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(54) **INPUT DEVICE**

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Description

Technical Field

5 [0001] The present disclosure generally relates to an input device, and more particularly relates to an input device for use in various types of electronic devices.

Background Art

10 [0002] Patent Literature 1 discloses a push-on switch (input device). The push-on switch includes a case, a moving contact, and an elastic member. The elastic member includes a cylindrical surrounding portion (frame portion). In a center hole of the surrounding portion, a circular columnar portion (pusher), of which an upper part serves as an operating portion, is coupled via a thin portion (coupling portion) so as to move up and down. A lower end of the surrounding portion is mounted on peripheral edge portions of the moving contact. The circular columnar portion includes, at a lower end surface thereof, a pressing portion, which protrudes downward. The pressing portion is used to press the moving contact.

15 [0003] In the push-on switch of Patent Literature 1, when the circular columnar portion is pushed and moved toward the moving contact, the thin portion pulls, along with the circular columnar portion, the surrounding portion toward the moving contact. This may cause the surrounding portion to be shifted from its predetermined position or have its orientation changed, thus possibly causing the pusher to be held with decreased stability. An input device according to the preamble of claim 1 is disclosed in WO-A-94/10962.

Citation List

25 Patent Literature

Patent Literature 1: JP 2006-120397 A

Summary of Invention

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[0004] The problem is to provide an input device with the ability to hold a pusher with good stability.

[0005] An input device according to the present disclosure is disclosed in claim 1.

Brief Description of Drawings

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[0006]

FIG. 1 is a schematic cross-sectional view illustrating a first state of an input device according to an exemplary embodiment of the present disclosure;

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FIG. 2 is a schematic cross-sectional view illustrating a second state of the input device;

FIG. 3 is a perspective view of the input device;

FIG. 4 is an exploded perspective view of the input device;

FIG. 5 is a plan view of a case of the input device;

FIG. 6 is a perspective view of a pusher and holder of the input device;

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FIG. 7 is a bottom view of the pusher and holder of the input device;

FIG. 8 is a cross-sectional view thereof taken along the plane X1-X1 shown in FIG. 7;

FIG. 9 illustrates an input device according to a comparative example;

FIG. 10 is a bottom view of a pusher and supporting portion of an input device according to a first variation;

FIG. 11 is a cross-sectional view thereof taken along the plane X2-X2 shown in FIG. 10;

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FIG. 12 is a bottom view of a pusher and holder of an input device according to a second variation;

FIG. 13 is a cross-sectional view thereof taken along the plane X3-X3 shown in FIG. 12;

FIG. 14 illustrates an input device according to a third variation;

FIG. 15 illustrates an input device according to a fourth variation;

FIG. 16 is a perspective view of a cover of the input device;

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FIG. 17 is a perspective view of a pusher and holder of the input device;

FIG. 18 is an exploded perspective view of an input device according to a fifth variation; and

FIG. 19 is a schematic cross-sectional view of the input device.

Description of Embodiments

1. Embodiment

1.1. Overview

[0007] FIG. 1 is a schematic cross-sectional view of an input device 1 according to an exemplary embodiment of the present disclosure. The input device 1 includes a case 2, a moving member 3, a pusher 5, and a holder 6. The case 2 has a fixed electrode 7. The moving member 3 has a moving electrode 8. The moving electrode 8 is arranged to face the fixed electrode 7 and displaced with respect to the fixed electrode 7. The pusher 5 is arranged opposite from the fixed electrode 7 with respect to the moving electrode 8. The holder 6 includes a frame portion 62 and a coupling portion 61. The frame portion 62 is gripped by the case 2. The coupling portion 61 couples the pusher 5 to the frame portion 62 inside an opening 620 of the frame portion 62 to allow the pusher 5 to be displaced along the thickness of the frame portion 62. At least one member selected from the group consisting of the case 2 and the holder 6 includes a restricting portion 64. The restricting portion 64 protrudes toward, and comes into contact with, the other member selected from the group consisting of the case 2 and the holder 6, to restrict dragging of the frame portion 62 into the opening 620 of the frame portion 62 via the coupling portion 61 while the pusher 5 is being displaced toward the moving electrode 8.

[0008] In the input device 1 according to this embodiment, in particular, the holder 6 includes a restricting portion 64 protruding from the frame portion 62 toward, and coming into contact with, the case 2.

[0009] In the input device 1 described above, the restricting portion 64 works to cancel the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. This reduces, even if the pusher 5 pulls, along with the coupling portion 61, the frame portion 62 while the pusher 5 is being pushed and moved toward the moving electrode 8, the chances of the frame portion 62 shifting from its predetermined position or changing its orientation. This reduces not only the positional shift of the pusher 5 but also a significant change in a sense of touch given to the person who is operating the pusher 5. This allows the input device 1 to hold the pusher 5 with good stability.

1.2. Details

[0010] Next, the input device 1 according to this embodiment will be described in further detail. FIG. 3 is a perspective view of the input device 1. The input device 1 is a so-called "push switch." The input device 1 may be used in a mobile telecommunications device, onboard equipment for vehicles, consumer electronic appliances, and various other types of electronic devices. The input device 1 may be built in the housing of any of these electronic devices so as to be mounted on a printed wiring board, for example. In that case, an operating button 10 (see FIGS. 1 and 2) serving as an intermediate member, for example, is arranged at a position of the housing where the operating button 10 faces the input device 1. This allows the input device 1 to be operated indirectly via the operating button 10 when the operator pushes the operating button 10.

[0011] As shown in FIG. 4, the input device 1 includes the case 2, the moving member 3, the pusher 5, the holder 6, and conductive members (first and second conductive members) 91, 92.

[0012] The case 2 houses the moving member 3, the pusher 5, the holder 6, and the conductive members 91, 92 as shown in FIGS. 3 and 4. The case 2 includes a body 21 and a cover 22.

[0013] As shown in FIGS. 4 and 5, the body 21 has the shape of a compressed box, which is quadrangular (e.g., square) in a plan view. The body 21 has electrical insulation properties. For example, the body 21 may be made of a synthetic resin. One surface 21a of the body 21 has a recess 210. In this embodiment, the one surface 21a of the body 21 is one surface (e.g., the upper surface in the example illustrated in FIG. 4) along the thickness of the body 21. The recess 210 defines a space to house the moving member 3. A bottom surface 211 of the recess 210 forms part of a mount surface to mount the moving member 3 thereon. As shown in FIG. 5, the recess 210 includes a first space 210a, which has a circular shape in a plan view, and a plurality of (e.g., four in this embodiment) second spaces 210b protruding outward from the first space 210a. The four second spaces 210b are arranged at regular intervals along the circumference of the first space 210a. In addition, the body 21 further includes, on each of the two side surfaces in a first direction (i.e., the upward/downward direction in FIG. 5) perpendicular to the thickness direction, a pair of projections 212. The pair of projections 212 are spaced apart from each other in a second direction (i.e., the rightward/leftward direction in FIG. 5) which is perpendicular to both the thickness of the body 21 and the first direction.

[0014] The cover 22 is attached onto the body 21 so as to partially cover the recess 210 of the body 21 as shown in FIG. 4. The cover 22 is made of a metallic material. The cover 22 includes a plate portion 220. The plate portion 220 has a uniform thickness and has a quadrangular shape (such as a square shape) in a plan view.

[0015] The four sides of the plate portion 220 are provided with a pair of first protruding pieces 231 and another pair of second protruding pieces 232, all of which protrude toward the body 21. The first protruding pieces 231 and the second protruding pieces 232 each have a rectangular plate shape. The two first protruding pieces 231 face each other in a

direction corresponding to the second direction which is defined with respect to the body 21. The two second protruding pieces 232 face each other in a direction corresponding to the first direction which is defined with respect to the body 21. The two first protruding pieces 231 and the two second protruding pieces 232 come into contact with the holder 6, thereby positioning the holder 6 with respect to the case 2 in a plan view. Each of the two second protruding pieces 232 has a pair of hooks 233, each of which protrudes from a tip of the second protruding piece 232. The pair of hooks 233 are spaced apart from each other in a direction corresponding to the second direction which is defined with respect to the body 21. Hooking the pair of hooks 233 of each of the two second protruding pieces 232 onto their associated pair of projections 212 which are provided on an associated one of the two side surfaces in the first direction of the body 21 allows the body 21 and the cover 22 to be joined together.

[0016] In addition, a through hole 24 is provided as a center hole of the plate portion 220 of the cover 22. The through hole 24 is provided to face the recess 210. The through hole 24 is provided to expose the pusher 5. The through hole 24 has a circular shape in a plan view. As can be seen, the cover 22 has the plate portion 220 having the through hole 24 that faces the recess 210 and covering the one surface 21a of the body 21.

[0017] Each of the first conductive member 91 and the second conductive member 92 is made of a material with electrical conductivity (and may be metallic plates in this embodiment). The first conductive member 91 and the second conductive member 92 together form a metallic body 9. The first conductive member 91 and the second conductive member 92 are attached to the body 21 to be out of contact with each other. In this embodiment, in particular, the metallic body 9 (including the first conductive member 91 and the second conductive member 92) is integrated with the body 21 by insert molding. In other words, the body 21 has been insert-molded by using the first conductive member 91 and the second conductive member 92 as insert products.

[0018] The first conductive member 91 includes an electrode (fixed electrode) 7 and a terminal (first terminal) 11 as shown in FIG. 5. The first conductive member 91 includes a portion exposed at (the center of) the bottom surface 211 of the recess 210 of the body 21 and the fixed electrode 7 is provided in that exposed portion. The fixed electrode 7 has a circular shape in a plan view. The first terminal 11 protrudes outward from a side surface of the body 21. For example, the first terminal 11 may be mechanically bonded, and electrically connected, by soldering, to a conductive member on a printed wiring board on which the input device 1 is mounted.

[0019] The second conductive member 92 includes an electrode (supporting electrode) 921 and a terminal (second terminal) 12 as shown in FIG. 5. The supporting electrode 921 has a frame shape. The supporting electrode 921 is exposed on the bottom surface 211 of the recess 210. Specifically, the supporting electrode 921 is exposed in a peripheral region of the bottom surface 211 to avoid contact with the fixed electrode 7 provided in the central area of the bottom surface 211 of the recess 210. The supporting electrode 921 is exposed at least in regions, corresponding to the respective second spaces 210b, of the recess 210. The surface of the supporting electrode 921 is flush with the bottom surface 211 and forms, along with the bottom surface 211, a mount surface. The second terminal 12 protrudes outward from a side surface of the body 21. Specifically, the second terminal 12 protrudes from one side surface, opposite from the first terminal 11, of the body 21. For example, the second terminal 12 may be mechanically bonded, and electrically connected, by soldering, to the conductive member on the printed wiring board on which the input device 1 is mounted.

