



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.04.2011 Bulletin 2011/17

(51) Int Cl.:
H01H 13/04 (2006.01)

(21) Application number: **10183889.4**

(22) Date of filing: **30.09.2010**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
BA ME RS

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(30) Priority: **20.10.2009 JP 2009241010**

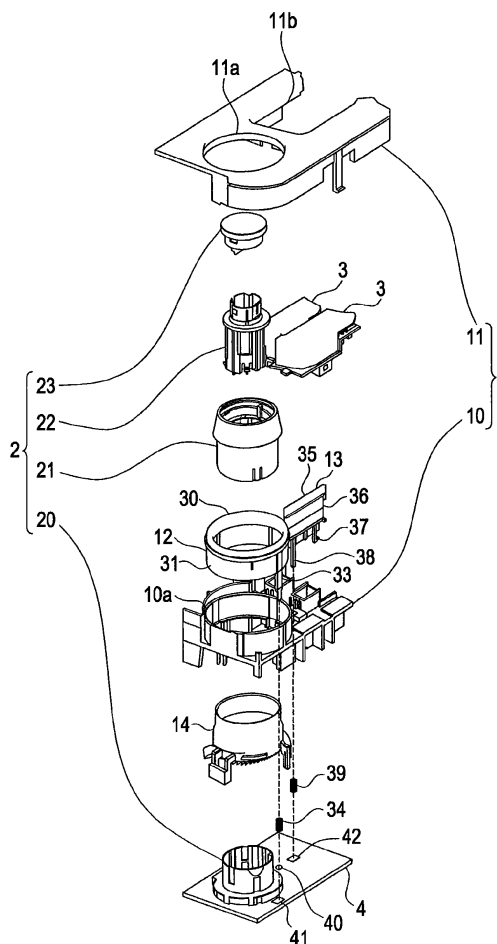
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(54) **Operating panel body**

(57) A plated component (12) has an exposed portion (30) exposed from a case (1) and a back portion (31) extending from the exposed portion (30) toward a substrate (4). The substrate (4) has a ground connecting portion (41) on a surface thereof facing the plated component (12). The back portion (31) of the plated component (12) has an extending portion (33) extending toward the ground connecting portion (41) of the substrate (4). The extending portion (33) has a stepped portion (33a) in a part thereof located at a predetermined position in the longitudinal direction and projecting from the case (1). An electrically conductive spring body (34) is held between the stepped portion (33a) and the ground connecting portion (41).

FIG. 2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an operating panel body installed in an automobile or the like and having an operating portion, and more specifically, it relates to an operating panel body having a plated component partly exposed from a case body.

2. Description of the Related Art

[0002] An operating panel body installed in an automobile or the like has a case made of a resin material. A substrate on which electronic components and others are disposed is placed at the back of the case. The term "back" used herein means the side opposite to the operator side. A knob-like or push-button-like operating portion is exposed from the front of the case. Because the operating panel body is directly exposed to the eyes of a driver and others, the operating panel body is required to have a good design. For this reason, some of the components of the operating panel body that are mainly made of a resin material are plated.

[0003] The plated components of the operating panel body are often provided, for example, around the operating portion. The plated components are at least partly exposed to the outside and are fixed to the back of the case, for example, by engagement. Because the surfaces of the plated components are electrically conductive, the plated components conduct static electricity into the case when an operator touches the plated components. If this static electricity is discharged to the electronic components disposed on the substrate in the case, the static electricity may damage the electronic components.

[0004] For a plated push-button switch, providing a spring body between the push-button switch and a grounded portion of a substrate so that static electricity is not discharged to electronic components on the substrate is disclosed, for example, in Japanese Unexamined Patent Application Publication No. 2004-146203.

[0005] Unlike a push-button switch such as that disclosed in Japanese Unexamined Patent Application Publication No. 2004-146203, a plated component provided to decorate an operating panel body is not operated and is fixed to a case. When a plated component is provided, for example, around an operating portion, the arrangement of the plated component is limited depending on the positions of the operating portion and, for example, a light guide body provided around the operating portion, and in some cases, a sufficient distance cannot be ensured between a substrate and the plated component.

[0006] Examples of such cases include a case where, in an operating panel body having a knob-like operating portion, an area around the operating portion is caused to emit light to improve the design. In this case, in an area

around the operating portion, which is formed in a solid cylindrical shape, a light guide body for causing the area around the operating portion to emit light uniformly along the circumferential direction is provided, and a plated component is disposed around the light guide body.

