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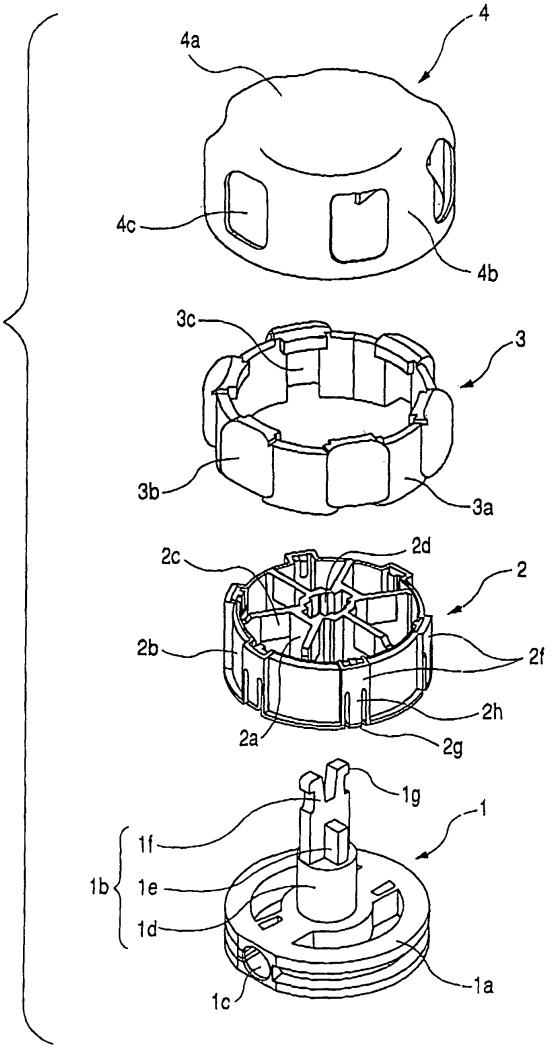
(54) **Rotation driving device**

(57) Provided is a rotation driving device for preventing surely a slide-preventing soft member from being separated. A rotation driving device includes a rotating member 2 driven to rotate; a cover member 4 having an outer peripheral surface of a circle shape attached to the outer periphery of the rotating member 2; and a slide-preventing soft member 3 attached to the cover member 4, in which the cover member 4 is provided with a plurality of opening portions 4c disposed in a peripheral wall portion 4b surrounding the outer periphery of the rotating member 2, the soft member 3 is provided with a plurality of protruding portions 3b protruding outwardly, and the soft member 3 is interposed between the rotating member 2 and the cover member 4 in a state where the protruding portions 3b are exposed from the opening portion 4c of the peripheral wall portion 4b of the cover member 4.

FIG. 2



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a rotational driving device which manipulates a rotational drive type electrical part such as a rotary switch and a rotary volume, more particularly, to a slide-preventing structure of a cover member.

2. Description of the Related Art

[0002] A conventional structure rotation driving device for manipulating electrical parts of a rotation type is that a knob for an external driving is attached to a rotating member manipulating such as a rotary switch or a rotary volume, the knob is held by hands of humans so as to perform the rotation driving, the rotator rotes. Accordingly, a point of contact of the rotary switch or a resistance value of the rotary volume is changed, thereby outputting a desirable signal.

[0003] At this time, since it is possible to easily slide by the hand of the human at the time of driving the knob, in order to enhance operation, a structure in which to a rib (unevenness portion) is provided so as to prevent from sliding to an outer periphery of the knob is widely known (e.g., refer to Patent JP-A-2002-324457).

[0004] However, a hard resin which applies coating used for widely known knob (resin plating such as metals) is easily slide itself.

[0005] Accordingly, in order to prevent from being slide, a structure in which a cover member formed of a thermoplastic elastomer resin is attached to an external side of the knob which is held by hands of the human and is rotated, and prevents the material from being slide is known (e.g., refer to Patent JP-A-2003-97101).

[0006] However, in the known rotation driving device, the knob and the cover member are formed of different type members. Accordingly, when high force is applied during manipulating the rotation, the cover member from the knob comes off. In this case, the cover member formed of a slide-preventing soft member is bonded by an adhesive. However, a bonding strength may be weak by a slightly variation or high temperature circumstance. For example, it is not possible to use for mounting an automobile.