[0020] The moving member 3 has a circular plate shape as a whole as shown in FIG. 4. The moving member 3 includes an elastically deformable portion 30 and at least one supporting portion (e.g., a plurality of supporting portions in this embodiment) 31. The moving member 3 has electrical conductivity. In this embodiment, the moving member 3 is made of a material with elasticity and the elastically deformable portion 30 and the supporting portions 31 are formed integrally with each other. Examples of materials having elasticity include a metallic plate such as a stainless steel (SUS) plate. Optionally, the metallic plate may be covered (e.g., plated), as needed, with a film of a metal (such as gold or silver) having higher electrical conductivity than the material (such as stainless steel) for the metallic plate.

[0021] The elastically deformable portion 30 has a dome shape. In particular, the elastically deformable portion 30 has a circular shape in a plan view. The elastically deformable portion 30 is a so-called "metallic dome." One surface along the thickness of the elastically deformable portion 30 (i.e., the upper surface thereof in FIG. 4) is a raised surface, of which a central portion constitutes a pressure receiving portion 32. As pressure is applied to the pressure receiving portion 32 of the elastically deformable portion 30, the elastically deformable portion 30 is deformed elastically as shown in FIG. 2, thus giving the operator a sense of click. More specifically, due to this elastic deformation, the central portion of the elastically deformable portion 30 reverses itself from a raised state into a recessed state. In this manner, as pressure is applied to the pressure receiving portion 32, the pressure receiving portion 32 of the elastically deformable portion 30 is elastically deformed to be recessed, thus giving the operator a sense of click. In this embodiment, a portion corresponding to the central portion (pressure receiving portion 32) of the elastically deformable portion 30 serves as the moving electrode 8.

[0022] The plurality of (e.g., four in this embodiment) supporting portions 31 are portions, supported on the mount surface, of the moving member 3. The respective supporting portions 31 protrude from a peripheral portion of the elastically deformable portion 30. In a plan view, the four supporting portions 31 extend radially from the elastically deformable portion 30 (moving electrode 8). These four supporting portions 31 are arranged at regular intervals along

the circumference of the elastically deformable portion 30. As can be seen, the supporting portions 31 are arranged to surround the elastically deformable portion 30. Each of the supporting portions 31 has the shape of a plate, of which the width decreases gradually as the distance to its tip decreases.

[0023] The moving member 3 is housed in the recess 210 of the body 21 and put on the mount surface. In particular, the four supporting portions 31 are arranged on the supporting electrode 921 of the second conductive member 92 so as to be respectively located in the four second spaces 210b of the recess 210. Thus, the moving electrode 8 of the elastically deformable portion 30 is held at a position where the moving electrode 8 faces the fixed electrode 7 of the case 2. Since the elastically deformable portion 30 is elastically deformable, the moving member 3 allows the moving electrode 8 to be displaced with respect to the fixed electrode 7 (see FIGS. 1 and 2).

[0024] The pusher 5 is a member for pressing the pressure receiving portion 32 of the elastically deformable portion 30 of the moving member 3. The pusher 5 has electrical insulation properties. The pusher 5 is made of a material with elasticity. In this embodiment, the pusher 5 is made of rubber. The pusher 5 has a columnar shape. Specifically, the pusher 5 has the shape of a solid column, of which a dimension (diameter) remains the same along the axis thereof, and suitably has the shape of a solid circular column. The pusher 5 is arranged opposite from the fixed electrode 7 with respect to the moving member 3 so as to face the pressure receiving portion 32 of the moving member 3. That is to say, the pusher 5 is arranged opposite from the fixed electrode 7 with respect to the moving electrode 8. In this embodiment, in a normal state, the pusher 5 is out of contact with the moving member 3 and a gap is left between the pusher 5 and the pressure receiving portion 32 of the moving member 3.

[0025] The holder 6 is a member for attaching the pusher 5 to the case 2. The holder 6 has electrical insulation properties. The holder 6 is made of a material with elasticity. In this embodiment, the holder 6 is made of rubber. The pusher 5 and the holder 6 are formed integrally with each other. The holder 6 includes the coupling portion 61, the frame portion 62, and an extended portion 63 as shown in FIGS. 4 and 6.

[0026] The frame portion 62 is a portion, designed to be gripped by the case 2, of the holder 6 as shown in FIGS. 1 and 2. In other words, the frame portion 62 of the holder 6 is a portion to be physically bonded to the case 2. In this embodiment, the frame portion 62 has a rectangular shape and has an opening 620. In this embodiment, the opening 620 has a circular shape. As shown in FIGS. 4 and 6, the frame portion 62 has a first surface 62a and a second surface 62b, which are mutually opposite surfaces in the thickness direction. The frame portion 62 is fixed onto the case 2 with the first surface 62a facing toward the fixed electrode 7 and with the second surface 62b facing away from the fixed electrode 7. Therefore, the first surface 62a is a surface located closer to the fixed electrode 7 and the second surface 62b is a surface located more distant from the fixed electrode 7. The frame portion 62 is sandwiched between the body 21 and the cover 22. That is to say, the frame portion 62 is gripped by the case 2. In other words, the frame portion 62 is physically bonded to the case 2. As used herein, "physical bonding" refers to bonding by a physical technique, not by a chemical technique. Examples of chemical bonding include adhesion and crimping (such as pressure bonding). Examples of physical bonding include clamping and fitting. Optionally, the frame portion 62 may be bonded to the case 2 by physical and chemical techniques in combination. In this embodiment, the frame portion 62 is sandwiched between a part, surrounding the recess 210, of the one surface 21a of the body 21 and a part, surrounding the through hole 24, of the plate portion 220 of the cover 22. The part, surrounding the recess 210, of the one surface 21a of the body 21 is a part (first part), facing the first surface 62a of the frame portion 62, of the case 2. The part, surrounding the through hole 24, of the plate portion 220 of the cover 22 is a part (second part), facing the second surface 62b of the frame portion 62, of the case 2.

[0027] As shown in FIGS. 1 and 2, the coupling portion 61 is a portion for coupling the pusher 5 to the frame portion 62. The coupling portion 61 couples, inside the opening 620 of the frame portion 62, the pusher 5 to the frame portion 62 such that the pusher 5 may be displaced along the thickness of the frame portion 62. As will be described in detail later, the coupling portion 61 deforms itself, thereby making the pusher 5 displaceable along the thickness of the frame portion 62. In particular, the coupling portion 61 reverses itself around its part coupled to the frame portion 62 as a fulcrum (see FIGS. 1 and 2), thereby making the pusher 5 displaceable along the thickness of the frame portion 62. In this embodiment, the coupling portion 61 has the shape of a hollow truncated cone. In a cross-sectional view, the outer side surface of the coupling portion 61 defines a smooth curve with respect to the axial direction. That is to say, the coupling portion 61 has the shape of a truncated cone, of which the outer side surface is narrowed inward compared to the outer side surface of a normal truncated cone with a diameter increasing at a constant rate. The coupling portion 61 has the same thickness along the entire longitudinal axis thereof. The coupling portion 61 extends from an inner side surface of the frame portion 62 toward an outer side surface of the pusher 5 to go away from the fixed electrode 7. That is to say, the coupling portion 61 is coupled, at the outer peripheral portion thereof, to the frame portion 62 to form an integral part of the frame portion 62. In particular, the outer peripheral portion of the coupling portion 61 is coupled integrally to an end portion, located closer to the first surface 62a, of the inner side surface of the frame portion 62. Meanwhile, the coupling portion 61 is integrally coupled, at the inner peripheral portion thereof, to the pusher 5. In particular, the inner peripheral portion of the coupling portion 61 is coupled integrally to a middle portion of the outer side surface of the pusher 5.

[0028] The extended portion 63 is extended toward the fixed electrode 7 from an end portion, coupled to the frame portion 62, of the coupling portion 61 (i.e., a lower end portion thereof in FIG. 1). In particular, the extended portion 63 is formed integrally with the coupling portion 61. Also, the extended portion 63 has a cylindrical shape (e.g., a circular cylindrical shape in this embodiment). The extended portion 63 is small enough to be housed inside the frame portion 62 (i.e., inside the opening 620 of the frame portion 62). As shown in FIGS. 1 and 2, the extended portion 63 is located inside the recess 210 of the body 21 and faces the inner side surface of the recess 210.

[0029] In this embodiment, as the pusher 5 is pressed to be displaced toward the moving electrode 8, the load applied to the coupling portion 61 of the holder 6 increases. Since the outer peripheral portion of the coupling portion 61 is coupled to the frame portion 62, an inner peripheral portion of the coupling portion 61 is pressed, along with the pusher 5, toward the moving electrode 8. As a result, the coupling portion 61 reverses itself around its part coupled to the frame portion 62 as a fulcrum as shown in FIG. 2. That is to say, as the pusher 5 is displaced toward the moving electrode 8, the coupling portion 61 reverses itself around a predetermined part of the holder 6 as a fulcrum, and the predetermined part includes a portion where the coupling portion 61 is coupled to the frame portion 62. In addition, while the coupling portion 61 is reversing itself, the extended portion 63 comes into contact with the inner side surface of the recess 210 (see FIG. 2), thereby helping the coupling portion 61 reverse itself. That is to say, the predetermined part of the holder 6, serving as the fulcrum of reversal of the coupling portion 61, includes a corner portion between the frame portion 62 and the extended portion 63. Once the pusher 5 stops being pressed, the coupling portion 61 exerts its elastic force to recover the original state (see FIG. 1) from the reversed state (see FIG. 2). Thus, the pusher 5 is displaced away from the moving electrode 8. As can be seen, the coupling portion 61 of the holder 6 is coupled to the frame portion 62 such that the pusher 5 is displaceable along the thickness of the frame portion 62 inside the frame portion 62 (i.e., inside the opening 620).

[0030] As can be seen, while the pusher 5 is being displaced, the coupling portion 61 is deformed. Thus, while the pusher 5 is being displaced toward the moving electrode 8, a moment of force that reverses the coupling portion 61 is produced in the coupling portion 61. In addition, the pusher 5 pulls not only the coupling portion 61 but also the frame portion 62 toward the moving electrode 8. Therefore, a moment of force that reverses the coupling portion 61 is also produced in the frame portion 62. This could cause the frame portion 62 to be shifted from its predetermined position or could also cause the frame portion 62 to change its orientation. Such positional shift or orientation change of the frame portion 62 could cause the pusher 5 to shift from its predetermined position or cause a significant change in a sense of touch given to the person who is operating the input device 1.