[0007] The plated component is formed in a substantially hollow cylindrical shape, has a flange portion formed at the front (operator-side) end thereof, and is disposed around the operating portion. The inner surface of the substantially hollow cylindrical plated component contributes to the reflection of light from a light source or light from the light guide body. A projection is formed on the outer surface of the plated component. The plated component is fixed by sandwiching this projection between an upper case and a lower case. To position the plated component in the rotation direction relative to the case and to prevent the plated component from rotating when the operating panel body is in use, the plated component has a projecting portion extending to the back of the case, and the backmost part of the projecting portion faces a substrate up close. To improve the workability, the projecting portion extending to the back of the case is formed so as to be long. The plated component is positioned in the early stage of fitting to the case and is then simply pressed into the case. For ease of assembly, as described above, the prevention of rotation is not performed at the position where the plated component is fixed, and the fixation and the positioning in the rotation direction are performed at separate positions.

[0008] If the light guide body is not provided, there is a space between the plated component and the operating portion. Therefore, the case is formed so as to extend beyond the backmost part of the plated component to the inside of the plated component. That is to say, a recess having a bottom and a surrounding wall is formed in the bottom surface of the case. The projecting portion of the plated component is engaged with this recess. Thus, a sufficient creepage distance can be ensured between the plated component and the substrate, and static electricity can be prevented from being discharged to electronic components on the substrate. However, when a light guide body is provided inside the plated component, the case cannot be formed in such a shape, and therefore the plated component directly faces the substrate and may discharge static electricity to the electronic components.

[0009] For example, when a plate-like plated component is disposed so as to be surrounded by an operating portion, the positioning of the plated component relative to a case has to be performed at the back of the case for ease of assembly as in the above-described case. Therefore, also in this case, the plated component and the substrate are close to each other, and static electricity may be discharge to the electronic components.

[0010] In these cases, when a spring body is simply provided between the plated component and the substrate as in Japanese Unexamined Patent Application Publication No. 2004-146203, the spring body is not held

reliably, it is difficult to ensure reliable connection between the plated component and the grounded portion of the substrate, and assembly is not easy.

SUMMARY OF THE INVENTION

[0011] The present invention provides an operating panel body in which static electricity from a plated component fixed to a case can be reliably caused to flow to a grounded portion of a substrate.

[0012] In an aspect of the present invention, an operating panel body includes a case at the back of which a substrate is disposed, a plated component disposed in front of the substrate and at least partly exposed from the case, and an operating body. The plated component is fixed to the case. The plated component has an exposed portion exposed from the case and a back portion extending from the exposed portion toward the substrate. The substrate has a ground connecting portion on a surface thereof facing the plated component.

[0013] The back portion of the plated component has an extending portion extending toward the ground connecting portion of the substrate. The extending portion has a stepped portion in a part thereof located at a predetermined position in the longitudinal direction and projecting from the case. An electrically conductive spring body is held between the stepped portion and the ground connecting portion.

[0014] It is preferable that the operating body have a cylindrical outer surface, a substantially hollow cylindrical light guide body be provided so as to surround the outer surface of the operating body, and the plated component be formed in a substantially hollow cylindrical shape so as to surround the light guide body.

[0015] It is preferable that the case have an operating body housing portion having an inner surface substantially fitting the outer surface of the plated component, and a fixing portion holding a flange portion formed on the outer surface of the plated component be formed in the inner surface of the operating body housing portion.

[0016] It is preferable that the plated component be formed in a substantially plate-like shape and have an engaging portion to be engaged with the case, and the engaging portion and the extending portion be formed in the backmost part of the plated component.

[0017] It is preferable that the extending portion extend to the neighborhood of the ground connecting portion and hold the spring body substantially throughout its length.

[0018] It is preferable that the case have an extending portion holding portion holding the extending portion, and the stepped portion of the extending portion be formed beyond the backmost part of the extending portion holding portion.

[0019] Because the back portion of the plated component has an extending portion extending toward the ground connecting portion of the substrate, the extending portion has a stepped portion in a part thereof located at

a predetermined position in the longitudinal direction and projecting from the case, and an electrically conductive spring body is held between the stepped portion and the ground connecting portion, static electricity flows from the plated component through the spring body to the ground connecting portion and is prevented from being discharged to the other electronic components on the substrate. In addition, because the spring body can be held between the stepped portion and the ground connecting portion, the spring body can be reliably electrically connected to both of them, and the spring body can be easily attached to the plated component.