SUMMARY OF THE INVENTION

[0007] Accordingly, the invention solves the above-described problem. It is an object of the present invention to provide a rotation driving device which prevents surely a soft member from being separated.

[0008] In addition, according to a first aspect of the invention, there is provided a rotation driving device including a rotating member driven to rotate, a cover member having an outer peripheral surface of a circle shape attached to the outer periphery of the rotating member, and a slide-preventing soft member attached to the cover member, in which the cover member is provided with a plurality of opening portions disposed in a peripheral wall portion surrounding the outer periphery of the rotating member, the soft member is provided with a plurality of protruding portions protruding outwardly, and the soft member is interposed between the rotating member and the cover member in a state where the protruding portions are exposed from the opening portion of the peripheral wall portion of the cover member.

[0009] In addition, according to a second aspect of the invention, the protruding portions of the soft member are inserted into the opening portion of the cover member and the protruding portions are strongly fitted into the opening portion by means of elasticity of the soft member.

[0010] In addition, according to a third aspect of the invention, a plurality of concave portions are provided on the opposite side of the protruding portions in the soft member, a plurality of convex portions are formed in the periphery of the rotating member so as to be opposite to the concave portions, and the soft member is interposed between the rotating member and the cover member in a state where the convex portions are allowed to engage with the concave portions.

[0011] In addition, according to a fourth aspect of the invention, the soft member is formed of a band-shaped member having both end portions, is disposed in an annular shape in which both end portions are opposed to each other, and is interposed between the rotating member and the cover member.

[0012] In addition, according to a fifth aspect of the invention, the entire periphery of the opening portion of the cover member is surrounded by the peripheral wall portion.

[0013] As mentioned above, the rotation driving device includes a rotation driving device including a rotating member driven to rotate, a cover member having an outer peripheral surface of a circle shape attached to the outer periphery of the rotating member, and a slide-preventing soft member attached to the cover member, in which the cover member is provided with a plurality of opening portions disposed in a peripheral wall portion surrounding the outer periphery of the rotating member, the soft member is provided with a plurality of protruding portions protruding outwardly, and the soft member is interposed between the rotating member and the cover member in a state where the protruding portions are exposed from the opening portion of the peripheral wall portion of the cover member. Since the soft member is inserted between the cover member and the rotating member so that a part of the soft member comes out from the opening portion of the cover member, the sliding is prevented by the soft member protruding from the opening portion. Accordingly, it is prevented surely from separating the soft member.

[0014] In addition, the protruding portions of the soft member are inserted into the opening portion of the cover

member and the protruding portions are strongly fitted into the opening portion by means of elasticity of the soft member. Accordingly, it is possible to prevent a position deviance of the cover member and the soft member.

[0015] In addition, a plurality of concave portions are provided on the opposite side of the protruding portions in the soft member, a plurality of convex portions are formed in the periphery of the rotating member so as to be opposite to the concave portions, and the soft member is interposed between the rotating member and the cover member in a state where the convex portions are allowed to engage with the concave portions. Accordingly, the convex portion disposed to the outer periphery is allowed to engage to the concave portion provided in the inner periphery of the soft member so as to prevent the rotating member and the soft member from deviating the rotation.

[0016] In addition, the soft member is formed of a band-shaped member having both end portions, is disposed in an annular shape in which both end portions are opposed to each other, and is interposed between the rotating member and the cover member.

Accordingly, a molding structure may be simple. Since it is only necessary that the band-shaped member is changed into a circular shape so as to allow to engage the band-shaped member to the rotating member and the cover member. Accordingly, it is easy to assemble the device.

[0017] In addition, the protruding portions of the soft member are inserted into the opening portion of the cover member and the protruding portions are strongly fitted into the opening portion by means of elasticity of the soft member. Accordingly, even when the opening portion is provided to the periphery wall portion, the periphery of the opening portion is surrounded with a portion of the peripheral wall portion. Accordingly, the peripheral wall portion may be strongly formed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a perspective view illustrating a rotation driving device of the invention.

Fig. 2 is an exploded perspective view illustrating the rotation driving device of the invention.

Fig. 3 is a sectional view illustrating the rotation driving device of the invention.

Fig. 4 is a perspective view illustrating a state where a cover member, a soft member, and a rotating member are allowed to engage.