[0031] Thus, to overcome such a problem, the holder 6 includes a restricting portion 64. As shown in FIGS. 6 and 7, the restricting portion 64 is provided on the first surface 62a of the frame portion 62. The restricting portion 64 is implemented as a rib protruding from the first surface 62a of the frame portion 62 toward (the one surface 21a of) the body 21. As shown in FIG. 8, a cross section of the restricting portion 64 as taken along a plane perpendicular to the longitudinal axis thereof has the shape of a triangle with a rounded vertex. Thus, the restricting portion 64 has sloped surfaces which are sloped with respect to a surface that the restricting portion 64 faces (namely, a sloped surface facing toward an outer edge of the frame portion 62 and a sloped surface facing toward an inner edge of the frame portion 62). In addition, the restricting portion 64 surrounds the opening 620 of the frame portion 62 around its entire circumference as shown in FIG. 7. More specifically, the restricting portion 64 has a rectangular frame shape in a plan view but has a tapered corner portion.

[0032] The restricting portion 64 protrudes from the holder 6 toward, and comes into contact with, the case 2, thereby reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. That is to say, when the frame portion 62 is pulled inward by the coupling portion 61, a moment of force that reverses the coupling portion 61 is produced. However, pressing the restricting portion 64 against the one surface 21a of the body 21 causes a moment of force, of which the direction is opposite from that of the moment of force that reverses the coupling portion 61, to be produced around the fulcrum. This reduces, even if the pusher 5 pulls the frame portion 62 along with the coupling portion 61 while being pressed and displaced toward the moving electrode 8, the chances of the frame portion 62 being dragged. This reduces the positional shift and orientation change of the frame portion 62, thus eventually reducing the positional shift of the pusher 5 and the change in a sense of touch given to the operator of the input device 1. This allows the input device 1 to hold the pusher 5 with good stability.

[0033] In particular, on the first surface 62a of the frame portion 62, the restricting portion 64 is located closer to the inner edge of the frame portion 62 than to the outer edge of the frame portion 62 as shown in FIGS. 7 and 8. In this embodiment, the centerline C2 of the restricting portion 64 is located closer to the inner edge of the frame portion 62 (i.e., closer to the opening 620) than the centerline C1 of the frame portion 62 is, as shown in FIG. 8. Thus, the restricting portion 64 protrudes from the frame portion 62 toward the case 2 to come into contact with, and be compressed by, the case 2 at a point closer to the opening 620 of the frame portion 62 than the middle of the frame portion 62 is. As used herein, the "middle of the frame portion 62" does not refer to the center of the entire frame portion 62 but refers to the middle of the width of its portion surrounding the opening 620. This further reduces, compared to a situation where the restricting portion 64 is located, on the first surface 62a, closer to the outer edge of the frame portion 62 than to the inner

edge thereof, the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8.

[0034] Furthermore, as shown in FIG. 8, the restricting portion 64 is asymmetric along its width. In other words, the vertex 64a of the restricting portion 64 is not located on the centerline C2 thereof. In this embodiment, the vertex 64a is located closer to the inner edge (i.e., the opening 620) of the frame portion 62 than the centerline C2 thereof is. That is to say, in the restricting portion 64 itself, the outer surface thereof is sloped more gently than the inner surface thereof. The restricting portion 64 comes into contact with a first part (i.e., a part, surrounding the recess 210, of the one surface 21a of the body 21) of the case 2 at a point (i.e., the vertex 64a) closer to the inner edge of the frame portion 62 than to the outer edge thereof. This reduces, compared to a situation where the restricting portion 64 comes into contact with the body 21 at a point closer to the outer edge of the frame portion 62 than to the inner edge thereof, the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. In addition, if the restricting portion 64 is made of rubber, then the restricting portion 64 itself is compressed to the greater degree on its inner edge than on its outer edge. This configuration is effectively applicable to a situation where the frame portion 62 is dragged into the opening 620 of the frame portion 62 so as to move inward while rotating itself via the coupling portion 61.

[0035] Furthermore, the restricting portion 64 forms part of the holder 6, and therefore, is made of rubber. That is to say, the restricting portion 64 has elasticity. In addition, the restricting portion 64 surrounds the opening 620 of the frame portion 62 around its entire circumference and comes into contact with a part, surrounding the recess 210, of the one surface 21a of the body 21. This allows the restricting portion 64 to serve as a seal between the frame portion 62 and the body 21. This allows the gap between the frame portion 62 and the case 2 to be closed, thus contributing to increasing the degree of airtightness inside the input device 1. In particular, the restricting portion 64 has a rectangular frame shape in a plan view but has a tapered corner portion. This facilitates compressing the restricting portion 64 uniformly around its entire circumference, thus allowing the frame portion 62 to be bonded to the case 2 with good stability.

[0036] FIG. 9 illustrates a holder 600 according to a comparative example. This holder 600 has no restricting portion 64, which is a major difference from the holder 6. In this holder 600, when pushed, the pusher 5 pulls the frame portion 62, along with the coupling portion 61, thus possibly causing the frame portion 62 to be dragged into the moving electrode 8. That is to say, while the pusher 5 is being displaced toward the moving electrode 8, the frame portion 62 could be dragged into the opening 620 thereof via the coupling portion 61. As used herein, "dragging of the frame portion 62 into the opening 620 thereof" refers to the displacement of a part, surrounding the opening 620, of the frame portion 62 toward the opening 620. This could cause the frame portion 62 to shift from its predetermined position or change its orientation. An exemplary change in the orientation of the frame portion 62 may be an inward tilt of the frame portion 62 as indicated by the two-dot chain in FIG. 9. That is to say, the frame portion 62 may turn from a state where the thickness of the frame portion 62 is parallel to the thickness of the case 2 into a state where the thickness of the frame portion 62 is tilted with respect to the thickness of the case 2. In that case, a gap could be left between the frame portion 62 and the plate portion 220 or the pusher 5 could shift from its predetermined position. In contrast, in the input device 1 according to this embodiment, providing the restricting portion 64 for the holder 6 reduces the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. In other words, the restricting portion 64 restricts dragging of the frame portion 62 into the opening 620 via the coupling portion 61 while the pusher 5 is being displaced toward the moving electrode 8. This allows the input device 1 according to this embodiment to reduce the positional shift and orientation change of the frame portion 62 compared to the comparative example shown in FIG. 9 (see FIG. 2).

1.3. Operation

[0037] Next, it will be described how the input device 1 operates. The input device 1 assumes either the first state shown in FIG. 1 or the second state shown in FIG. 2. In the first state, the elastically deformable portion 30 of the moving member 3 is not elastically deformed to keep the moving electrode 8 out of contact with the fixed electrode 7. Thus, in the first state, the first terminal 11 and the second terminal 12 are not electrically conductive with each other. In the second state, on the other hand, the elastically deformable portion 30 of the moving member 3 is elastically deformed to bring the moving electrode 8 into contact with the fixed electrode 7. Thus, in the second state, the first terminal 11 and the second terminal 12 are electrically conductive with each other. Therefore, the first state and the second state may be called an OFF state and an ON state, respectively.

[0038] To turn the input device 1 from the first state into the second state, the operator needs to press the pusher 5 with at least certain force. This causes the pressure receiving portion 32 of the moving member 3 to be pressed via the pusher 5 toward the mount surface. Consequently, the elastically deformable portion 30 of the moving member 3 goes gradually deformed. Thereafter, when the magnitude of the force that presses the elastically deformable portion 30 exceeds a certain value, the elastically deformable portion 30 is buckled with momentum to be deformed significantly (see FIG. 2). Such reversal of the elastically deformable portion 30 gives the operator who is pressing the pusher 5 a sense of click as the elastically deformable portion 30 is elastically deformed. When the elastically deformable portion 30 is deformed as described above, the moving electrode 8 comes into contact with the fixed electrode 7 as shown in FIG. 2, thus making the first terminal 11 and the terminal 12 electrically conductive with each other. Consequently, the

input device 1 turns into the second state.

[0039] To turn the input device 1 from the second state into the first state, the operator just needs to stop pressing the pusher 5. When the pusher 5 is no longer pressed, the elastically deformable portion 30 recovers its original shape by restitution. When the elastically deformable portion 30 recovers its original shape, the moving electrode 8 goes out of contact with the fixed electrode 7 as shown in FIG. 1, thus making the first terminal 11 and the second terminal 12 electrically non-conductive with each other. Consequently, the input device 1 turns into the first state.

2. Variations

[0040] Note that the embodiment described above is only an exemplary one of various embodiments of the present disclosure and should not be construed as limiting. Rather, the exemplary embodiment may be readily modified in various manners depending on a design choice or any other factor without departing from the scope of the present disclosure. Next, variations of the exemplary embodiment will be enumerated one after another.

[0041] For example, the shapes of the case 2 and the holder 6 are not limited to the ones adopted for the exemplary embodiment described above.

2.1. First variation

[0042] FIG. 10 illustrates a holder 6A for an input device according to a first variation. The holder 6A includes a restricting portion 64A, which is different from the restricting portion 64 of the holder 6.

[0043] The restricting portion 64A is provided for the first surface 62a of the frame portion 62 as shown in FIG. 10. The restricting portion 64A is implemented as a rib protruding from the first surface 62a of the frame portion 62 toward the body 21. As shown in FIG. 11, a cross section of the restricting portion 64A as taken along a plane perpendicular to the longitudinal axis thereof has a fan shape. Thus, the restricting portion 64 has a sloped surface (e.g., a raised curved surface) which is sloped with respect to a surface that the restricting portion 64A faces. In addition, the restricting portion 64A surrounds the opening 620 of the frame portion 62 around its entire circumference as shown in FIG. 10. More specifically, the restricting portion 64A has a rectangular frame shape in a plan view but has a corner portion with curvature.

[0044] Note that on the first surface 62a of the frame portion 62, the restricting portion 64A is located closer to the outer edge of the frame portion 62 than to the inner edge of the frame portion 62. That is to say, the centerline of the restricting portion 64A is located closer to the outer edge of the frame portion 62 than the centerline of the frame portion 62 is. Furthermore, as shown in FIG. 11, the restricting portion 64A is asymmetric along its width. In other words, the vertex of the restricting portion 64A is not located on its centerline. In this variation, the vertex of the restricting portion 64A is located closer to the inner edge (i.e., the opening 620) of the frame portion 62 than the centerline thereof is.