[0020] Because the operating body has a cylindrical outer surface, a substantially hollow cylindrical light guide body is provided so as to surround the outer surface of the operating body, and the plated component is formed in a substantially hollow cylindrical shape so as to surround the light guide body, reliable discharge can be performed through the spring body when the cylindrical light guide body is provided inside the plated component, and the plated component is close to the substrate.

[0021] Because the case has an operating body housing portion having an inner surface substantially fitting the outer surface of the plated component, and a fixing portion holding a flange portion formed on the outer surface of the plated component is formed in the inner surface of the operating body housing portion, the plated component can be easily fixed to the case.

[0022] Because the plated component is formed in a substantially plate-like shape and has an engaging portion to be engaged with the case, and the engaging portion and the extending portion is formed in the backmost part of the plated component, reliable discharge can be performed through the spring body when the plated component is plate-like and is close to the substrate in the engaging portion.

[0023] Because the extending portion extends to the neighborhood of the ground connecting portion and holds the spring body substantially throughout its length, the spring body can be reliably held by the extending portion, and the spring body can be reliably brought into contact with the ground connecting portion.

[0024] Because the case has an extending portion holding portion holding the extending portion, and the stepped portion of the extending portion is formed beyond the backmost part of the extending portion holding portion, the spring body is pressed only by the stepped portion and the ground connecting portion and is prevented from being brought into contact with the other components, and therefore more reliable discharge can be performed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Fig. 1 is a front view of an operating panel body according to an embodiment;

Fig. 2 is an exploded perspective view of the operating panel body;

Fig. 3 is a sectional view taken along line III-III of Fig. 1; and

Fig. 4 is a schematic view showing the relationship between a plate-like plated component and a substrate.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] An embodiment of the present invention will now be described in detail with reference to the drawings. Fig. 1 is a front view of an operating panel body according to this embodiment. The operating panel body of this embodiment forms a part of an operating panel of an automobile and is used for the operation of an air conditioner, an audio system, or the like. Fig. 1 is a view of the operating panel body from the inside of the automobile. When the operating panel body is viewed from the inside of the automobile as shown in Fig. 1, an rotational operating portion 2 for operating a rotational electric component and two upper and lower pushing operating portions 3 for operating push switches are held by a case 1 forming a part of the inner surface of the automobile.

[0027] A ring-like plated component 12 is disposed around the rotational operating portion 2 so as to surround this. Between the two upper and lower pushing operating portions 3, a plate-like plated component 13 is disposed so as to separate them. These plated components are made of synthetic resin. The entire surfaces thereof are plated with metal. These plated components are shaded in Fig. 1.

[0028] Fig. 2 is an exploded perspective view of the operating panel body. As shown in this figure, the operating panel body is a combination of a plurality of components. The case 1 includes a surface-forming portion 11 exposed to the inside of the automobile and a main body 10 provided on the back thereof. The surface-forming portion 11 and the main body 10 are integrated by a snap connection. A substrate 4 is provided at the back of the case 1. Components such as a switch base 20 are disposed on the substrate 4.

[0029] The surface-forming portion 11, which forms a part of the case 1, has a first opening 11a that exposes a part of the rotational operating portion 2, and a second opening 11b that exposes the pushing operating portions 3. The rotational operating portion 2 exposed by the first opening 11a includes a switch base 20, a guide member 21, a slide member 22, and a cap member 23. The switch base 20 is an operating knob provided in a rotary switch provided on the substrate 4. The guide member 21 is a substantially cylindrical member that is integrally attached to the switch base 20 so as to cover the switch base 20. The slide member 22 is guided by the guide member 21 in the central axis direction so as to be able to be pushed, and it is rotatable integrally with the guide member 21. The cap member 23 covers a surface of the slide member 22 on the side of the inside of the automo-

bile, is integrally attached to the slide member 22, and is exposed by the first opening 11a to the inside of the automobile.

[0030] The main body 10, which forms a part of the case 1, has a circular hole-like operating body housing portion 10a into which the rotational operating portion 2 is inserted and that houses the rotational operating portion 2. A substantially hollow cylindrical light guide body 14 is inserted into the operating body housing portion 10a so as to surround the rotational operating portion 2. In addition, a substantially hollow cylindrical ring-like plated component 12 is inserted into the operating body housing portion 10a so as to surround the light guide body 14. The ring-like plated component 12 has an exposed portion 30 that is exposed from the case 1 and a back portion 31 that extends toward the substrate 4. The back portion 31 substantially fits the inner surface of the operating body housing portion 10a of the main body 10, and the positioning in the horizontal direction (the planar direction of the substrate 4) can thereby be performed.