Fig. 5 is a perspective view illustrating the soft member.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] Hereinafter, an embodiment of the invention will be described in Figs. 1 and 5. Fig. 1 is a perspective view illustrating a rotation driving device of the invention. Fig. 2 is an exploded perspective view illustrating the rotation driving device of the invention. Fig. 3 is a sectional view illustrating the rotation driving device of the invention. Fig. 4 is a perspective view illustrating a state where a cover member, a soft member, and a rotating member are allowed to engage. Fig. 5 is a perspective view illustrating the soft member.

[0020] In the figs. 1 to 5, a rotator 1 is formed of an insulating material such as a synthetic resin and includes a flange portion 1a having a disk shape and an axis portion 1b protruding from the center of the flange portion 1a to a upside. In addition, a coil spring generating a cam portion of a housing and a click taken by sliding and a receiving hole are provided in an opposed position of an outer peripheral surface of the flange portion 1a. In addition, the axis portion 1b includes a base portion 1d having a cylinder shape, a first fitting portion 1e protruding to an upside of the base portion 1d having a cross shape, and a second fitting portion 1f disposed to a line end from the first fitting portion divided by two parts. In addition, a pair of hook portions 1g, 1g are provided in an outer periphery of the second fitting portion 1f.

[0021] The rotating member 2 is formed of an insulating material such as a synthetic resin and includes a bearing portions 2a having a rectangular form disposed to the center, a tubular portion 2b having a ring shape between a plurality of cross-linking portions to a periphery of the bearing portion 2a. In addition, an engaging hole 2d having a cross shape is provided in the bearing portion 2a through an upper and lower direction and a pair of protrusion 2e, 2e are provided in the upper portion of the inner side of the engaging hole 2d. A first engaging portion 1e of the axis portion 1b of the rotator 1 having a cross shape is inserted to the engaging hole 2d, the rotating member 2 is inserted in a state where a movement is regulated in a rotation direction, a plurality of protrusions 2e, 2e are allowed to engage to a plurality of hook portions 1g, 1g of the second fitting portion 1f in a state where a movement is regulated in an upper and lower direction.

[0022] In addition, a plurality of convex portions 2f protruding outwardly in a position of a predetermined interval along the upper and lower direction of the outer periphery in the tubular portion 2b of the rotating member 2. In addition, an elastic piece 2h having a hook portion 2g in a lower side of the convex portion 2f, the hook portion 2g of the elastic piece 2h is allowed to engage to a protrusion 4d provided in a lower inner peripheral surface of a peripheral wall portion 4b of a following cover member 4. Accordingly, the cover member 4 and the rotating member 2 are allowed to engage integrally.

[0023] A slide-preventing soft member 3 is formed of a soft type material such as a rubber material or an elastomer resin and formed of a band-shaped member as shown in Fig. 5. A plurality of protruding portions 3b are provided in one surface side of the soft member 3 from a board portion 3a in a predetermined interval, which protrudes in a same direction and has a rectangular

shape. In addition, a concave portion 3c which is smaller than a width of the plurality of protruding portion 3b in an opposite other side of the protruding portion 3b opposite to the protruding portion 3b.

[0024] The soft member 3 is curved to a ring shape in a state where both end portions of the board portion 3a having a band-shape are opposed to each other, so that the plurality of protruding portions 3b faces an outer direction, and is interposed between the rotating member 2 and a following cover member 4. At this time, a plurality of concave portions 3c provided in a soft member of opposite (inner side in this case) to a plurality of concave portions 3c and a plurality of convex portions 2f provided in an outer periphery of the tubular portion 2b of the rotating member 2 are allowed to engage with each other. Accordingly, the soft member 3 may be attached to an outer periphery of the tubular portion 2b of the rotating member 2.

[0025] Accordingly, since the soft member 3 is formed of a band-shape member having both end portions, is disposed to a ring-shape in a state where the both end portions is opposed to each other in case of mounting the soft member 3 to the rotating member 2 so as to be attached to an outer periphery of the tubular portion 2b of the rotation 2, a molding structure forming the soft member 3 may be simple. Accordingly, since it is only necessary that the ring-shape member is changed into a circular shape so as to allow to engage the band-shaped member to the rotating member 2 and the cover member 4. Accordingly, it is easy to assemble the device.