[0045] The restricting portion 64A described above, as well as the restricting portion 64, protrudes from the holder 6 toward, and comes into contact with, the case 2, thus reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. This reduces, even if the pusher 5 pulls the frame portion 62 along with the coupling portion 61 while the pusher 5 is being pressed and moved toward the moving electrode 8, the chances of the frame portion 62 being dragged. Thus, according to this first variation, the pusher 5 may be held with good stability.

[0046] Also, the restricting portion 64A has a rectangular frame shape in a plan view but has a tapered corner portion. This facilitates compressing the restricting portion 64A uniformly, thus allowing the frame portion 62 to be bonded to the case 2 with good stability.

2.2. Second variation

[0047] FIG. 12 illustrates a holder 6B for an input device according to a second variation. The holder 6B includes restricting portions 641B, 642B, which are different from the restricting portion 64 of the holder 6. That is to say, the holder 6B includes two restricting portions 641B, 642B.

[0048] The restricting portions 641B, 642B are provided for the first surface 62a of the frame portion 62 as shown in FIG. 12. Each of the restricting portions 641B, 642B is implemented as a rib protruding from the first surface 62a of the frame portion 62 toward the body 21. The restricting portions 641B, 642B surround the opening 620 of the frame portion 62 around its entire circumference as shown in FIG. 12. More specifically, the restricting portions 641B, 642B have, in a plan view, the shapes of rectangular frames of different sizes. Specifically, in this variation, the restricting portion 641B is smaller than, and located inside, the restricting portion 642B.

[0049] In addition, on the first surface 62a of the frame portion 62, the restricting portion 641B is located closer to the inner edge of the frame portion 62 than to the outer edge of the frame portion 62 as shown in FIG. 13. That is to say, the centerline of the restricting portion 641B is located closer to the inner edge of the frame portion 62 than the centerline of the frame portion 62 is. As shown in FIG. 13, the restricting portion 641B is symmetric along its width. In other words, the vertex of the restricting portion 641B is located on its centerline. On the other hand, on the first surface 62a of the

frame portion 62, the restricting portion 642B is located closer to the outer edge of the frame portion 62 than to the inner edge of the frame portion 62. That is to say, the centerline of the restricting portion 642B is located closer to the outer edge of the frame portion 62 than the centerline of the frame portion 62 is. As shown in FIG. 13, the restricting portion 642B is asymmetric along its width. In other words, the vertex of the restricting portion 642B is not located on its centerline. In this variation, the vertex of the restricting portion 642B is located closer to the outer edge of the frame portion 62 than the centerline thereof is.

[0050] The restricting portions 641B, 642B described above, as well as the restricting portion 64, protrude from the holder 6 toward, and come into contact with, the case 2, thus reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. This reduces, even if the pusher 5 pulls the frame portion 62 along with the coupling portion 61 while being pressed and moved toward the moving electrode 8, the chances of the frame portion 62 being dragged. Thus, according to this second variation, the pusher 5 may also be held with good stability.

[0051] In addition, the restricting portions 641B, 642B, as well as the restricting portion 64, may serve as a seal between the frame portion 62 and the body 21. This allows the gap between the frame portion 62 and the case 2 to be closed, thus contributing to increasing the degree of airtightness inside the input device 1. In particular, the holder 6B includes the plurality of restricting portions (namely, the two restricting portions 641B, 642B), thus increasing the creepage distance of the holder 6B and thereby further increasing the degree of airtightness.

2.3. Third variation

[0052] FIG. 14 illustrates a holder 6C for an input device according to a third variation. The holder 6C includes a restricting portion 64C, which is different from the restricting portion 64 of the holder 6.

[0053] The restricting portion 64C is provided for the second surface 62b of the frame portion 62 as shown in FIG. 14. The restricting portion 64C is implemented as a rib protruding from the second surface 62b of the frame portion 62 toward the cover 22 (more specifically, a surface, facing the body 21, of the plate portion 220 of the cover 22). Just like the restricting portion 64, a cross section of the restricting portion 64C as taken along a plane perpendicular to the longitudinal axis thereof has the shape of a triangle with a rounded vertex. In addition, the restricting portion 64C, as well as the restricting portion 64, surrounds the opening 620 of the frame portion 62 around its entire circumference.

[0054] The restricting portion 64C protrudes from the holder 6 toward, and comes into contact with, the case 2, thereby reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. That is to say, when the frame portion 62 is pulled inward by the coupling portion 61, a moment of force that reverses the coupling portion 61 is produced. However, pressing the restricting portion 64C against the plate portion 220 of the cover 22 causes a moment of force, of which the direction is opposite from that of the moment of force that reverses the coupling portion 61, to be produced around the fulcrum. This reduces, even if the pusher 5 pulls the frame portion 62 along with the coupling portion 61 while being pressed and displaced toward the moving electrode 8, the chances of the frame portion 62 being dragged. This reduces the positional shift and orientation change of the frame portion 62, thus eventually reducing the positional shift of the pusher 5 and the change in a sense of touch given to the operator of the input device 1. Thus, the third variation allows the pusher 5 to be held with good stability.

[0055] In particular, on the second surface 62b of the frame portion 62, the restricting portion 64C is located closer to the outer edge of the frame portion 62 than to the inner edge of the frame portion 62. In this variation, the centerline of the restricting portion 64C is located closer to the outer edge of the frame portion 62 than the centerline of the frame portion 62 is. This further reduces, compared to a situation where the restricting portion 64C is located, on the second surface 62b, closer to the inner edge of the frame portion 62 than to the outer edge thereof, the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8.

[0056] Furthermore, the restricting portion 64C is asymmetric along its width. In other words, the vertex of the restricting portion 64C is not located on its centerline. In this variation, the vertex of the restricting portion 64C is located closer to the outer edge of the frame portion 62 than the centerline thereof is. Thus, the restricting portion 64C comes into contact with a second part (i.e., a part, surrounding the through hole 24, of the plate portion 220 of the cover 22) of the case 2 at a point (i.e., the vertex) closer to the outer edge of the frame portion 62 than to the inner edge thereof. This reduces, compared to a situation where the restricting portion 64C comes into contact with the cover 22 at a point closer to the inner edge of the frame portion 62 than to the outer edge thereof, the force applied the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8.

2.4. Fourth variation

[0057] FIG. 15 illustrates a case 2D and holder 6D of an input device according to a fourth variation.

[0058] The case 2D includes a cover 22D, which is different from the cover 22 of the case 2. The cover 22D further includes restricting portions 25. The restricting portions 25 protrude from the cover 22D of the case 2D toward, and come

into contact with, the frame portion 62 of the holder 6D. More specifically, the cover 22D includes restricting portions 251, each of which is provided for an associated one of two first protruding pieces 231, and restricting portions 252, each of which is provided for an associated one of two second protruding pieces 232 as shown in FIG. 16. In the following description, when there is no need to distinguish the restricting portions 251, 252 from each other, the restricting portions 251, 252 will be hereinafter collectively referred to as "restricting portions 25." Each restricting portion 251 is a rib protruding from a surface, facing the holder 6D, of an associated first protruding piece 231. The restricting portion 251 extends along the entire length of its associated first protruding piece 231. Also, the restricting portion 251 is provided for a base end portion (i.e., a portion closer to the plate portion 220) of its associated first protruding piece 231. Each restricting portion 252 is a rib protruding from a surface, facing the holder 6D, of an associated second protruding piece 232. The restricting portion 252 extends along the entire length of its associated second protruding piece 232. Also, the restricting portion 252 is provided for a base end portion (i.e., a portion closer to the plate portion 220) of its associated second protruding piece 232. Each restricting portion 25 has a flat surface facing away from the plate portion 220. In addition, the restricting portions 25 form integral parts of the case 2D.

[0059] The holder 6D includes a restricting portion 64D, which is different from the restricting portion 64 of the holder 6. The restricting portion 64D protrudes from the frame portion 62 of the holder 6D toward, and comes into contact with, the cover 22D of the case 2D. More specifically, as shown in FIG. 17, the restricting portion 64D is provided for an outer side surface of the frame portion 62. The restricting portion 64D is implemented as a rib protruding outward from the outer side surface of the frame portion 62. The restricting portion 64D is provided for a part, located closer to the first surface 62a, of the outer side surface of the frame portion 62. In particular, the restricting portion 64D is provided for the frame portion 62 so as to avoid contact with the restricting portions 25 in a direction perpendicular to the thickness of the frame portion 62. In addition, the restricting portion 64D has a flat surface facing the opposite direction from the first surface 62a of the frame portion 62. Furthermore, the restricting portion 64D surrounds the opening 620 of the frame portion 62 around its entire circumference.

[0060] In this variation, each restricting portion 25 is in contact with an associated outer side surface of the frame portion 62, thus reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. In addition, the restricting portion 64D is in contact with the respective surfaces, facing the holder 6D, of the two first protruding pieces 231 and the two second protruding pieces 232, thus reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. Furthermore, the restricting portions 25 and the restricting portion 64D face each other and are in contact with each other along the thickness of the frame portion 62. This further reduces the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. When the frame portion 62 is pulled inward by the coupling portion 61, a moment of force that reverses the coupling portion 61 is produced. However, the restricting portions 25 are pressed against the outer side surfaces of the frame portion 62, the restricting portion 64D is pressed against the cover 22D, and the restricting portions 25, 64D are pressed against each other. Thus, the restricting portions 25, 64D produce a moment of force, of which the direction is opposite from that of the moment of force that reverses the coupling portion 61, around the fulcrum. This reduces, even if the pusher 5 pulls the frame portion 62 along with the coupling portion 61 while the pusher 5 is being pressed and displaced toward the moving electrode 8, the chances of the frame portion 62 being dragged. This reduces the positional shift and orientation change of the frame portion 62, thus eventually reducing the positional shift of the pusher 5 and the change in a sense of touch given to the operator of the input device 1. Thus, the fourth variation allows the pusher 5 to be held with good stability.

2.5. Fifth variation

[0061] FIGS. 18 and 19 illustrate an input device 1E according to a fifth variation.

[0062] As shown in FIG. 18, the input device 1E includes a case 2E, the moving member 3, the pusher 5, a holder 6E, the conductive members (first and second conductive members) 91, 92, and an insulating sheet 26.