[0031] Fig. 3 is a sectional view taken along line III-III of Fig. 1. The left and right portions of this figure show a section passing through the center of the rotational operating portion 2, and the middle portion thereof shows a section passing through the periphery of the rotational operating portion 2. As shown in this figure, the light guide body 14 is disposed substantially along the outer surface of the rotational operating portion 2, and the ring-like plated component 12 is disposed so as to surround the light guide body 14. The exposed portion of the rotational operating portion 2 has a diameter slightly larger than that of the back portion. The light guide body 14 is hidden under the exposed portion of the rotational operating portion 2 and is not exposed to the outside, whereas the exposed portion 30 of the ring-like plated component 12 is exposed to the outside in the gap between the rotational operating portion 2 and the case 1.

[0032] The ring-like plated component 12 has a flange portion 32 that projects from the outer surface along the circumferential direction. The flange portion 32 is sandwiched between the surface-forming portion 11 and the main body 10, which each form a part of the case 1, and the ring-like plated component 12 is thereby fixed to the case 1. The back portion 31 of the ring-like plated component 12 extends toward the substrate 4. The end part of the back portion 31 faces the substrate 4 at a position relatively close to the substrate 4.

[0033] As shown in Fig. 2, in addition to the switch base 20, an electronic component 40, such as an LED, for brightening an area around the rotational operating portion 2 is disposed on the substrate 4. The LED is disposed so as to be able to irradiate at least the light guide body 14. By causing the LED to emit light, the light guide body 14 emits light throughout its circumference. At the same time, light transmitted by the light guide body 14 or direct light is reflected by the inner surface of the ring-like plated component 12 so that light leaks efficiently through the gap between the rotational operating portion 2 and the

ring-like plated component 12. Although electronic components other than the LED are disposed on the substrate 4, they are not shown.

[0034] As shown in the middle portion of Fig. 3, the back portion 31 of the ring-like plated component 12 has an extending portion 33 at a predetermined position in the circumferential direction. The extending portion 33 extends backward, that is to say, toward the substrate 4. The extending portion 33 is formed so as to have an elongate shape. The tip of the extending portion 33 is extremely close to the surface of the substrate 4. A first ground connecting portion 41 is formed on the surface of the substrate 4 that is close to the tip portion of the extending portion 33. The first ground connecting portion 41 is electrically grounded.

[0035] The main body 10, which forms a part of the case 1, has an extending portion holding portion 10b formed therein. The extending portion holding portion 10b holds the basal portion of the extending portion 33 of the ring-like plated component 12. The extending portion holding portion 10b holds the elongate extending portion 33 tightly so that it does not wobble and does not turn. Thus, when this operating panel body is actually installed in an automobile, the extending portion 33 does not turn even if a large vibration is applied. In the process of assembling an operating panel body, the ring-like plated component 12 can be easily fitted into the main body 10 by pressing the ring-like plated component 12 into the main body 10 with the tip of the extending portion 33 in the extending portion holding portion 10b so that the outer surface of the back portion 31 is inside the inner surface of the operating body housing portion 10a.

[0036] The extending portion 33 of the ring-like plated component 12 has a projecting stepped portion 33a formed in a portion thereof located beyond the backmost part of the extending portion holding portion 10b of the case 1, that is to say, in a portion thereof not held by the extending portion holding portion 10b, so that the diameter of the tip portion is smaller than that of the basal portion. Between the stepped portion 33a and the first ground connecting portion 41 of the substrate 4, an electrically conductive spring body 34 is held.

[0037] The spring body 34 is a metallic coil spring. The spring body 34, being held between the stepped portion 33a and the first ground connecting portion 41, is slightly compressed and thereby becomes pressed against both the stepped portion 33a and the first ground connecting portion 41. Thus, the ring-like plated component 12 and the first ground connecting portion 41 of the substrate 4 are electrically connected by the spring body 34. Because the stepped portion 33a of the ring-like plated component 12 is formed only in the tip portion not held by the extending portion holding portion 10b, the spring body 34 is in contact only with the ring-like plated component 12 and the first ground connecting portion 41 and is not in contact with the other components such as the main body 10. Therefore, when static electricity flows to the ring-like plated component 12, the static electricity is re-

liably discharged through the spring body 34 to the first ground connecting portion 41 and is prevented from being discharged to the other components such as the LED.

[0038] Because the extending portion 33 of the ring-like plated component 12 extends to a position extremely close to the first ground connecting portion 41 of the substrate 4, the extending portion 33 holds the spring body 34 substantially throughout its length. Thus, the spring body 34 can be reliably brought into contact with the first ground connecting portion 41, and at the time of assembly, the spring body 34 can be easily attached to the ring-like plated component 12.