[0026] The cover member 4 is similarly formed of an insulating material such as a synthetic resin and includes a peripheral wall portion 4b having an outer peripheral surface of a ceiling portion 4a and a circular shape. In addition, a plurality of opening portions 4c formed of a rectangular shape at a predetermined interval in the peripheral wall portion 4b is provided and an entire periphery of the opening portion 4c is surrounded with the peripheral wall portion 4b. In addition, a protrusion 4d protruding inwardly is provided in an inner periphery of the peripheral wall portion 4b in a lower side provided in the opening portion 4c. The cover member 4 is used for a knob which manipulates an inside of the rotation driving device. For example, resin plating such as metals is formed in the surface of the ceiling portion 4a of the cover member 4 and the outer peripheral surface of the peripheral wall portion 4b.

[0027] The cover member 4 may be attached to the outer peripheral side of the tubular portion 2b, the soft member 3 curved to a ring shape in the tubular portion 2b of the rotating member 2. The soft member 3 is interposed between the rotating member 2 and the cover member 4 in a state where the plurality of protruding portions 3b of the soft member 3 is exposed from the plurality of opening portions 4c of the peripheral wall portion 4b of the cover member 4 to an outside. In addition, at this time, because of an elasticity of the soft member 3, the outer peripheral portion of the protruding portions 3b is strongly allowed to engage to the opening portion 4c of the cover member 4.

[0028] Accordingly, the protruding portions 3b of the soft member 3 are inserted into the opening portion of the cover member 4 and the protruding portions 3b are strongly fitted into the opening portion 4c by means of elasticity of the soft member 3. Accordingly, it is possible to prevent a position deviance of the cover member 4 and the soft member 3.

[0029] In this case, the opening portion 4c of the cover member 4 is formed so that an entire periphery is surrounded by the peripheral wall portion 4b of the cover member 4. Accordingly, when the plurality of opening portions 4c are provided to the peripheral wall portion 4b of the cover member 4, a periphery of the each opening portion 4c is surrounded with a part of the peripheral wall portion 4b. Accordingly, the peripheral wall portion forming the outer peripheral portion of the cover member 4 may be strongly formed.

[0030] In addition, an elastic piece 2h having the hook portion 2g is provided in a lower side of the convex portion 2f of the tubular portion 2b of the rotating member 2 and the hook portion 2g of the elastic piece 2h is allowed to engage to the protrusion 4d provided in the inner periphery of the lower side of the peripheral wall portion 4b of the cover member 4. The cover member 4 and the rotating member 2 are allowed to engage integrally.

[0031] In addition, in the soft member 3, the plurality of protruding portion 3b is inserted into the opening portion 4c of the cover member 4, the plurality of protruding portions 3b are exposed from the opening portion c of the peripheral wall portion 4b of the cover member 4 outwardly, the concave portion 3c is opposite to the outer periphery of the rotating member 2 to the concave portion 3c provided in an opposite side of the protruding portion 3b of the soft member 3. Accordingly, the soft member 3 is interposed between the rotating member 2 and the cover member 4 in a state where the plurality of convex portions 2f are allowed to engage.

[0032] Accordingly, the plurality of concave portions 3c are provided to the side of the soft member 3 opposite to the protruding portion 3b, the plurality of the convex portion 2f are provided in the outer periphery of the rotating member 2 opposite to the concave portion, and the soft member 3 is interposed between the rotating member 2 and the cover member 4. Accordingly, the concave portion 3c provided in the inner peripheral side of the soft member 3 is allowed to engage to the convex portion 2f provided to the outer periphery of the rotating member 2 so as to prevent the rotating member 2 and the soft member 3 from deviating the rotation.

[0033] According to the embodiment of the invention, the cover member 4 includes a plurality of opening portions 4c provided in the peripheral wall portion 4b which surrounds the outer periphery of the rotating member 2. The soft member 3 includes the plurality of protruding portions 3b protruded to the same direction and the soft member 3 is interposed between the rotating member 2

and the cover member 4 in a state where the protruding portion 3b is exposed from the opening portion 4c of the peripheral wall portion 4b of the cover member 4 outwardly. Since the slide-preventing soft member 3 between the cover member 4 and the rotating member 2 is interposed so that a part of the soft member 3 comes out from the opening portion 4c of the cover member 4 outwardly, it is prevented from being slide by the soft member 3 protruding from the opening portion 4c in case of manipulating the cover member 4. Accordingly, since the soft member 3 is interposed between the rotating member 2 and the cover member 4, it is prevented surely from separating the soft member 3.

