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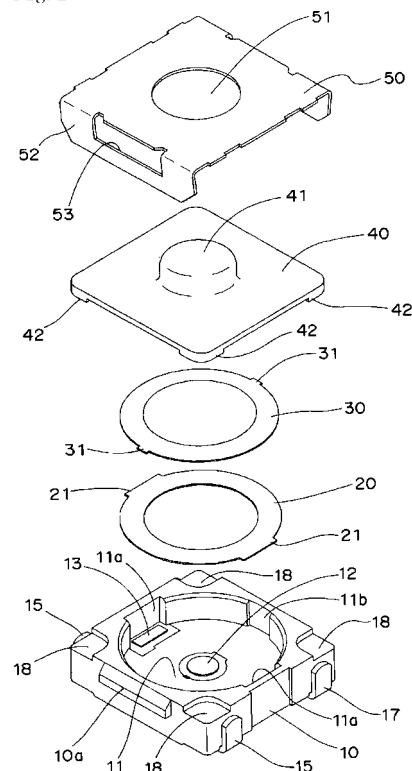
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(54) **Push-Button Switch**

(57) A push-button switch that excels in durability is provided.

A push-button switch includes a base including a common fixed contact point at a middle of a bottom surface of a concave region and arranged with fixed contact points at corners of the concave region, a reverse spring or a movable contact point fitted into the concave region and having an outer peripheral edge contacting the fixed contact points, and a push-button for pushing down the reverse spring. In particular, a wear preventing relay terminal is arranged between the fixed contact points of the base and the reverse spring.

Fig. 2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to push-button switches, in particular, to a push-button switch that excels in durability.

2. Description of the related art

[0002] A push-button switch configured by a case 1, a movable contact point 5, a driving body 6 including an operation unit 7, and a covering plate 8 is conventionally proposed as shown in FIGS. 1 to 4 of Japanese Patent Application Laid-Open No. 64-7442.

[0003] In such push-button switch, when the operation unit 7 is pushed down to operate the driving body 6, a central part of the movable contact point 5 is pushed down. When the central part of the movable contact point 5 lowers to a predetermined position, the central part is reversed thereby contacting a fixed contact point 4 arranged on a bottom surface of a concave region of the case 1 and electrically conducting the fixed contact point 4 and a fixed contact point 3 by way of the movable contact point 5.

[0004] However, when a central part of a movable contact point 5 is pushed down by a driving body 6, an outer peripheral edge thereof slidably moves on an upper surface of a fixed contact point 3 in a push-button switch described above. Thus, if a surface of a fixed contact point 3 is gold plated, the gold plating gets scraped off and a contact resistance increases. Furthermore, if the fixed contact point 3 is brazen and the movable contact point 5 is stainless steel or phosphor bronze, the movable contact point 5 gets scraped off and easily wears away, and thus durability is poor.

SUMMARY OF THE INVENTION

[0005] In view of the above problems, it is an object of the present invention to provide a push-button switch that excels in durability.

[0006] In order to overcome the above problem, the push-button switch according to the present invention includes a base having a common fixed contact point at a middle of a bottom surface of a concave region and arranged with fixed contact points at corners of the concave region; a reverse spring or a movable contact point fitted into the concave region and having an outer peripheral edge contacting the fixed contact points; and a push-button for pushing down the reverse spring; where-in a wear preventing relay terminal is arranged between the fixed contact points of the base and the reverse spring.

[0007] According to the present invention, the fixed contact points are less likely to be worn away since the

outer peripheral edge of the reverse spring slidably moves on an upper surface of the wear preventing relay terminal. In particular, since a pressure of the reverse spring decreases and the frictional force becomes smaller, wear is furthermore less likely to occur and durability enhances.

The spring characteristic can be changed by appropriately changing a thickness dimension of the wear preventing relay terminal, and the desired operation feeling can be obtained.

[0008] According to an embodiment of the present invention, the wear preventing relay terminal has a circular ring shape.