[0039] As shown in Fig. 2, the plate-like plated component 13 is provided between the pushing operating portions 3. Therefore, to fix the plate-like plated component 13 to the case 1, the plate-like plated component 13 has to be engaged with the back part of the case 1. Therefore, the backmost part of the plate-like plated component 13 is relatively close to the substrate 4. Also in this case, electrical continuity through a spring body 39 is ensured.

[0040] Fig. 4 is a schematic view showing the relationship between the plate-like plated component 13 and the substrate 4. In this figure, the case 1 and others are omitted. As shown in Fig. 4, the plate-like plated component 13 has an exposed portion 35 that is exposed to the inside of the automobile in the gap between the two pushing operating portions 3, and a back portion 36 that extends from the exposed portion 35 toward the substrate 4. In the backmost part of the back portion 36, an engaging hook 37 and an extending portion 38 are formed. The engaging hook 37 is for engaging with the case 1, and the extending portion 38 extends toward a second ground connecting portion 42 formed on the substrate 4.

[0041] The extending portion 38 has a stepped portion 38a formed in a portion thereof near the substrate 4 so that the diameter of the tip portion is smaller than that of the basal portion. Between the stepped portion 38a and the second ground connecting portion 42, an electrically conductive spring body 39 is held. The spring body 39 has the same configuration as the spring body 34 held by the ring-like plated component 12. The spring body 39, being held between the stepped portion 38a and the second ground connecting portion 42, is slightly compressed and thereby becomes pressed against both the stepped portion 38a and the second ground connecting portion 42. Thus, the plate-like plated component 13 and the second ground connecting portion 42 of the substrate 4 are electrically connected by the spring body 39. Therefore, when static electricity flows to the plate-like plated part 13, the static electricity is reliably discharged through the spring body 39 to the second ground connecting portion 42 and is prevented from being discharged to the other components.

[0042] As described above, in this embodiment, in both the ring-like plated component 12 and the plate-like plated component 13, the backmost parts thereof are relatively close to the substrate 4. So, both the ring-like plated

component 12 and the plate-like plated component 13 are provided with an extending portion extending toward a ground connecting portion of the substrate 4, the extending portion has a stepped portion formed therein such that the tip portion is thinner, and a spring body is held between the stepped portion and the ground connecting portion. Thus, static electricity from each plated component flows reliably through the spring bodies to the ground connecting portions and is not discharged to the other components, and the spring bodies are reliably held and brought into contact with the ground connecting portions.

[0043] When an operator rotates the exposed portion of the operating portion 2, the slide member 22 rotates. The rotating slide member 22 rotates the guide member 21 and the switch base 20 and drives the rotary switch. When the operator pushes the exposed part of the operating portion 2, the slide member 22 is pushed into the guide member 21 while being guided by the guide member 21 and drives a tactile switch (not shown). When the operator pushes the pushing operating portions 3, a tactile switch (not shown) is driven.

[0044] While an embodiment of the present invention has been described, the present invention is not limited to the embodiment, and various modifications may be made within the range of its technical idea. While an operating panel body having a rotational operating portion 2 and two pushing operating portions 3 has been described in this embodiment, the number and arrangement of the operating portions and the shape of the case 1 are not limited to those in this embodiment. While the ring-like plated component 12 and the plate-like plated component 13 are formed by plating the entire surface of a plastic component with metal, it is only necessary to plate at least the exposed portion, the stepped portion 33a, and a portion connecting them, and the ring-like plated component 12 and the plate-like plated component 13 may be formed from a metal plate.

Claims

1. An operating panel body comprising:

a case (1) at the back of which a substrate (4) is disposed;
a plated component (12, 13) disposed in front of the substrate (4) and at least partly exposed from the case (1); and
an operating body (2, 3),
wherein the plated component (12, 13) is fixed to the case (1),
the plated component (12, 13) has an exposed portion exposed from the case (1) and a back portion extending from the exposed portion toward the substrate (4),
the substrate (4) has a ground connecting portion (41, 42) on a surface thereof facing the plat-

ed component (12, 13),
the back portion of the plated component (12, 13) has an extending portion (33, 38) extending toward the ground connecting portion (41, 42) of the substrate (4),
the extending portion (33, 38) has a stepped portion (33a, 38a) in a part thereof located at a predetermined position in the longitudinal direction and projecting from the case (1), and
an electrically conductive spring body (34, 39) is held between the stepped portion (33a, 38a) and the ground connecting portion (41, 42).