[0063] As shown in FIGS. 18 and 19, the case 2E houses the moving member 3, the pusher 5, the holder 6E, the conductive members 91, 92, and the insulating sheet 26. The case 2E includes a body 21E and the cover 22.

[0064] The body 21E has a step portion 213, which is a difference from the body 21. The step portion 213 is provided around the circumference for the inner walls, forming the recess 210, of the body 21E. In this variation, the space, surrounded with the step portion 213, of the recess 210 serves as the space where the fixed electrode 7 and the moving electrode 8 are arranged, namely, the first space 210a and the four second spaces 210b. One surface (i.e., the upper surface in FIG. 18) 213a of the step portion 213 is at a level lower by a predetermined height than the top surface (i.e., the one surface 21a) of the body 21E. In addition, the height dimension (i.e., a dimension as measured in the upward/downward direction) of the step portion 213 is the same around the circumference. On the one surface 213a of the step portion 213, mounted are outer peripheral edges of the insulating sheet 26. The one surface 213a of the step portion 213 may have any width dimension (i.e., a dimension as measured in the rightward/leftward direction) large enough to mount the outer peripheral edges of the insulating sheet 26 thereon.

[0065] The insulating sheet 26 has the shape of a rectangle, of which the area is large enough to cover the first space 210a and four second spaces 210b of the recess 210. The insulating sheet 26 is made of a material with electrical insulation properties. The insulating sheet 26 is suitably made of a material having resistance to a gas such as sulfur dioxide (SO₂) gas. Examples of materials for the insulating sheet 26 include resin materials such as polytetrafluoroethylene (PTFE). Alternatively, the insulating sheet 26 may also be made of a material having gas resistance such as nylon 9T or a polyimide resin.

[0066] A pressure sensitive adhesive is applied onto the entire lower surface of the insulating sheet 26. Thus, mounting the outer peripheral edges of the insulating sheet 26 on the upper surface of the step portion 213 allows the insulating sheet 26 to be affixed onto the upper surface of the step portion 213 with the pressure sensitive adhesive and held by the case 2.

[0067] As shown in FIGS. 18 and 19, the holder 6E includes the coupling portion 61, the frame portion 62, and a restricting portion 64E.

[0068] As shown in FIG. 19, the restricting portion 64E is provided for the first surface 62a of the frame portion 62. The restricting portion 64E protrudes from the first surface 62a of the frame portion 62 toward the body 21E (more specifically, toward the one surface 213a of the step portion 213 of the body 21E). In particular, the restricting portion 64E forms an integral part of the frame portion 62. In addition, as shown in FIG. 19, the restricting portion 64E has a triangular cross section, which is taken along a plane perpendicular to the longitudinal axis thereof. Furthermore, the restricting portion 64E surrounds the opening 620 of the frame portion 62 around its entire circumference. Thus, the restricting portion 64E has a cylindrical shape. The restricting portion 64E is small enough to be housed inside the recess 210 but is too large to be housed inside the space surrounded with the step portion 213 (i.e., the space including the first space 210a and the four second spaces 210b).

[0069] The holder 6E is arranged on the one surface 213a of the step portion 213 of the body 21E as shown in FIG. 19. More specifically, the holder 6E is supported on the one surface 213a of the step portion 213 via the restricting portion 64E. Also, mounting the cover 22 onto the body 21E causes the frame portion 62 and restricting portion 64E of the holder 6E to be sandwiched between the one surface 213a of the step portion 213 of the body 21E and a part, surrounding the through hole 24, of the plate portion 220 of the cover 22. The one surface 213a of the step portion 213 of the body 21E is a part (first part), facing the first surface 62a of the frame portion 62, of the case 2E. Meanwhile, the part, surrounding the through hole 24, of the plate portion 220 of the cover 22D is a part (second part), facing the second surface 62b of the frame portion 62, of the case 2E.

[0070] The restricting portion 64E protrudes from the holder 6E toward, and comes into contact with, the case 2E, thereby reducing the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8. That is to say, when the frame portion 62 is pulled inward by the coupling portion 61, a moment of force that reverses the coupling portion 61 is produced. However, pressing the restricting portion 64E against the one surface 213a of the step portion 213 of the body 21E makes the restricting portion 64E produce a moment of force, of which the direction is opposite from that of the moment of force that reverses the coupling portion 61, around the fulcrum. This reduces, even if the pusher 5 pulls the frame portion 62 along with the coupling portion 61 while being pressed and displaced toward the moving electrode 8, the chances of the frame portion 62 being dragged. This reduces the positional shift and orientation change of the frame portion 62, thus eventually reducing the positional shift of the pusher 5 and the change in a sense of touch given to the operator of the input device 1E. Thus, the input device 1E may hold the pusher 5 with good stability. In addition, according to this variation, the restricting portion 64E is arranged to come into contact with the inner edges of the step portion 213. That is to say, the restricting portion 64E is arranged to come into contact with corners of the step portion 213. This further reduces the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8.

[0071] Furthermore, the insulating sheet 26 is interposed between the restricting portion 64E and the step portion 213. Thus, the insulating sheet 26 affixed onto the step portion 213 is pressed downward by the restricting portion 64E that forms an integral part of the pusher 5. The restricting portion 64E has its height dimension (i.e., a dimension as measured in the upward/downward direction) defined to allow a lower end of the restricting portion 64E to apply predetermined pressure to a corresponding region of the insulating sheet 26. According to this configuration, the restricting portion 64E presses the outer peripheral edges of the insulating sheet 26, thus reducing the chances of the insulating sheet 26 being dragged into the space where the fixed electrode 7 and the moving electrode 8 are arranged (i.e., the space including the first space 210a and the four second spaces 210b). In addition, the first space 210a and four second spaces 210b of the recess 210 are hermetically sealed with the insulating sheet 26. Thus, this variation achieves the advantages of preventing a gas such as sulfur dioxide gas from flowing externally into the first space 210a and the four second spaces 210b, thereby reducing the chances of the fixed electrode 7 and the moving electrode 8 being affected by the gas.

[0072] As a pressure sensitive adhesive for the insulating sheet 26, a pressure sensitive adhesive made of a resin such as an acrylic pressure sensitive adhesive or a silicone pressure sensitive adhesive may be adopted. Such a pressure sensitive adhesive made of a resin ordinarily tends to soften under an environment with a relatively high temperature. If the input device 1E is mounted onto a printed wiring board of an electronic device by reflow soldering, for example,

then the pressure sensitive adhesive of the insulating sheet 26 could soften. In this input device 1E, however, the outer peripheral edges of the insulating sheet 26 are pressed by the restricting portion 64E against the step portion 213. Thus, even if the pressure sensitive adhesive of the insulating sheet 26 softens, the insulating sheet 26 is hardly peelable from the step portion 213, thereby facilitating keeping the space where the fixed electrode 7 and the moving electrode 8 are arranged (i.e., the first space 210a and the four second spaces 210b) hermetically sealed. This allows the input device 1E to be mounted onto the electronic device with the fixed electrode 7 and the moving electrode 8 much less affected by the gas.

[0073] Note that from the standpoint of keeping the space where the fixed electrode 7 and the moving electrode 8 are arranged (i.e., the first space 210a and the four second spaces 210b) hermetically sealed, the pressure sensitive adhesive is suitably applied onto the entire lower surface of the insulating sheet 26. Nevertheless, the pressure sensitive adhesive has only to be applied onto at least a region, designed to overlap with the step portion 213, of the lower surface of the insulating sheet 26.

[0074] Optionally, in an implementation in which the pressure sensitive adhesive is applied onto the entire lower surface of the insulating sheet 26, another insulating sheet may be attached to a central region of the lower surface of the insulating sheet 26. This prevents, while the input device 1E is being operated, the pressure sensitive adhesive applied to the insulating sheet 26 from adhering to another member (such as the moving electrode 8).

[0075] Alternatively, instead of using the pressure sensitive adhesive, the insulating sheet 26 may also be held by the case 2E by being welded onto the step portion 213. Examples of welding methods include welding using a laser beam and welding using an ultrasonic wave.

2.6. Other variations

[0076] The shape of the restricting portion does not have to be any one of the exemplary shapes described for the exemplary embodiment and its variations. The restricting portion does not have to be a rib protruding from at least one of respective surfaces, facing each other, of the case and the holder but may also be a sloped surface formed by making at least one of those surfaces sloped. That is to say, the restricting portion may be provided by making one of the respective surfaces, facing each other, of the case and the holder sloped with respect to the other. In addition, the position of the restricting portion does not have to be any one of the exemplary positions described for the exemplary embodiment and its variations. Furthermore, the restricting portion does not have to be provided for the holder 6 but may also be provided for the case 2. The number of the restricting portion(s) provided does not have to be one but may also be two or more. In short, in the input device 1, at least one member selected from the group consisting of the case 2 and the holder 6 needs to include a restricting portion 64 which protrudes toward, and comes into contact with, the other member and which reduces the force applied to the frame portion 62 while the pusher 5 is being displaced toward the moving electrode 8.

[0077] Furthermore, the respective shapes of the case 2, the moving member 3, the pusher 5, the holder 6, the first conductive member 91, and the second conductive member 92 do not have to be the shapes described for the exemplary embodiment and its variations.

[0078] In one variation, in a plan view, the case 2 does not have to have a circular or quadrangular shape but may also have any other polygonal shape.

[0079] In another variation, the elastically deformable portion 30 of the moving member 3 does not have to be made of a metallic material but may also be made of a resin. Also, the elastically deformable portion 30 does not have to have a dome shape but may also have any other elastically deformable shape that gives the operator a sense of click.

[0080] Furthermore, the number of the supporting portion(s) 31 of the moving member 3 is not limited to any particular number. For example, the moving member 3 may include three supporting portions 31. In that case, the three supporting portions 31 may be arranged at regular intervals to surround the elastically deformable portion 30. Alternatively, if the moving member 3 includes a single supporting portion 31, then the supporting portion 31 may have the shape of a ring that surrounds the elastically deformable portion 30.

[0081] In addition, the number of the moving member(s) 3 provided is not limited to any particular number. Optionally, a plurality of moving members 3 may be used to be stacked one on top of another. In that case, the magnitude of the operating force to be applied to buckle the moving members 3 varies according to the number of the moving members 3 stacked, thus giving the operator a varying sense of touch when he or she is operating the input device 1.

[0082] In still another variation, the pusher 5 does not have to protrude from the case 2. Alternatively, the pusher 5 may be housed in the case 2. In that case, a portion, covering the pusher 5, of the cover 22 of the case 2 may have flexibility. Also, in that case, the pusher 5 may have electrical conductivity and may be made of a metallic material, for example.