Claims

1. A rotation driving device comprising:

a rotating member (2) driven to rotate; a cover member (4) having an outer peripheral surface of a circle shape attached to the outer periphery of the rotating member (2); and a slide-preventing soft member (3) attached to the cover member (4),
characterized in that the cover member (4) is provided with a plurality of opening portions (4c) disposed in a peripheral wall portion (4b) surrounding the outer periphery of the rotating member (2), the soft member (3) is provided with a plurality of protruding portions (3b) protruding outwardly, and the soft member (3) is interposed between the rotating member (2) and the cover member (4) in a state where the protruding portions (3b) are exposed from the opening portion (4c) of the peripheral wall portion (4b) of the cover member (4).

2. The rotation driving device according to Claim 1, wherein the protruding portions (3b) of the soft member (3) are inserted into the opening portion of the cover member (4) and the protruding portions (3b) are strongly fitted into the opening portion (4c) by means of elasticity of the soft member (3).

3. The rotation driving device according to Claims 1 or 2, wherein a plurality of concave portions (3c) are provided on the opposite side of the protruding portions (3b) in the soft member (3), a plurality of convex portions (2f) are formed in the periphery of the rotating member (2) so as to be opposite to the concave portions (3c), and the soft member (3) is interposed between the rotating member (2) and the cover member (4) in a state where the convex portions (2f) are allowed to engage with the concave portions (3c).

4. The rotation driving device according to any one of Claims 1 to 3, wherein the soft member (3) is formed of a band-shaped member having both end portions, is disposed in an annular shape in which both end portions are opposed to each other, and is interposed between the rotating member (2) and the cover member (4).

5. The rotation driving device according to any one of Claims 1 to 4, wherein the entire periphery of the opening portion (4c) of the cover member (4) is surrounded by the peripheral wall portion (4b).