2. The operating panel body according to Claim 1, wherein the operating body (2, 3) has a cylindrical outer surface, a substantially hollow cylindrical light guide body (14) is provided so as to surround the outer surface of the operating body (2, 3), and the plated component (12, 13) is formed in a substantially hollow cylindrical shape so as to surround the light guide body (14).

3. The operating panel body according to Claim 2, wherein the case (1) has an operating body housing portion having an inner surface substantially fitting the outer surface of the plated component (12, 13), and a fixing portion holding a flange portion (32) formed on the outer surface of the plated component (12, 13) is formed in the inner surface of the operating body housing portion.

4. The operating panel body according to any one of Claims 1 to 3, wherein the plated component (12, 13) is formed in a substantially plate-like shape and has an engaging portion to be engaged with the case (1), and the engaging portion and the extending portion (33, 38) are formed in the backmost part of the plated component (12, 13).

5. The operating panel body according to any one of Claims 1 to 4, wherein the extending portion (33, 38) extends to the neighborhood of the ground connecting portion (41, 42) and holds the spring body (34, 39) substantially throughout its length.

6. The operating panel body according to any one of Claims 1 to 5, wherein the case (1) has an extending portion holding portion (10b) holding the extending portion (33, 38), and the stepped portion (33a, 38a) of the extending portion (33, 38) is formed beyond the backmost part of the extending portion holding portion (10b).