[0083] In yet another variation, in the first state, no gap needs to be left between the pusher 5 and the moving member 3. For example, in the input device 1 in the first state, the pusher 5 may be in contact with the pressure receiving portion 32 of the moving member 3. Also, in the input device 1 in the first state, a lower end portion of the pusher 5 may be in

contact with the insulating sheet 26.

[0084] In yet another variation, the holder 6 does not have to be made of rubber. The holder 6 may have electrical conductivity and may be made of a metallic material, for example. Also, in a plan view, the frame portion 62 of the holder 6 does not have to have a circular or quadrangular shape but may also have any other polygonal shape. Furthermore, the coupling portion 61 of the holder 6 does not have to have a cylindrical shape but may also be made up of a plurality of beams. Furthermore, the holder 6 does not have to include the extended portion 63.

[0085] In yet another variation, the pusher 5 and the holder 6 do not have to be formed integrally with each other but may also be provided separately from each other. In the latter case, the holder 6 may be fixed to the pusher 5 by an appropriate fixing means such as bonding with adhesive.

[0086] In yet another variation, the numbers of the first conductive member(s) 91 and the second conductive members 92 provided are not limited to any particular numbers. Also, in the second conductive members 92, the supporting electrode 921 may be made up of two or more electrodes. For example, the second conductive members 92 may include a plurality of supporting electrodes 921 respectively corresponding to the plurality of supporting portions 31 of the moving member 3.

[0087] In the exemplary embodiment described above, the fixed electrode 7 and the moving electrode 8 form mechanical contacts. Optionally, in one variation, a dielectric layer may be provided between the fixed electrode 7 and the moving electrode 8. In that case, a pressure sensor is formed. That is to say, the moving electrode 8 and the fixed electrode 7 may be used to form either mechanical contacts or a pressure sensor.

[0088] The stroke length of the input device 1, i.e., the magnitude of movement of the pusher 5 to be pressed to turn the input device 1 from the first state into the second state by pressing the pusher 5, may be set as appropriate. For example, the input device 1 may be a short-stroke type with a relatively short stroke length, a long-stroke type with a relatively long stroke length, or a medium-stroke type, of which the stroke length stand somewhere between the short-stroke type and the long-stroke type. Furthermore, the input device 1 does not have to a normally OFF type but may also be a normally ON type that turns OFF only when operated. That is to say, the pusher 5 of the input device 1 may be configured to press the moving member 3 from an OFF position to an ON position on receiving external force, or vice versa.

[0089] The input device 1 does not have to be designed for use in an operating unit of a device to be operated by a human but may also be used in a detection unit of a device, for example. When used in a detection unit of a device, the input device 1 may be used as, for example, a limit switch for detecting the position of a mechanical part such as an actuator.

[0090] These configurations according to other variations described above are applicable to not only the exemplary embodiment described above but also the first to fifth variations as well.

Reference Signs List

[0091]

1, 1E	Input Device
2, 2D, 2E	Case
21, 21E	Body
21a, 213a	One Surface
210	Recess
22, 22D	Cover
220	Plate Portion
24	Through Hole
3	Moving Member
5	Pusher
6, 6A, 6B, 6C, 6D, 6E	Holder
61	Coupling Portion
62	Frame Portion
62a	First Surface
62b	Second Surface
620	Opening
63	Extended Portion
64, 64A, 641B, 642B, 64C, 64D, 64E	Restricting Portion
7	Fixed Electrode
8	Moving Electrode

Claims

1. An input device (1; 1E) comprising:

a case (2; 2D; 2E) having a fixed electrode (7);
 a moving member (3) having a moving electrode (8) arranged to face the fixed electrode (7), the moving electrode (8) being configured to be displaced with respect to the fixed electrode (7);
 a pusher (5) arranged opposite from the fixed electrode (7) with respect to the moving electrode (8); and
 a holder (6; 6A; 6B; 6C; 6E) including a frame portion (62) and a coupling portion (61), the frame portion (62) being gripped by the case (2; 2D; 2E), the coupling portion (61) coupling the pusher (5) to the frame portion (62) inside an opening (620) of the frame portion (62) to allow the pusher (5) to be displaced along thickness of the frame portion (62),
 at least one member selected from the group consisting of the case (2; 2D; 2E) and the holder (6; 6A; 6B; 6C; 6E) including a restricting portion (64; 64A; 641B, 642B; 64C; 64E),
 the restricting portion (64; 64A; 641B, 642B; 64C; 64E) protruding toward, and coming into contact with, the other member selected from the group consisting of the case (2; 2D; 2E) and the holder (6; 6A; 6B; 6C; 6E), to restrict dragging of the frame portion (62) into the opening (620) of the frame portion (62) via the coupling portion (61) while the pusher (5) is being displaced toward the moving electrode (8),
 the frame portion (62) has: a first surface (62a) located closer to the fixed electrode (7); and a second surface (62b) located more distant from the fixed electrode (7),

characterized in that

the case (2; 2D; 2E) has: a first part facing the first surface (62a) of the frame portion (62); and a second part facing the second surface (62b) of the frame portion (62), the frame portion (62) being sandwiched between the first part and the second part, and
 the restricting portion (64; 64A; 641B, 642B; 64C; 64E) is provided between the first surface (62a) of the frame portion (62) and the first part of the case (2; 2D; 2E) and/or between the second surface (62b) of the frame portion (62) and the second part of the case (2; 2D; 2E).

2. The input device (1; 1E) of claim 1, wherein

the holder (6; 6A; 6B; 6C; 6E) includes the restricting portion (64; 64A; 641B, 642B; 64C; 64E),
 the restricting portion (64; 64A; 641B, 642B; 64C; 64E) is configured to restrict movement of the frame portion (62) in a rotational direction of the frame portion (62) itself when the frame portion (62) is dragged into the opening (620).

3. The input device (1; 1E) of claim 1 or 2, wherein

the holder (6; 6A; 6B; 6C; 6E) includes the restricting portion (64; 64A; 641B, 642B; 64C; 64E),
 the coupling portion (61) is configured to reverse itself around a predetermined part of the holder (6; 6A; 6B; 6C; 6E) as a fulcrum while the pusher (5) is being displaced toward the moving electrode (8), and
 the restricting portion (64; 64A; 641B, 642B; 64C; 64E) is configured to produce, around the fulcrum, a moment of force in one direction, the one direction being opposite from another direction of a moment of force that reverses the coupling portion (61).

4. The input device (1) of claim 3, wherein

the holder (6; 6A; 6B; 6C) includes an extended portion (63) extended from an end portion of the coupling portion (61) toward the fixed electrode (7), the coupling portion (61) being coupled to the frame portion (62) at the end portion thereof, and
 the predetermined part includes a corner portion between the frame portion (62) and the extended portion (63).

5. The input device (1; 1E) of any one of claims 1 to 4, wherein

the restricting portion (64; 64A; 641B, 642B; 64C; 64E) surrounds the opening (620) of the frame portion (62) around its entire circumference.

6. The input device (1) of any one of claims 1 to 5, wherein

the holder (6; 6A; 6B; 6C) includes the restricting portion (64; 64A; 641B, 642B; 64C),

the restricting portion (64; 64A; 641B, 642B; 64C) has a sloped surface, the sloped surface being sloped with respect to a surface that the restricting portion (64; 64A; 641B, 642B; 64C) faces.

7. The input device (1; 1E) of any one of claims 1 to 6, wherein the restricting portion (64; 64A; 641B, 642B; 64C; 64E) is provided for at least one of the first surface (62a) or the second surface (62b) of the frame portion (62).

8. The input device (1; 1E) of claim 7, wherein the restricting portion (64; 64A; 641B; 64E) is provided for the first surface (62a) of the frame portion (62) to be located closer to an inner edge of the frame portion (62) than to an outer edge of the frame portion (62).

9. The input device (1; 1E) of claim 8, wherein the restricting portion (64; 64A; 641B; 64E) is in contact with the first part of the case (2; 2D; 2E) at a point closer to the inner edge of the frame portion (62) than to the outer edge of the frame portion (62).

10. The input device (1) of claim 7, wherein the restricting portion (64C) is provided for the second surface (62b) of the frame portion (62) to be located closer to an outer edge of the frame portion (62) than to an inner edge of the frame portion (62).

11. The input device (1) of claim 10, wherein the restricting portion (64C) is in contact with the second part of the case (2; 2D; 2E) at a point closer to the outer edge of the frame portion (62) than to the inner edge of the frame portion (62).

12. The input device (1; 1E) of any one of claims 1 to 11, wherein the holder (6; 6A; 6B; 6C; 6E) is made of rubber.

13. The input device (1; 1E) of claim 12, wherein the pusher (5) and the holder (6; 6A; 6B; 6C; 6E) are formed integrally with each other and made of rubber.

14. The input device (1; 1E) of any one of claims 1 to 13, wherein

the case (2; 2D; 2E) includes a body (21; 21E) and a cover (22; 22D),
the body (21; 21E) has a recess (210) provided on one surface (21a; 213a) thereof,
the fixed electrode (7) is exposed at a bottom surface (210) of the recess of the body (21; 21E),
the moving member (3) is housed in the recess (210) of the body (21; 21E),
the cover (22; 22D) includes a plate portion (220) having a through hole (24) and covering the one surface (21a; 213a) of the body (21; 21E), the through hole (24) facing the recess (210),
the frame portion (62) is sandwiched between the one surface (21a; 213a) of the body (21) and the plate portion (220) of the cover (22; 22D), and
the pusher (5) is located inside the through hole (24) of the plate portion (220) of the cover (22; 22D).

15. The input device (1; 1E) of any one of claims 1 to 14, wherein

the holder (6; 6A; 6B; 6C; 6E) is made of rubber,
the holder (6; 6A; 6B; 6C; 6E) including the restricting portion (64; 64A; 641B, 642B; 64C; 64D; 64E),
the restricting portion (64; 64A; 641B, 642B; 64C; 64D; 64E) protruding from the frame portion (62) toward the case (2; 2D; 2E) and coming into contact with, and being compressed by, the case (2; 2D; 2E) at a point closer to the opening (620) of the frame portion (62) than a middle of the frame portion (62) is.