According to the present embodiment, the directivity in assembling is not necessary, and a frictional force in time of contact becomes even.

[0009] According to another embodiment of the present invention, the surface of the wear preventing relay terminal is gold plated.

According to the present embodiment, the electrical conductivity increases, and the push-button switch of high contact reliability is obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 shows a perspective view of an embodiment of a push-down switch according to the present invention;

FIG. 2 shows an exploded perspective view of the push-down switch shown in FIG. 1;

FIG. 3 shows a plan view of a base shown in FIG. 2;

FIG. 4A shows a cross sectional view taken along line A-A of the push-down switch shown in FIG. 1;

FIG. 4B shows a cross sectional perspective view of the push-down switch shown in FIG. 1;

FIG. 5A shows a cross sectional view taken along line A-A of the push-down switch shown in FIG. 1;

FIG. 5B shows a cross sectional perspective view of the push-down switch shown in FIG. 1; and

FIG. 6 shows a graph describing the operation feeling.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] An embodiment of a push-button switch according to the present invention will now be described according to the accompanying drawings of FIGS. 1 to 6.

Briefly, the present embodiment is configured by a base 10, a wear preventing relay annular terminal 20, a reverse spring 30 or a movable contact point, a push-button 40, and a cover 50, as shown in FIGS. 1 and 2.

[0012] As shown in FIG. 3, the base 10 is a resin molded article having a square plane, where a common fixed contact point 12 is arranged in a projecting manner through insert molding at a middle of a bottom surface

of a circular concave region 11 formed at the central part, and fixed contact points 13, 14 are embedded at the corners of the concave region 11 with the common fixed contact point 12 in between. The common fixed contact point 12 is pulled out from a lower surface of the base 10 and connected to the terminals 15, 15 bent up along an opposing external surfaces. The fixed contact points 13, 14 are pulled out from the lower surface of the base 10, and connected to the terminals 16, 17 bent up along the opposing external surfaces. A positioning step part 18 is formed at the corners on the upper surface of the base 10, and positioning cut-out parts 11 a, 11 b are respectively arranged at opposing positions with the common fixed contact point 12 in between. Furthermore, an engagement nail part 10a is formed at the opposing external surface edges of the base 10.

[0013] As shown in FIG. 2, the wear preventing relay annular terminal 20 has an outer peripheral shape that fits to the concave region 11 and that covers the fixed contact points 13, 14, and has a pair of positioning projections 21 arranged at the outer peripheral edge. Materials such as phosphor bronze and stainless steel having large hardness and excelling in conductivity are preferable for the wear preventing relay annular terminal 20. The relay annular terminal 20 does not need to be a continuous annular form and may be a discontinuous circular arc. The relay annular terminal 20 does not need to have a flat cross section and may be a circular cross section.

[0014] A reverse spring 30 is molded to a dome shape by performing press-work on a conductive material of thin circular plate shape, and functions as a movable contact point. The reverse spring 30 has an outer peripheral shape that can be fitted to the concave region 11, and has a pair of positioning projections 31 arranged on the opposing outer peripheral edges.

[0015] The push-button 40 has an outer peripheral shape that can cover the upper surface of the base 10, and includes an operating projection 41 projecting upward and downward at the central part, and a projection 42 that can be fitted to the positioning step part 18 of the base 10 is arranged in a projecting manner at the corners of the lower surface.

[0016] The cover 50 has a plane shape that can cover the base 10, and includes a fit-in hole 51 at the central part and an engagement cut-out part 53 at an angular part of a folding part 52 extended from the opposing side edges.

[0017] In the push-button switch made up of the above described components, the projection 21 of the wear preventing relay annular terminal 20 and the projection 31 of the reverse spring 30 are fitted to the cut-out parts 11a, 11b arranged at the concave region 11 of the base 10 and sequentially assembled. Thereafter, the projection 42 of the push-button 40 is fitted and positioned in the positioning step part 18 arranged on the upper surface of the base 10, the cover 50 is placed thereon to fit the operating projection 41 into the fit-in hole 51, and the cut-out part 53 of the cover 50 is engaged with the engage-

ment nail 10a of the base 10, thereby completing the assembly task.