FIG. 1

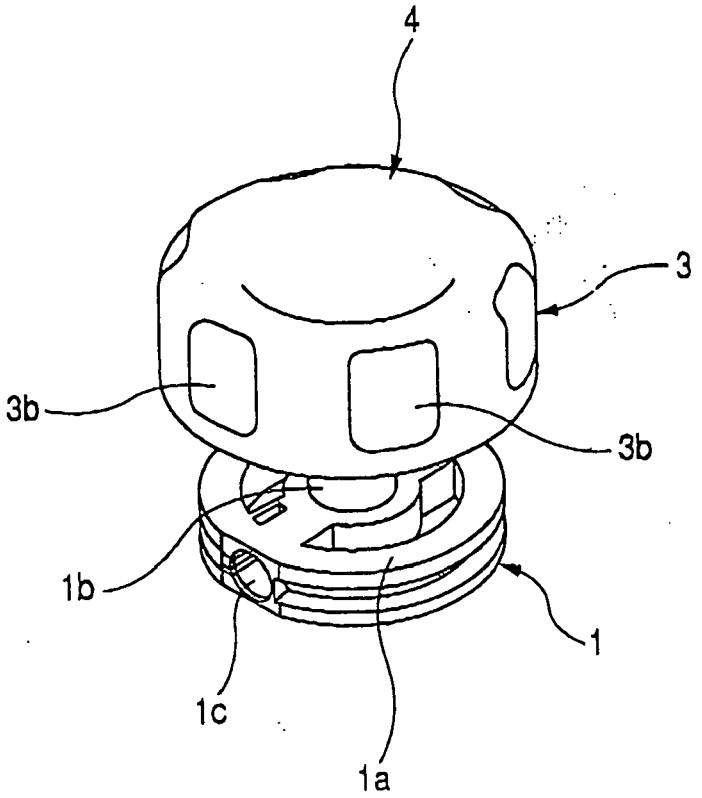


FIG. 2

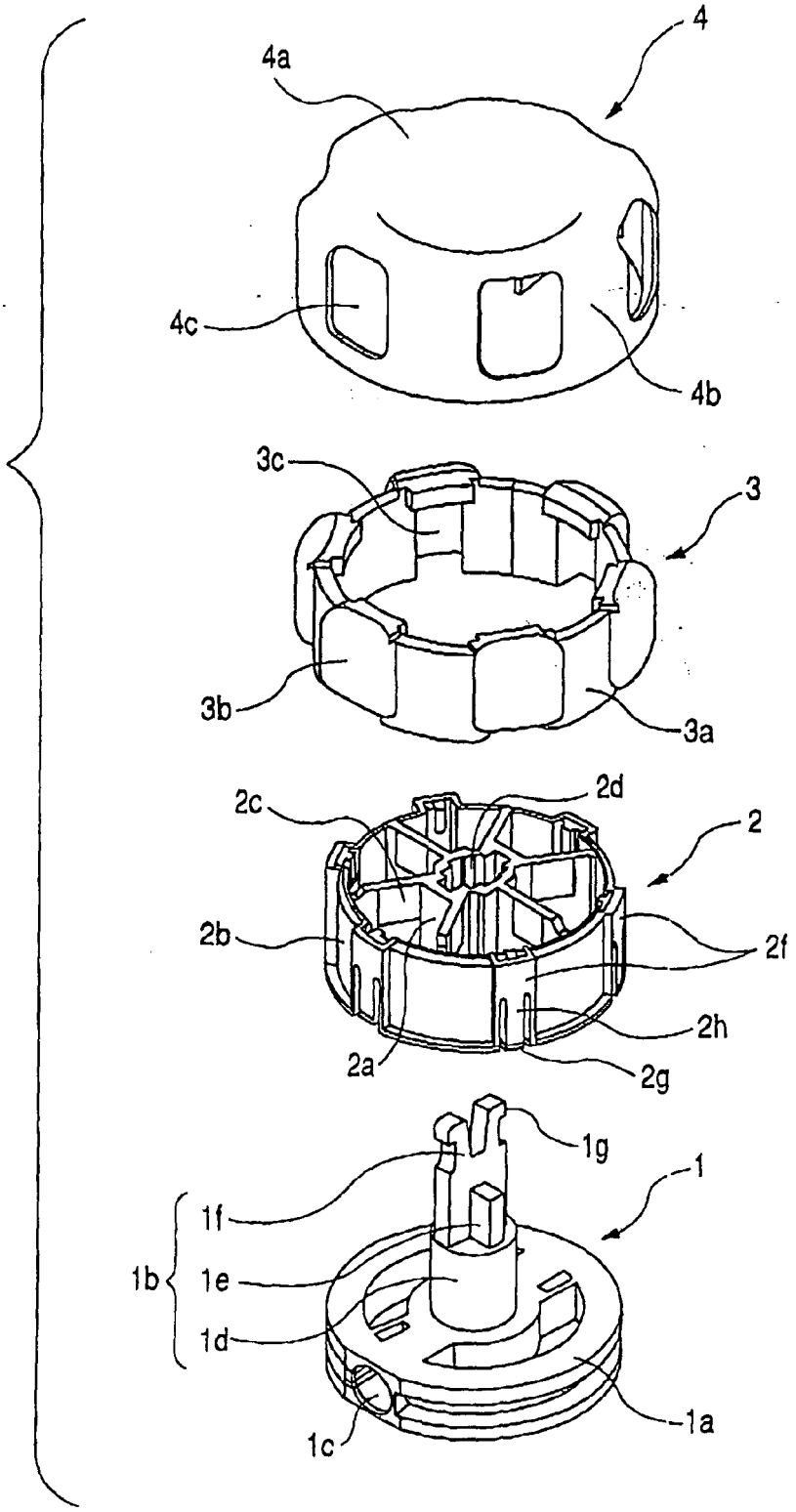
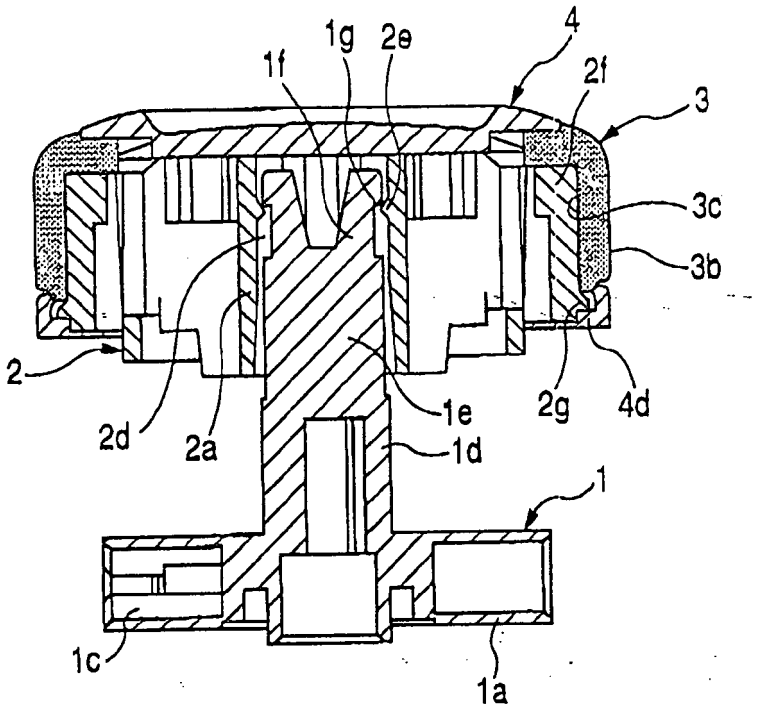