Patentansprüche

1. Eingabevorrichtung (1; 1E), die umfasst:

ein Gehäuse (2; 2D, 2E), das eine feste Elektrode (7) aufweist;
ein bewegliches Element (3), das eine bewegliche Elektrode (8) aufweist, die angeordnet ist, um der festen Elektrode (7) zugewandt zu sein, wobei die bewegliche Elektrode (8) dazu ausgestaltet ist, in Bezug auf die feste Elektrode (7) verlagert zu werden;

einen Drücker (5), welcher der festen Elektrode (7) in Bezug auf die bewegliche Elektrode (8) entgegengesetzt angeordnet ist; und

einen Halter (6; 6A; 6B; 6C; 6E), der einen Rahmenabschnitt (62) und einen Kopplungsabschnitt (61) umfasst, wobei der Rahmenabschnitt (62) durch das Gehäuse (2; 2D; 2E) eingeklemmt ist, wobei der Kopplungsabschnitt (61) den Drücker (5) an den Rahmenabschnitt (62) innerhalb einer Öffnung (620) des Rahmenabschnitts (62) koppelt, um das Verlagern des Drückers (5) entlang der Dicke des Rahmenabschnitts (62) zu erlauben, mindestens ein Element, das ausgewählt ist aus der Gruppe, die besteht aus dem Gehäuse (2; 2D; 2E) und dem Halter (6; 6A; 6B; 6C; 6E), der einen Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) umfasst, wobei der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) hin zu dem anderen Element, das ausgewählt ist aus der Gruppe, die besteht aus dem Gehäuse (2; 2D; 2E) und dem Halter (6; 6A; 6B; 6C; 6E), hervorsteht und damit in Kontakt gelangt, um das Ziehen des Rahmenabschnitts (62) in die Öffnung (620) des Rahmenabschnitts (62) über den Kopplungsabschnitt (61) einzuschränken, während der Drücker (5) hin zu der beweglichen Elektrode (8) verlagert wird,

der Rahmenabschnitt (62) aufweist: eine erste Oberfläche (62a), die sich näher an der festen Elektrode (7) befindet; und eine zweite Oberfläche (62b), die sich weiter von der festen Elektrode (7) befindet,

dadurch gekennzeichnet, dass

das Gehäuse (2; 2D; 2E) aufweist: einen ersten Teil, welcher der ersten Oberfläche (62a) des Rahmenabschnitts (62) zugewandt ist; und einen zweiten Teil, welcher der zweiten Oberfläche (62b) des Rahmenabschnitts (62) zugewandt ist, wobei der Rahmenabschnitt (62) zwischen dem ersten Teil und dem zweiten Teil eingeschoben ist, und

der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) zwischen der ersten Oberfläche (62a) des Rahmenabschnitts (62) und dem ersten Teil des Gehäuses (2; 2D; 2E) und/oder zwischen der zweiten Oberfläche (62b) des Rahmenabschnitts (62) und dem zweiten Teil des Gehäuses (2; 2D; 2E) bereitgestellt ist.

2. Eingabevorrichtung (1; 1E) nach Anspruch 1, wobei

der Halter (6; 6A; 6B; 6C; 6E) den Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) umfasst, der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) dazu ausgestaltet ist, Bewegung des Rahmenabschnitts (62) in einer Drehrichtung des Rahmenabschnitts (62) selbst einzuschränken, wenn der Rahmenabschnitt (62) in die Öffnung (620) gezogen wird.

3. Eingabevorrichtung (1; 1E) nach Anspruch 1 oder 2, wobei

der Halter (6; 6A; 6B; 6C; 6E) den Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) umfasst, der Kopplungsabschnitt (61) dazu ausgestaltet ist, sich um einen vorbestimmten Teil des Halters (6; 6A; 6B; 6C; 6E) als ein Drehpunkt umzukehren, während der Drücker (5) hin zur beweglichen Elektrode (8) verlagert wird, und

der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) dazu ausgestaltet ist, um den Drehpunkt ein Kraftmoment in einer Richtung zu erzeugen, wobei die eine Richtung entgegengesetzt zu einer anderen Richtung eines Kraftmoments ist, welches den Kopplungsabschnitt (61) umkehrt.

4. Eingabevorrichtung (1) nach Anspruch 3, wobei

der Halter (6; 6A; 6B; 6C) einen erweiterten Abschnitt (63) umfasst, der von einem Endabschnitt des Kopplungsabschnitts (61) hin zu der festen Elektrode (7) erweitert ist, wobei der Kopplungsabschnitt (61) an den Rahmenabschnitt (62) an dessen Endabschnitt gekoppelt ist, und der vorbestimmte Teil einen Eckabschnitt zwischen dem Rahmenabschnitt (62) und dem erweiterten Abschnitt (63) umfasst.

5. Eingabevorrichtung (1; 1E) nach einem der Ansprüche 1 bis 4, wobei

der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) die Öffnung (620) des Rahmenabschnitts (62) um seinen gesamten Umfang umgibt.

6. Eingabevorrichtung (1) nach einem der Ansprüche 1 bis 5, wobei

der Halter (6; 6A; 6B; 6C) den Einschränkungabschnitt (64; 64A; 641B; 642B; 64C) umfasst, der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C) eine geneigte Oberfläche aufweist, wobei die geneigte Oberfläche in Bezug auf eine Oberfläche, welcher der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C)

zugewandt ist, geneigt ist.

7. Eingabevorrichtung (1; 1E) nach einem der Ansprüche 1 bis 6, wobei
der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64E) für mindestens eine von der ersten Oberfläche (62a)
oder der zweiten Oberfläche (62b) des Rahmenabschnitts (62) bereitgestellt ist.
8. Eingabevorrichtung (1; 1E) nach Anspruch 7, wobei
der Einschränkungabschnitt (64; 64A; 641B; 64E) für die erste Oberfläche (62a) des Rahmenabschnitts (62) be-
reitetgestellt ist, um sich näher an einem Innenrand des Rahmenabschnitts (62) als an einem Außenrand des Rah-
menabschnitts (62) zu befinden.
9. Eingabevorrichtung (1; 1E) nach Anspruch 8, wobei
der Einschränkungabschnitt (64; 64A; 641B; 64E) mit dem ersten Teil des Gehäuses (2; 2D; 2E) an einem Punkt
in Kontakt ist, der näher am Innenrand des Rahmenabschnitts (62) als am Außenrand des Rahmenabschnitts (62)
liegt.
10. Eingabevorrichtung (1) nach Anspruch 7, wobei
der Einschränkungabschnitt (64C) für die zweite Oberfläche (62b) des Rahmenabschnitts (62) bereitgestellt ist,
um sich näher an einem Außenrand des Rahmenabschnitts (62) als an einem Innenrand des Rahmenabschnitts
(62) zu befinden.
11. Eingabevorrichtung (1) nach Anspruch 10, wobei
der Einschränkungabschnitt (64C) mit dem zweiten Teil des Gehäuses (2; 2D; 2E) an einem Punkt in Kontakt ist,
der näher am Außenrand des Rahmenabschnitts (62) als am Innenrand des Rahmenabschnitts (62) liegt.
12. Eingabevorrichtung (1; 1E) nach einem der Ansprüche 1 bis 11, wobei
der Halter (6; 6A; 6B; 6C; 6E) aus Kautschuk besteht.
13. Eingabevorrichtung (1; 1E) nach Anspruch 12, wobei
der Drücker (5) und der Halter (6; 6A; 6B; 6C; 6E) einteilig miteinander gebildet sind und aus Kautschuk bestehen.
14. Eingabevorrichtung (1; 1E) nach einem der Ansprüche 1 bis 13, wobei
das Gehäuse (2; 2D; 2E) einen Körper (21; 21E) und eine Abdeckung (22; 22D) umfasst,
der Körper (21; 21E) eine Vertiefung (210) aufweist, die auf einer Oberfläche (21a; 213a) davon bereitgestellt ist,
die feste Elektrode (7) an einer unteren Oberfläche (210) der Vertiefung des Körpers (21; 21E) freiliegt,
das bewegliche Element (3) in der Vertiefung (210) des Körpers (21; 21E) untergebracht ist,
die Abdeckung (22; 22D) einen Plattenabschnitt (220) umfasst, der ein Durchgangsloch (24) aufweist und die
eine Oberfläche (21a; 213a) des Körpers (21; 21E) bedeckt, wobei das Durchgangsloch (24) der Vertiefung
(210) zugewandt ist,
der Rahmenabschnitt (62) zwischen der einen Oberfläche (21a; 213a) des Körpers (21) und dem Plattenab-
schnitt (220) der Abdeckung (22; 22D) eingeschoben ist, und
der Drücker (5) sich im Inneren des Durchgangslochs (24) des Plattenabschnitts (220) der Abdeckung (22;
22D) befindet.
15. Eingabevorrichtung (1; 1E) nach einem der Ansprüche 1 bis 14, wobei
der Halter (6; 6A; 6B; 6C; 6E) aus Kautschuk besteht,
der Halter (6; 6A; 6B; 6C; 6E) den Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64D; 64E) umfasst,
der Einschränkungabschnitt (64; 64A; 641B; 642B; 64C; 64D; 64E) von dem Rahmenabschnitt (62) hin zu
dem Gehäuse (2; 2D; 2E) hervorsteht und mit dem Gehäuse (2; 2D; 2E) an einem Punkt, der näher an der
Öffnung (620) der Rahmenabschnitts (62) als eine Mitte des Rahmenabschnitts (62) liegt, in Kontakt gelangt
und dadurch zusammengedrückt wird.