[0018] As shown in FIG. 4A, before the operation of the push-button 40, the reverse spring 30 pushes the operating projection 41 of the push-button 40 upward and an outer peripheral edge of the reverse spring 30 contacts the fixed contact point 13, 14 by way of the wear preventing relay annular terminal 20, whereas the central part separates from the common fixed contact point 12.

[0019] When the operating projection 41 of the push-button 40 is pushed down, a central part of the reverse spring 30 is pushed down, and when lowered to a predetermined position, the central part of the reverse spring 30 reverses and contacts the common fixed contact point 12, whereby the common fixed contact point 12 and the fixed contact points 13, 14 become electrically conducted by way of the wear preventing relay annular terminal 20 and the reverse spring 30.

[0020] When the pushing on the push-button 40 is released, the push-button 40 is pushed up by the spring force of the reverse spring 30, and the central part of the reverse spring 30 separates from the common fixed contact point 12 and restores to the original state.

[0021] According to the present embodiment, even if the reverse spring 30 is pushed down and the outer peripheral edge thereof slidably moves outward, the outer peripheral edge moves on the hard wear preventing relay annular terminal 20 and the pressure of the reverse spring decreases and the frictional force becomes smaller, and thus wear is less likely to occur. Thus, a push-button switch excelling in durability compared to the conventional example is obtained.

[0022] Furthermore, according to the present embodiment, the spring characteristic can be changed, as shown in FIG. 6 by appropriately selecting a thickness dimension of the wear preventing relay annular terminal 20. Thus, a push-button switch having a desired operation feeling can be obtained.

[0023] The push-button switch according to the present invention is not limited to the above embodiment, and may obviously be applied to other push-button switches.

Claims

1. A push-button switch comprising:

- a base having a common fixed contact point at a middle of a bottom surface of a concave region and arranged with fixed contact points at corners of the concave region;
- a reverse spring or a movable contact point fitted into the concave region and having an outer peripheral edge contacting the fixed contact points; and
- a push-button for pushing down the reverse spring; wherein

a wear preventing relay terminal is arranged between the fixed contact points of the base and the reverse spring.

2. A push-button switch according to claim 1, wherein the wear preventing relay terminal has a circular ring shape. 5
3. A push-button switch according to claim 1 or 2, wherein a surface of the wear preventing relay terminal is gold plated. 10