FIG. 1

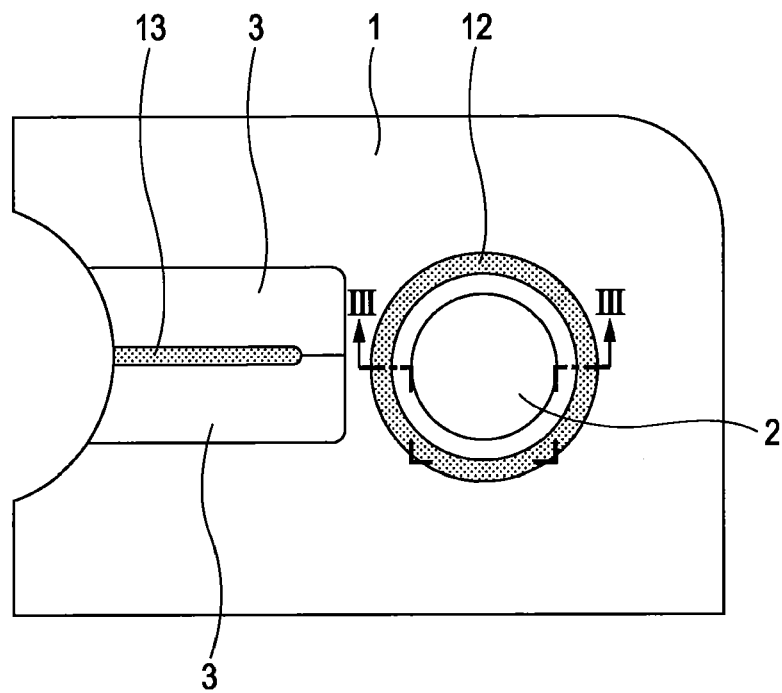


FIG. 2

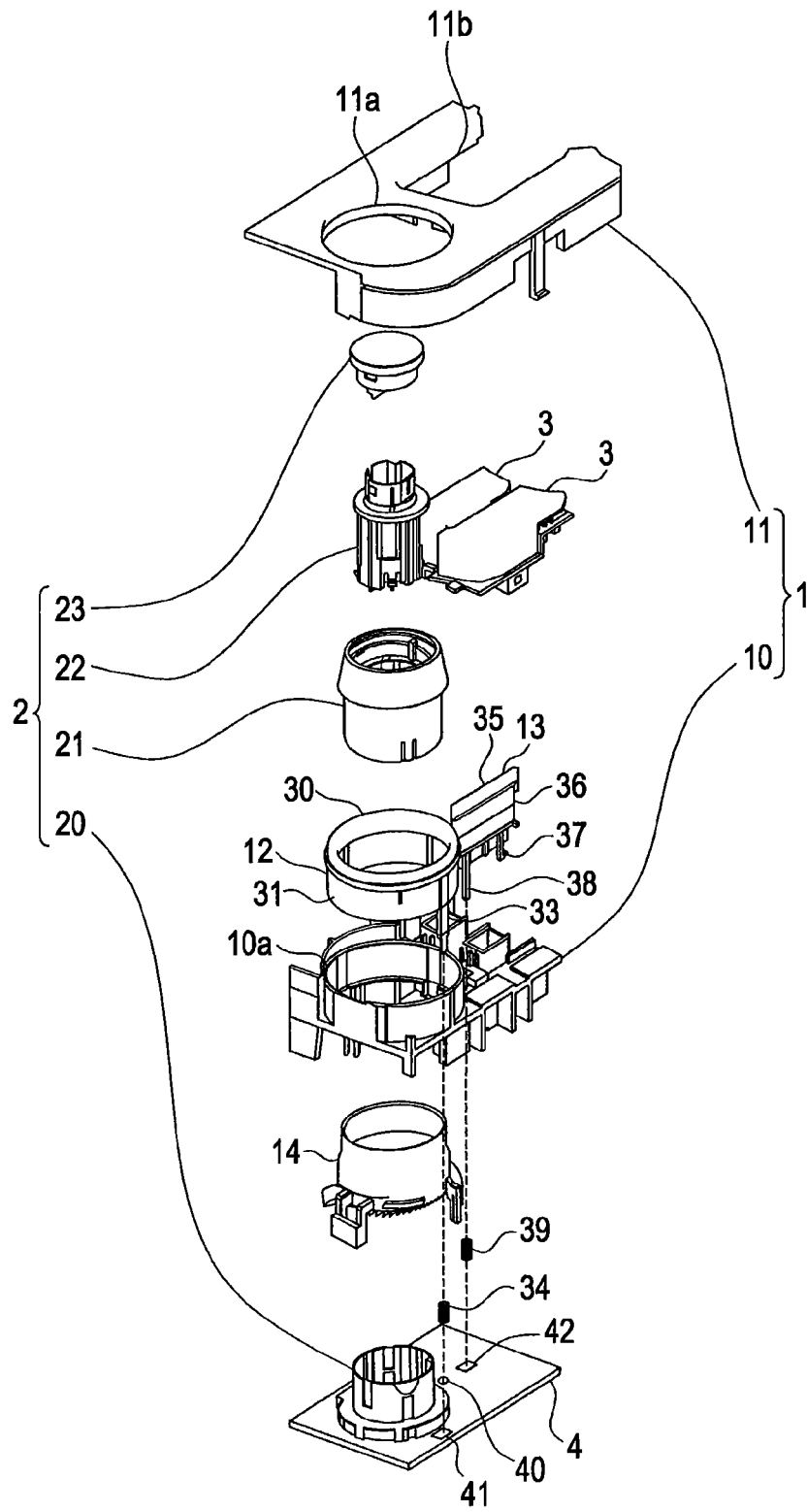


FIG. 3

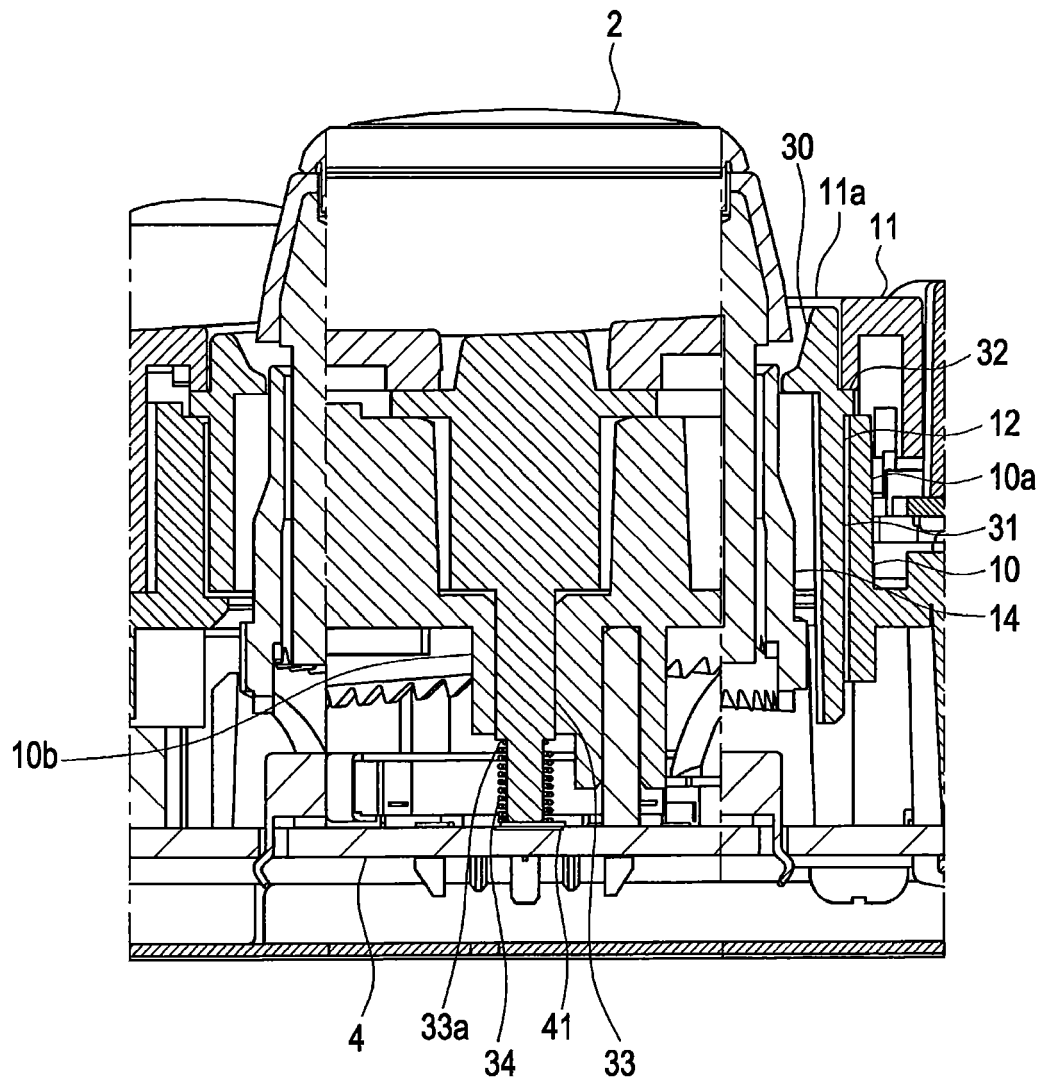