FIG. 3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1f
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2a
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1d
1
1c
1a

FIG. 4

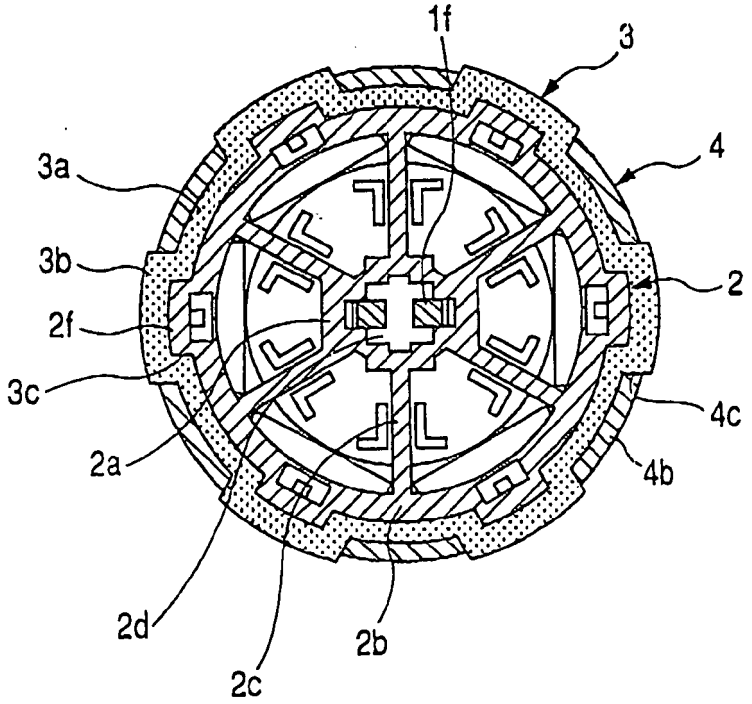
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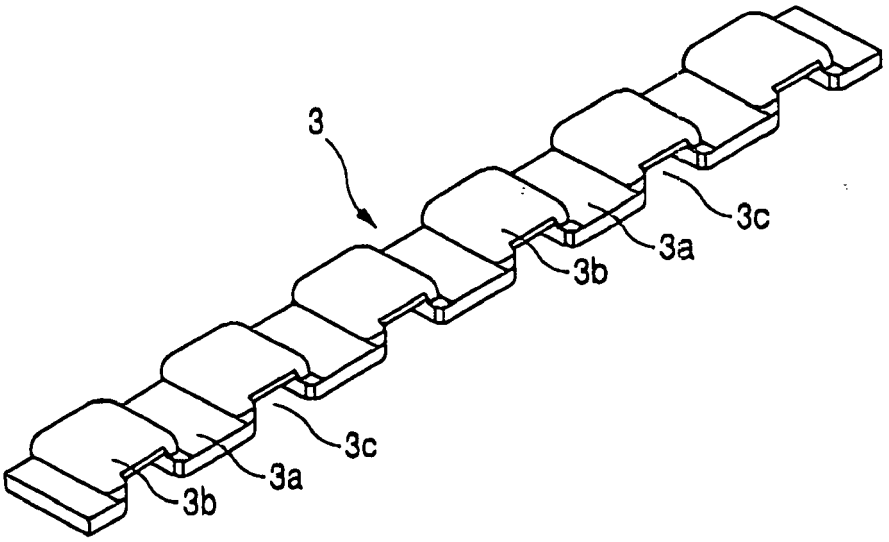
FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- JP 2003097101 A **[0005]**