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Fig. 1

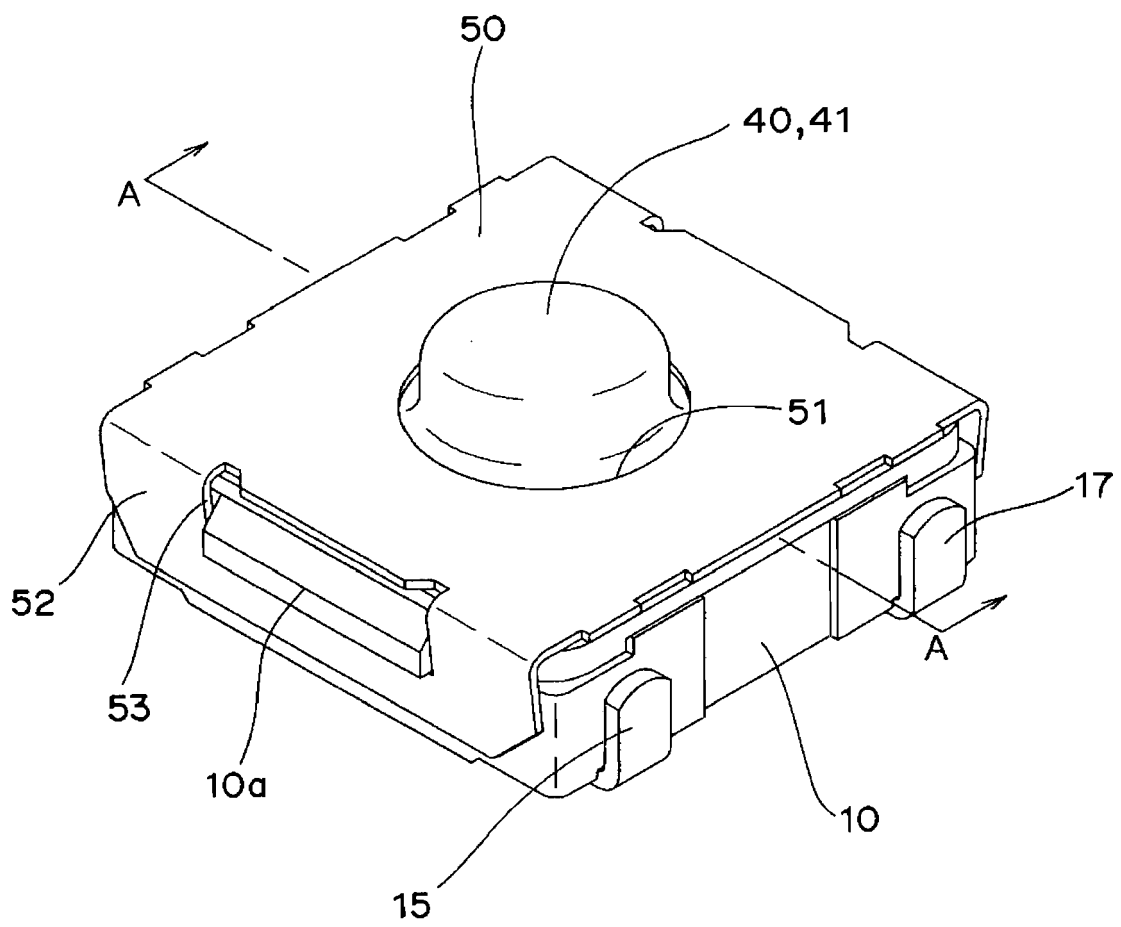


Fig. 2

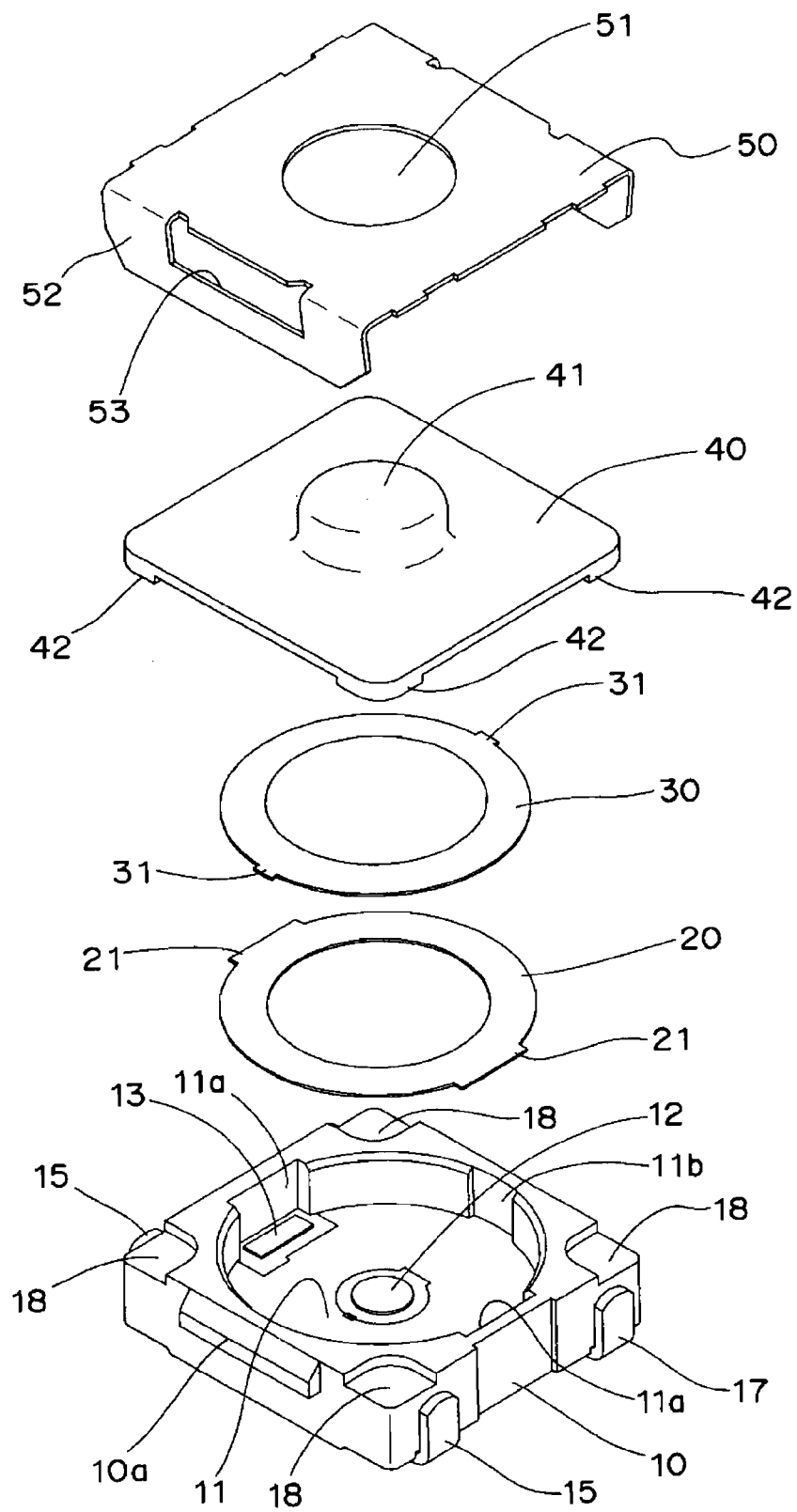