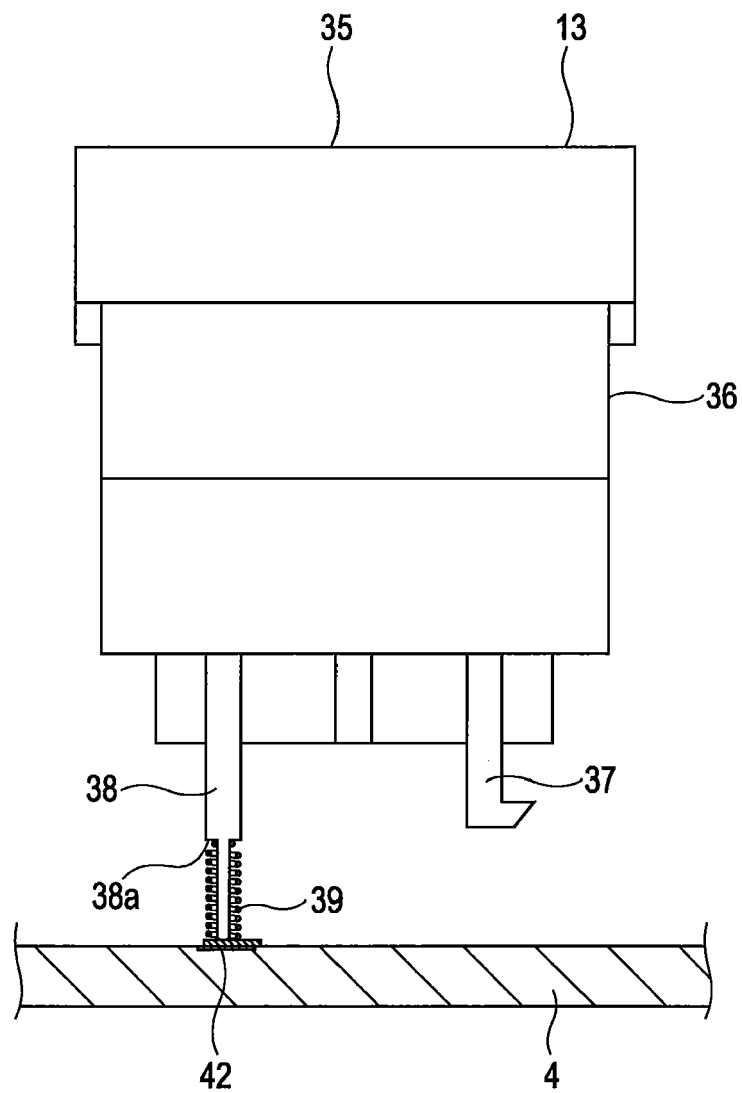


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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