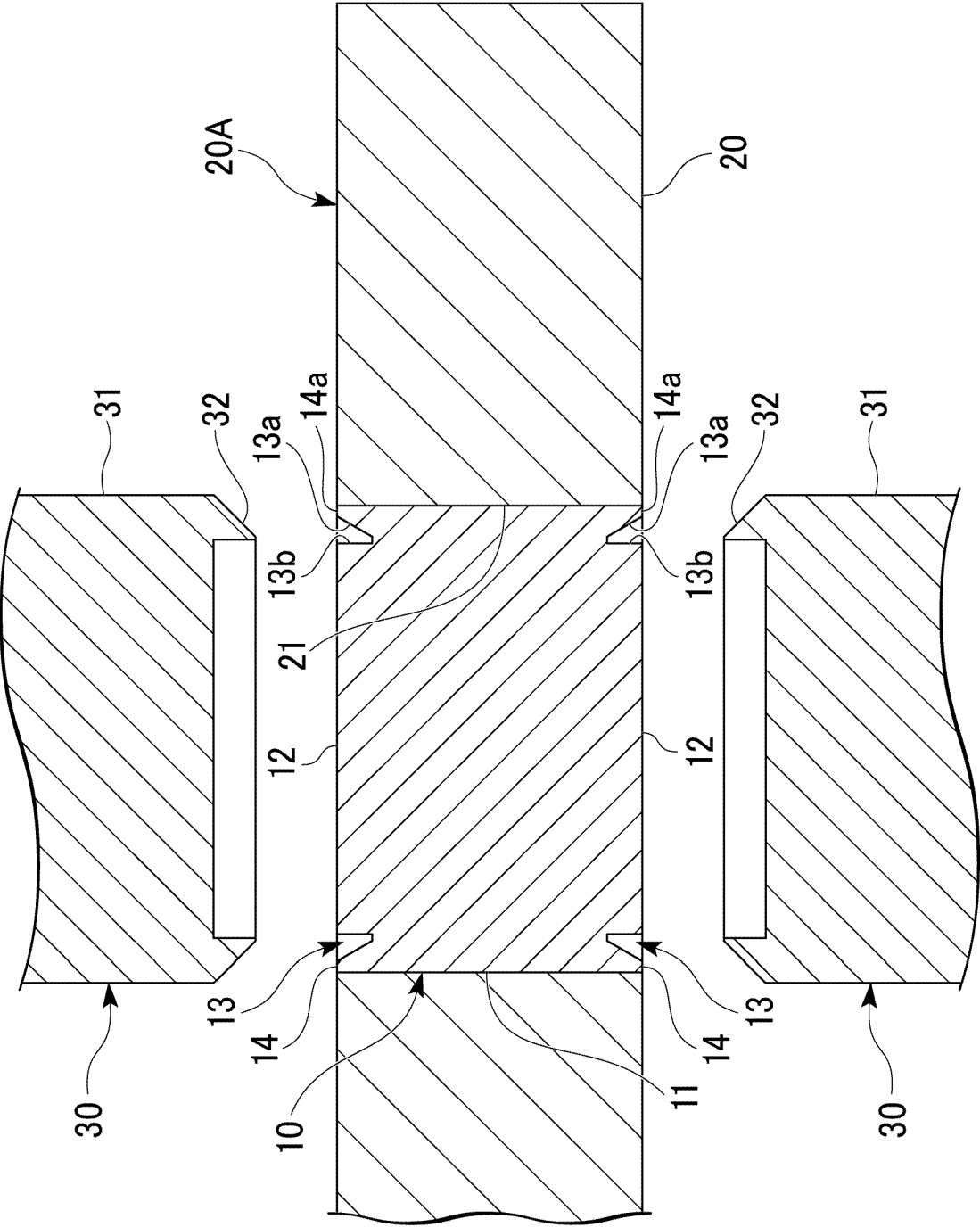


FIG. 4

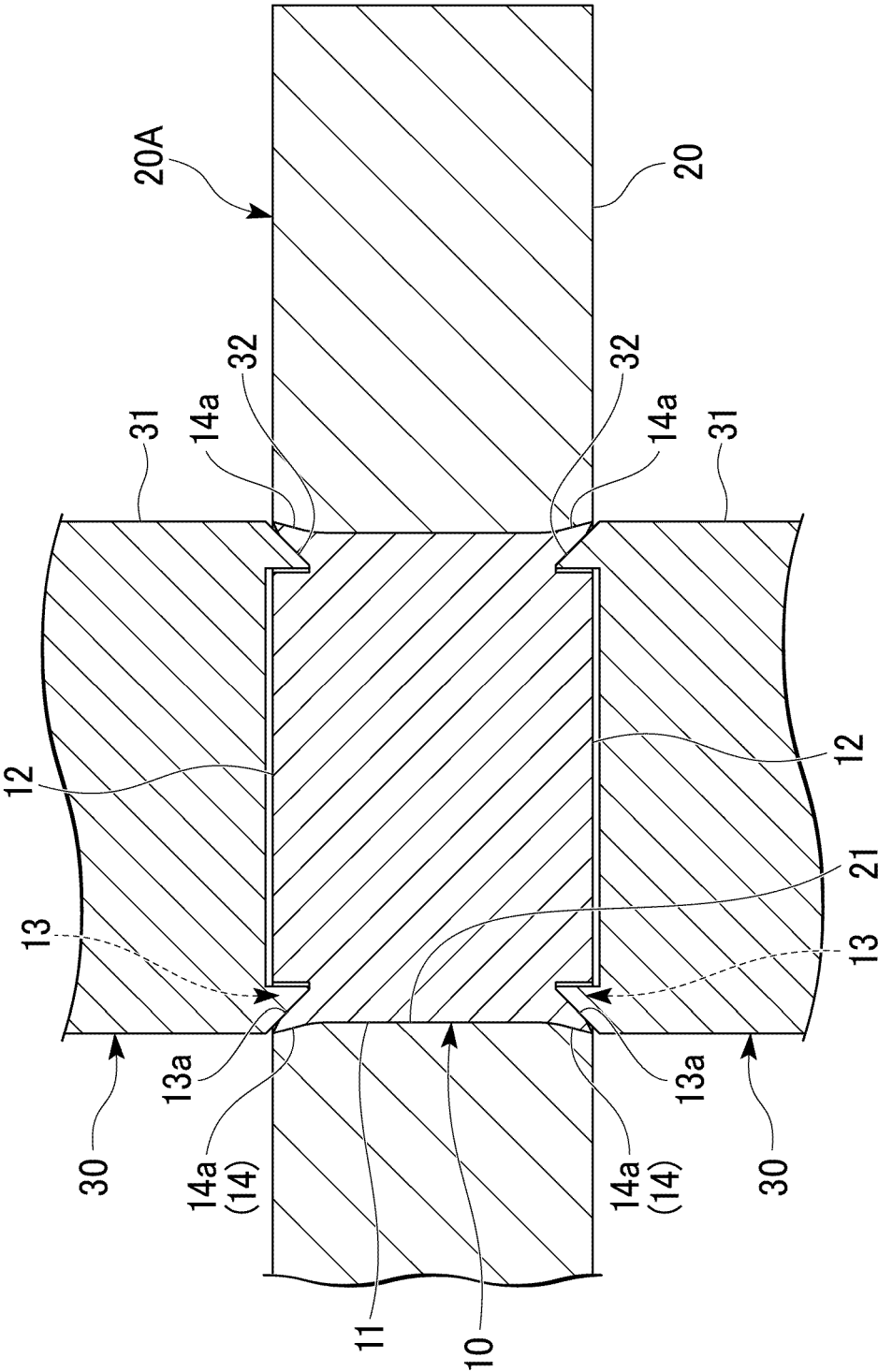


FIG. 5

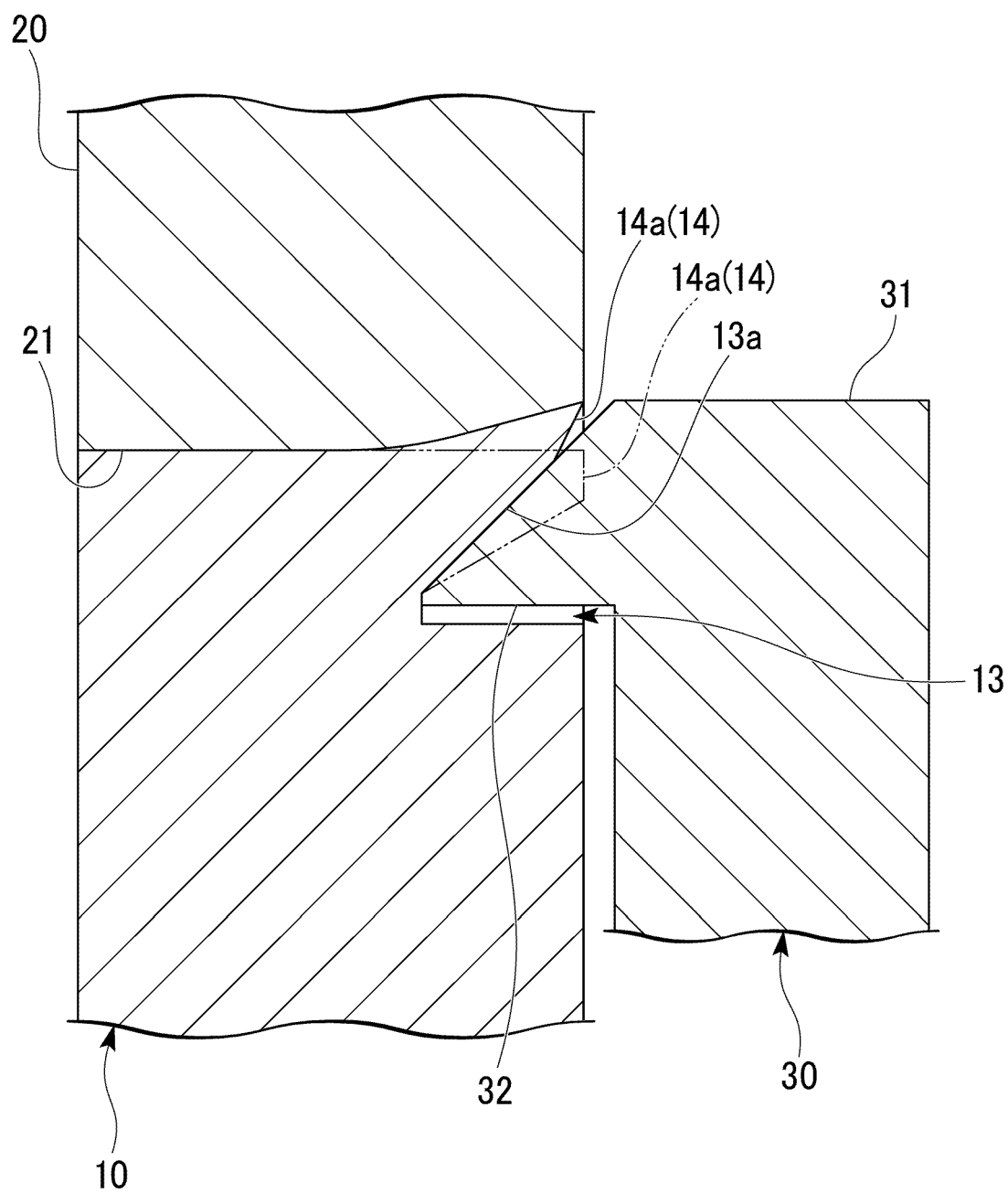


FIG. 6

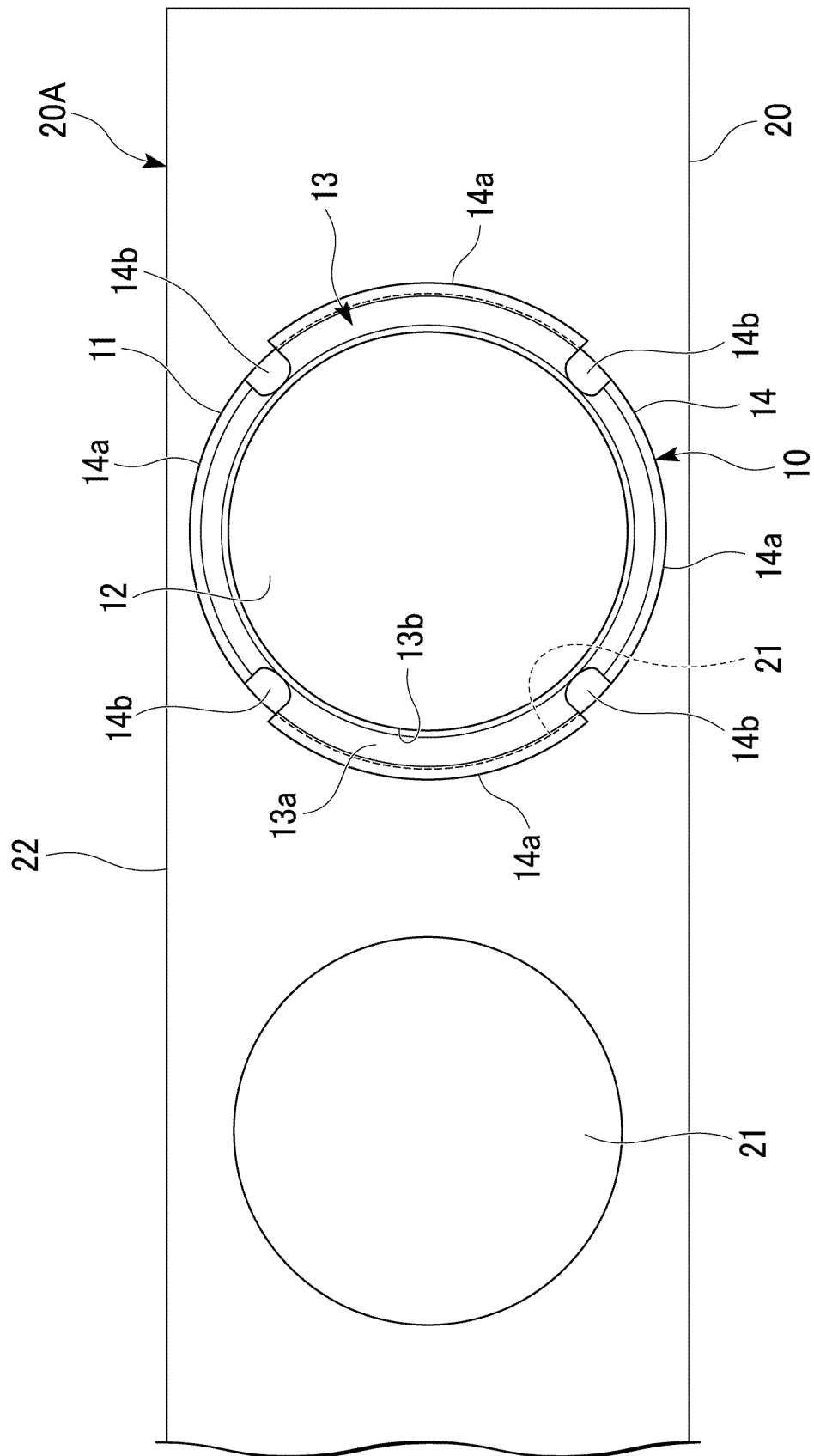
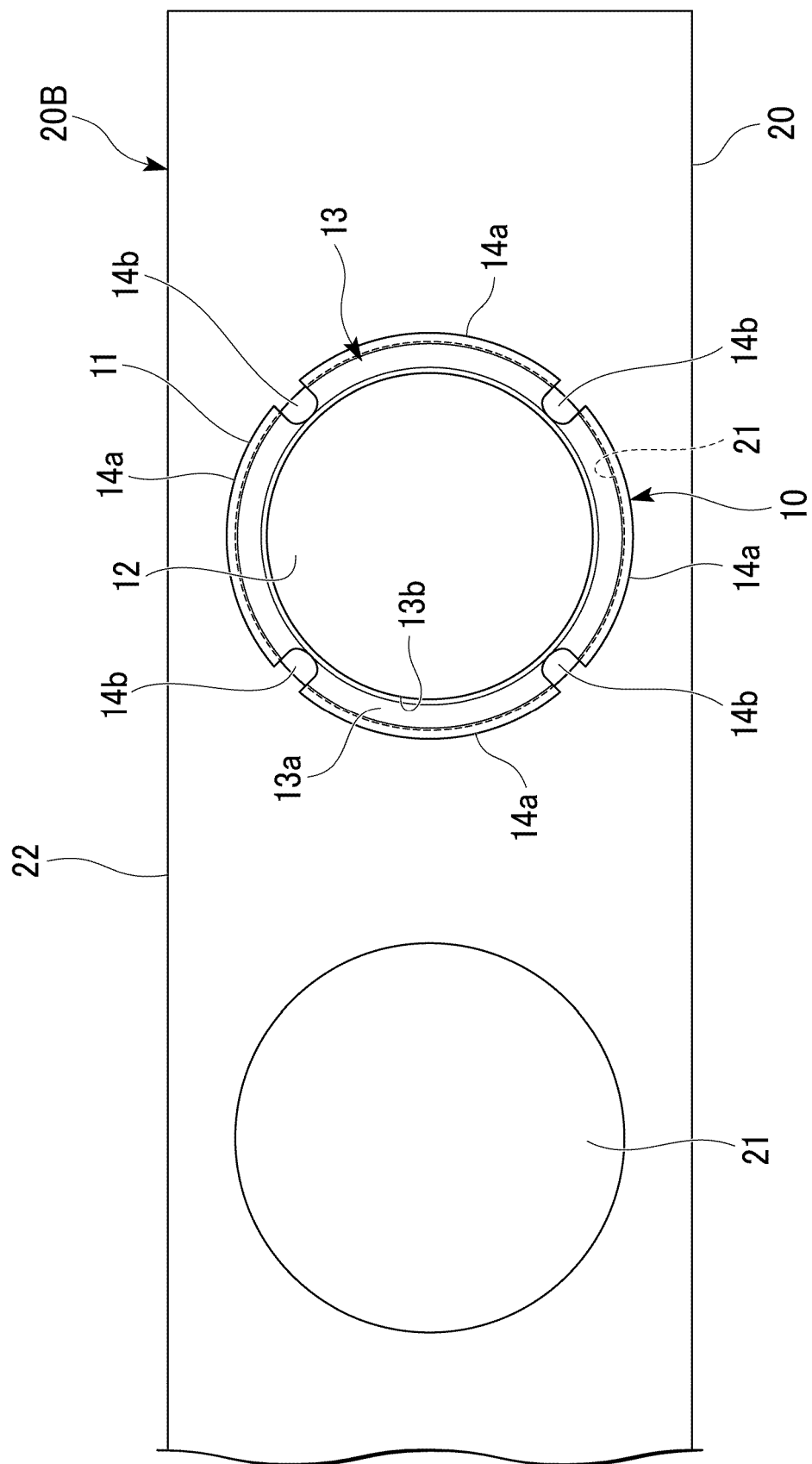


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/011841

A. CLASSIFICATION OF SUBJECT MATTER

G10C3/12(2006.01)i, G10B3/12(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)

G10C3/12, G10B3/12

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	1996-2017
Kokai Jitsuyo Shinan Koho	1971-2017	Toroku Jitsuyo Shinan Koho	1994-2017

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.
X A	JP 2006-106368 A (Yamaha Corp.), 20 April 2006 (20.04.2006), paragraphs [0035] to [0037]; fig. 11 (Family: none)	4, 5 1-3, 6
A	JP 2003-177740 A (Kawai Musical Instruments Mfg. Co., Ltd.), 27 June 2003 (27.06.2003), entire text; all drawings (Family: none)	1-6
A	JP 2006-79075 A (Daisei Industry Co., Ltd.), 23 March 2006 (23.03.2006), entire text; all drawings (Family: none)	1-6

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
01 June 2017 (01.06.17)Date of mailing of the international search report
13 June 2017 (13.06.17)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/011841

5	C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
10	A	JP 2006-47909 A (Kabushiki Kaisha Sangyo Kankyo Sogo Kenkyusho), 16 February 2006 (16.02.2006), entire text; all drawings (Family: none)	1-6
15			
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003177740 A [0006]