Fig. 3

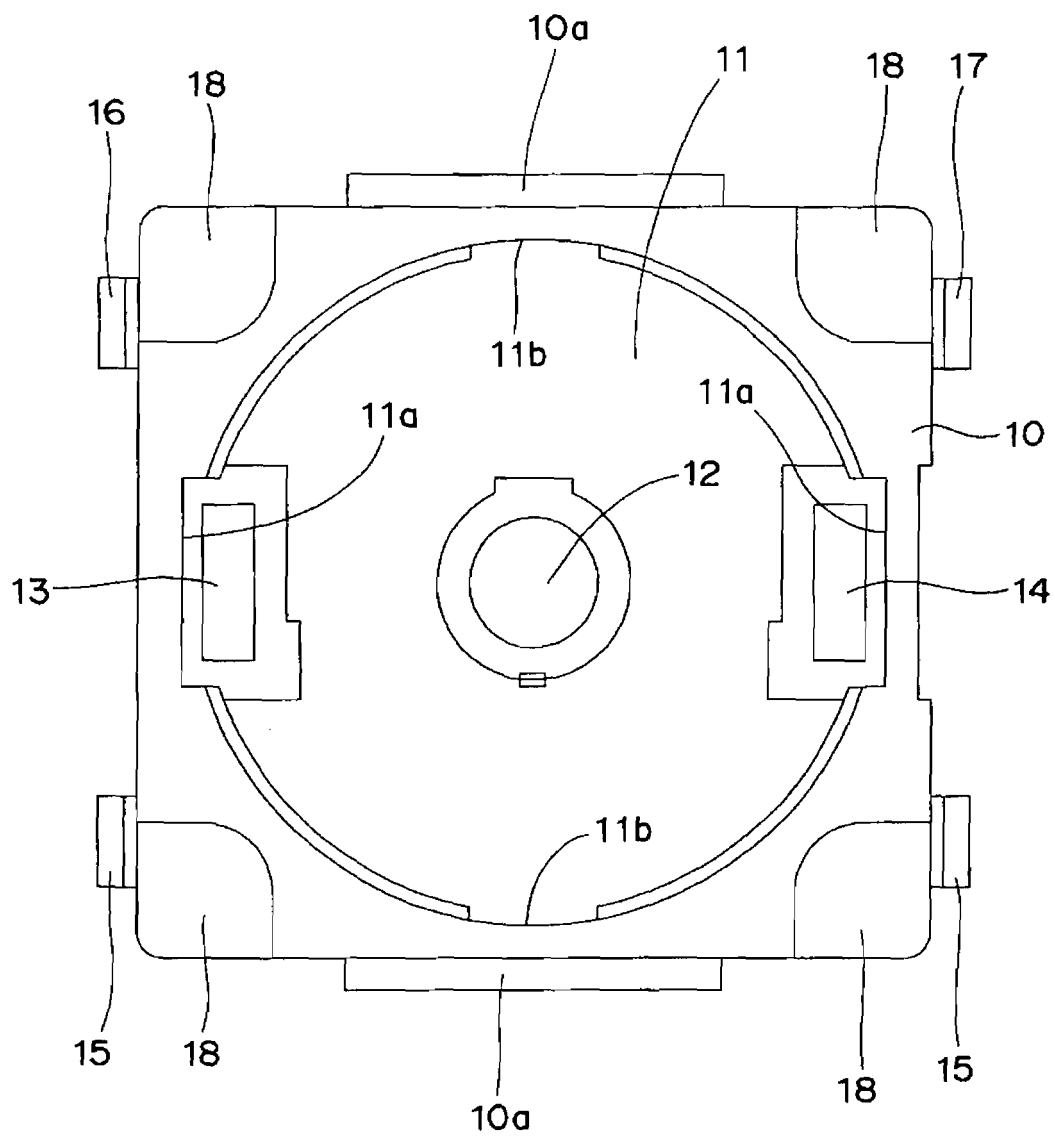


Fig. 4A

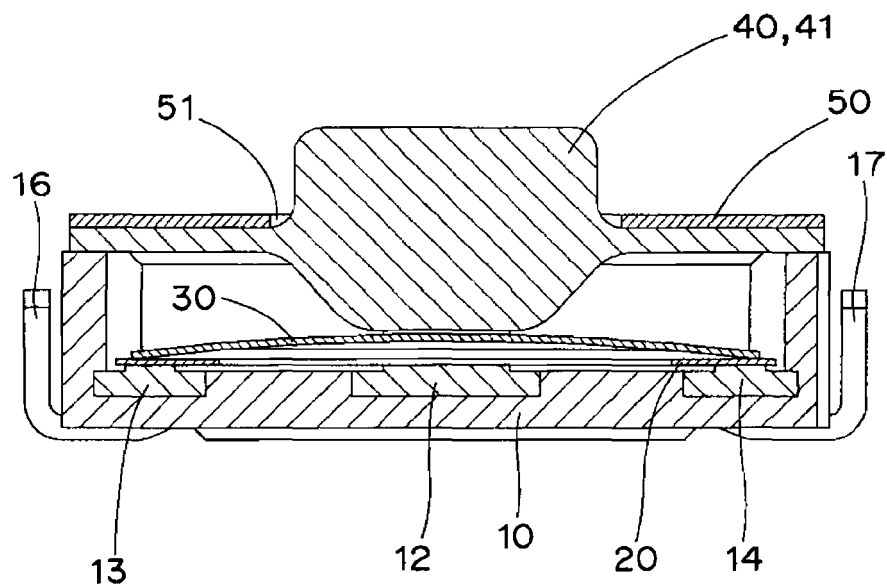


Fig. 4B

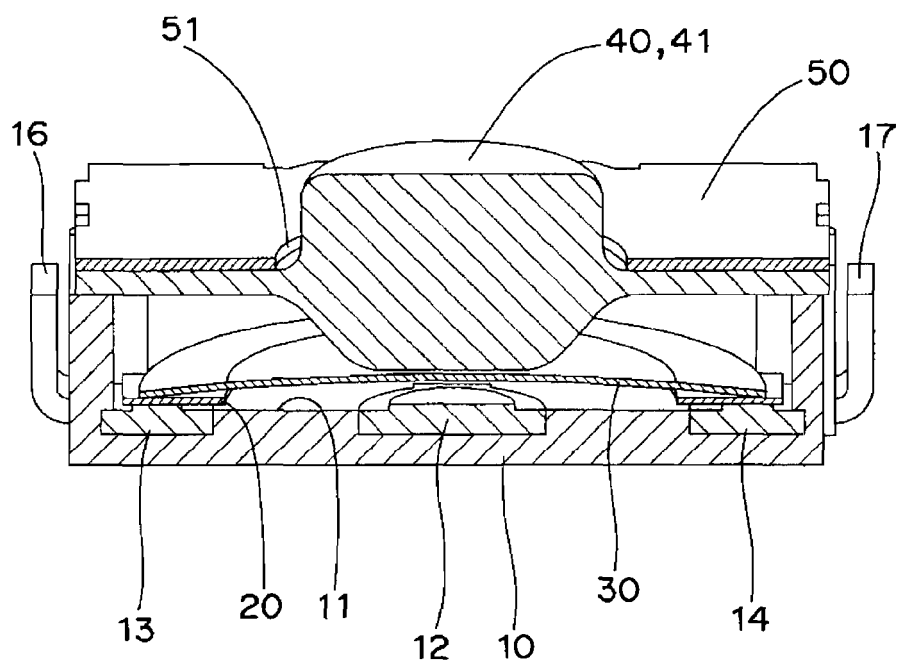


Fig. 5A

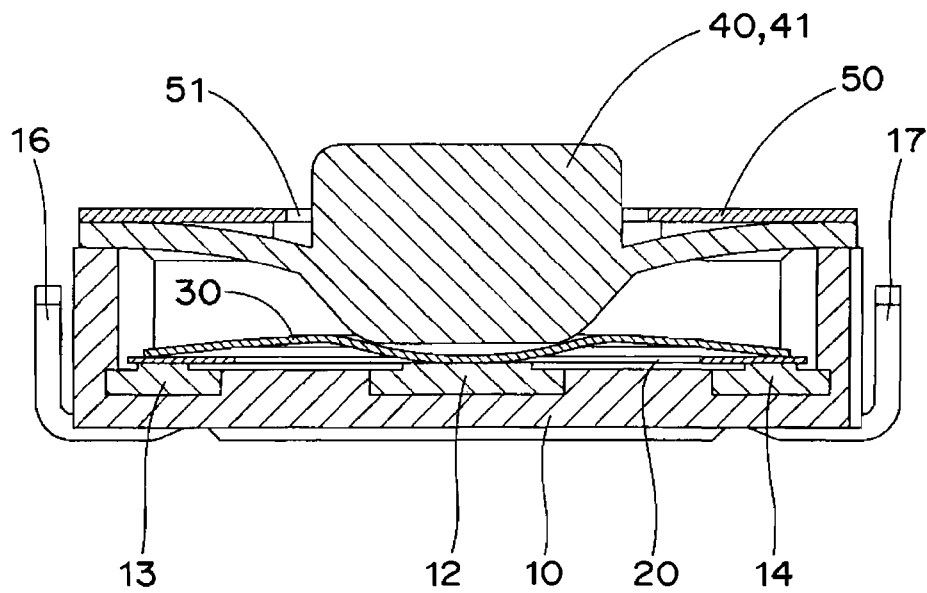


Fig. 5B

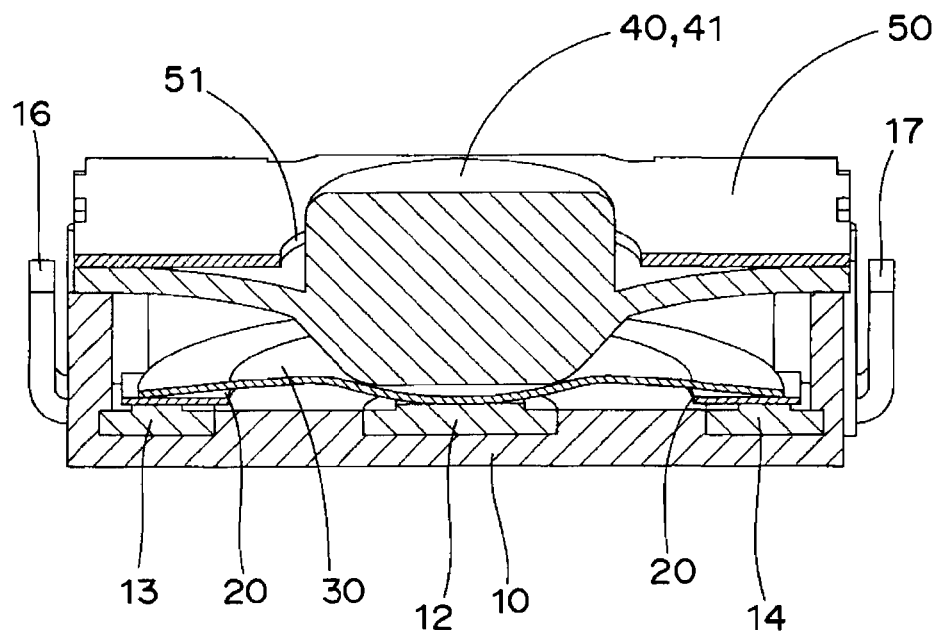
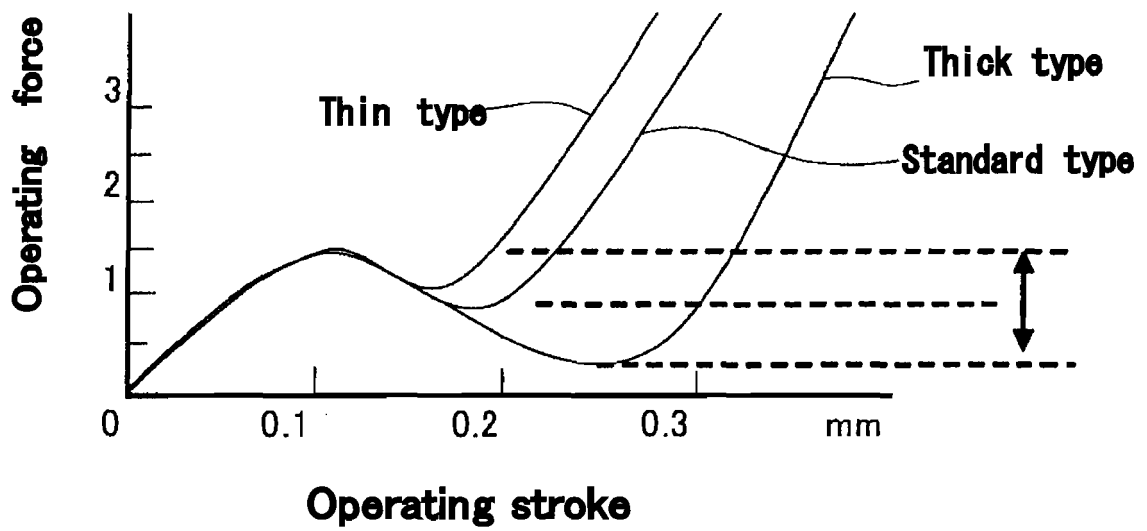


Fig. 6





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 4103

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 January 2008	Examiner Nieto, José Miguel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 11 4103

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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