Revendications

1. Dispositif d'entrée (1 ; 1E) comprenant :

un boîtier (2 ; 2D ; 2E) ayant une électrode fixe (7) ;
 un élément mobile (3) ayant une électrode mobile (8) agencée pour faire face à l'électrode fixe (7), l'électrode mobile (8) étant configurée pour être déplacée par rapport à l'électrode fixe (7) ;
 un poussoir (5) agencé à l'opposé de l'électrode fixe (7) par rapport à l'électrode mobile (8) ; et
 un support (6 ; 6A ; 6B ; 6C ; 6E) comprenant une partie de bâti (62) et une partie de couplage (61), la partie de bâti (62) étant saisie par le boîtier (2 ; 2D ; 2E), la partie de couplage (61) couplant le poussoir (5) à la partie de bâti (62) à l'intérieur d'une ouverture (620) de la partie de bâti (62) pour permettre au poussoir (5) d'être déplacé le long de l'épaisseur de la partie de bâti (62),
 au moins un élément sélectionné dans le groupe comprenant le boîtier (2 ; 2D ; 2E) et le support (6 ; 6A ; 6B ; 6C ; 6E) comprenant une partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E),
 la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E) faisant saillie vers et venant en contact avec l'autre élément sélectionné dans le groupe comprenant le boîtier (2 ; 2D ; 2E) et le support (6 ; 6A ; 6B ; 6C ; 6E), pour limiter la traînée de la partie de bâti (62) dans l'ouverture (620) de la partie de bâti (62) via la partie de couplage (61) alors que le poussoir (5) est déplacé vers l'électrode mobile (8),
 la partie de bâti (62) a : une première surface (62a) positionnée plus à proximité de l'électrode fixe (7) ; et une seconde surface (62b) positionnée plus à distance de l'électrode fixe (7),
caractérisé en ce que :

le boîtier (2 ; 2D ; 2E) a : une première partie faisant face à la première surface (62a) de la partie de bâti (62) ; et une seconde partie faisant face à la seconde surface (62b) de la partie de bâti (62), la partie de bâti (62) étant prise en sandwich entre la première partie et la seconde partie, et
 la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E) est prévue entre la première surface (62a) de la partie de bâti (62) et la première partie du boîtier (2 ; 2D ; 2E) et/ou entre la seconde surface (62b) de la partie de bâti (62) et la seconde partie du boîtier (2 ; 2D ; 2E).

2. Dispositif d'entrée (1 ; 1E) selon la revendication 1, dans lequel :

le support (6 ; 6A ; 6B ; 6C ; 6E) comprend la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E),
 la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E) est configurée pour limiter le mouvement de la partie de bâti (62) dans une direction de rotation de la partie de bâti (62) elle-même lorsque la partie de bâti (62) est traînée dans l'ouverture (620).

3. Dispositif d'entrée (1 ; 1E) selon la revendication 1 ou 2, dans lequel :

le support (6 ; 6A ; 6B ; 6C ; 6E) comprend la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E),
 la partie de couplage (61) est configurée pour s'inverser elle-même autour d'une partie prédéterminée du support (6 ; 6A ; 6B ; 6C ; 6E) comme un point d'appui alors que le poussoir (5) est déplacé vers l'électrode mobile (8), et
 la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E) est configurée pour produire, autour du point d'appui, un moment de force dans une direction, la direction étant opposée à une autre direction d'un moment de force qui inverse la partie de couplage (61).

4. Dispositif d'entrée (1) selon la revendication 3, dans lequel :

le support (6 ; 6A ; 6B ; 6C) comprend une partie étendue (63) étendue à partir d'une partie d'extrémité de la partie de couplage (61) vers l'électrode fixe (7), la partie de couplage (61) étant couplée à la partie de bâti (62) au niveau de sa partie d'extrémité, et
 la partie prédéterminée comprend une partie de coin entre la partie de bâti (62) et la partie étendue (63).

5. Dispositif d'entrée (1 ; 1E) selon l'une quelconque des revendications 1 à 4, dans lequel :

la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E) entoure l'ouverture (620) et la partie de bâti (62) autour de toute sa circonférence.

6. Dispositif d'entrée (1) selon l'une quelconque des revendications 1 à 5, dans lequel :

le support (6 ; 6A ; 6B ; 6C) comprend la partie de restriction (64 ; 64A ; 641B, 642B ; 64C),
 la partie de restriction (64 ; 64A ; 641B, 642B ; 64C) a une surface inclinée, la surface inclinée étant inclinée par rapport à une surface à laquelle la partie de restriction (64 ; 64A ; 641B, 642B ; 64C) fait face.

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7. Dispositif d'entrée (1 ; 1E) selon l'une quelconque des revendications 1 à 6, dans lequel :
la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64E) est prévue pour au moins l'une parmi la première surface (62a) ou la seconde surface (62b) de la partie de bâti (62).

8. Dispositif d'entrée (1 ; 1E) selon la revendication 7, dans lequel :
la partie de restriction (64 ; 64A ; 641B ; 64E) est prévue pour que la première surface (62a) de la partie de bâti (62) soit positionnée plus à proximité d'un bord interne de la partie de bâti (62) que d'un bord externe de la partie de bâti (62).

9. Dispositif d'entrée (1 ; 1E) selon la revendication 8, dans lequel :
la partie de restriction (64 ; 64A ; 641B ; 64E) est en contact avec la première partie du boîtier (2 ; 2D ; 2E) à un point plus à proximité du bord interne de la partie de bâti (62) que du bord externe de la partie de bâti (62).

10. Dispositif d'entrée (1) selon la revendication 7, dans lequel :
la partie de restriction (64C) est prévue pour que la seconde partie (62b) de la partie de bâti (62) soit positionnée plus à proximité d'un bord externe de la partie de bâti (62) que d'un bord interne de la partie de bâti (62).

11. Dispositif d'entrée (1) selon la revendication 10, dans lequel :
la partie de restriction (64C) est en contact avec la seconde partie du boîtier (2 ; 2D ; 2E) à un point plus à proximité du bord externe de la partie de bâti (62) que du bord interne de la partie de bâti (62).

12. Dispositif d'entrée (1 ; 1E) selon l'une quelconque des revendications 1 à 11, dans lequel :
le support (6 ; 6A ; 6B ; 6C ; 6E) est réalisé à partir de caoutchouc.

13. Dispositif d'entrée (1 ; 1E) selon la revendication 12, dans lequel :
le poussoir (5) et le support (6 ; 6A ; 6B ; 6C ; 6E) sont formés de manière solidaire entre eux et sont réalisés à partir de caoutchouc.

14. Dispositif d'entrée (1 ; 1E) selon l'une quelconque des revendications 1 à 13, dans lequel :

le boîtier (2 ; 2D ; 2E) comprend un corps (21 ; 21E) et un couvercle (22 ; 22D),
le corps (21 ; 21E) a un évidement (210) prévu sur sa surface (21a ; 213a),
l'électrode fixe (7) est exposée au niveau d'une surface inférieure (210) de l'évidement du corps (21 ; 21E),
l'élément mobile (3) est logé dans l'évidement (210) du corps (21 ; 21E),
le couvercle (22 ; 22D) comprend une partie de plaque (220) ayant un trou débouchant (24) et recouvrant la surface (21a ; 213a) du corps (21 ; 21E), le trou débouchant (24) faisant face à l'évidement (210),
la partie de bâti (62) est prise en sandwich entre la surface (21a ; 213a) du corps (21) et la partie de plaque (220) du couvercle (22 ; 22D), et
le poussoir (5) est positionné à l'intérieur du trou débouchant (24) de la partie de plaque (220) du couvercle (22 ; 22D) .

15. Dispositif d'entrée (1 ; 1E) selon l'une quelconque des revendications 1 à 14, dans lequel :

le support (6 ; 6A ; 6B ; 6C ; 6E) est réalisé à partir de caoutchouc,
le support (6 ; 6A ; 6B ; 6C ; 6E) comprenant la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64D ; 64E),
la partie de restriction (64 ; 64A ; 641B, 642B ; 64C ; 64D ; 64E) faisant saillie de la partie de bâti (62) vers le boîtier (2 ; 2D ; 2E) et venant en contact avec et étant comprimée par le boîtier (2 ; 2D ; 2E) à un point plus à proximité de l'ouverture (620) de la partie de bâti (62) qu'un milieu de la partie de bâti (62) ne l'est.

FIG. 1

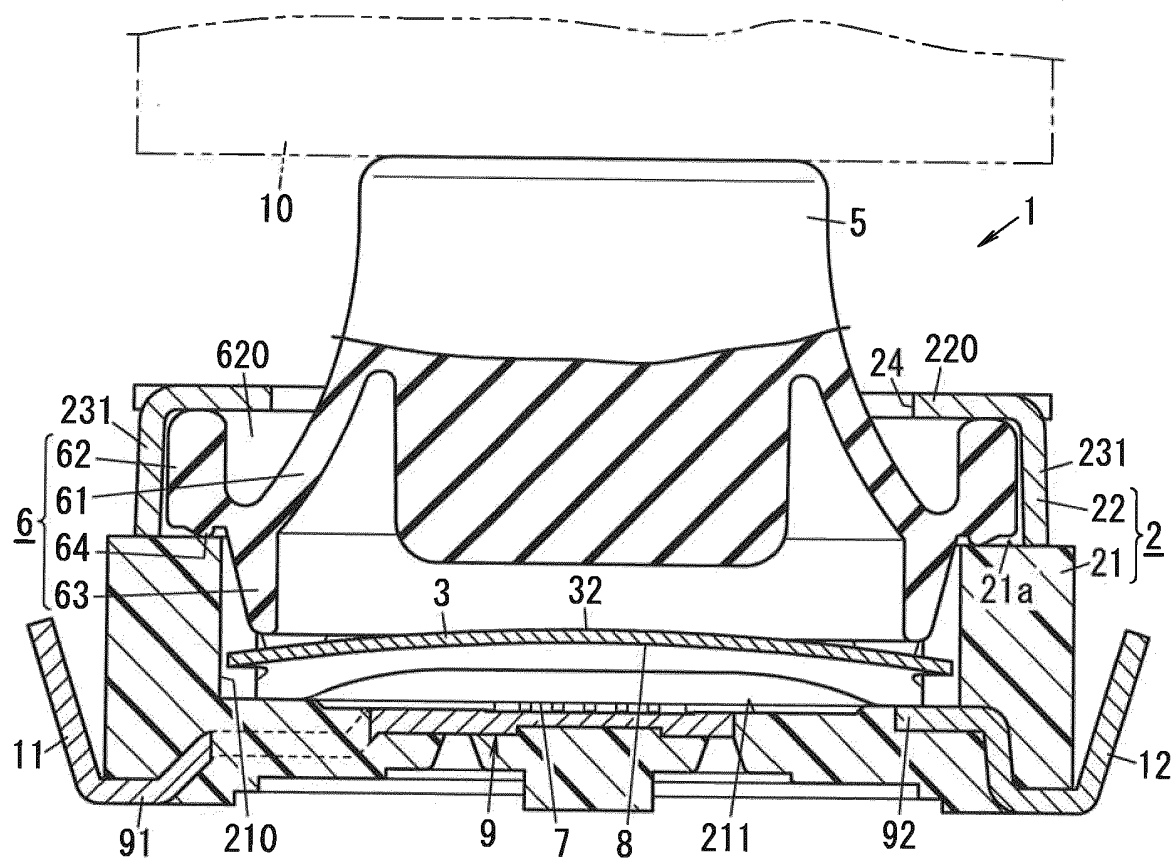


FIG. 2

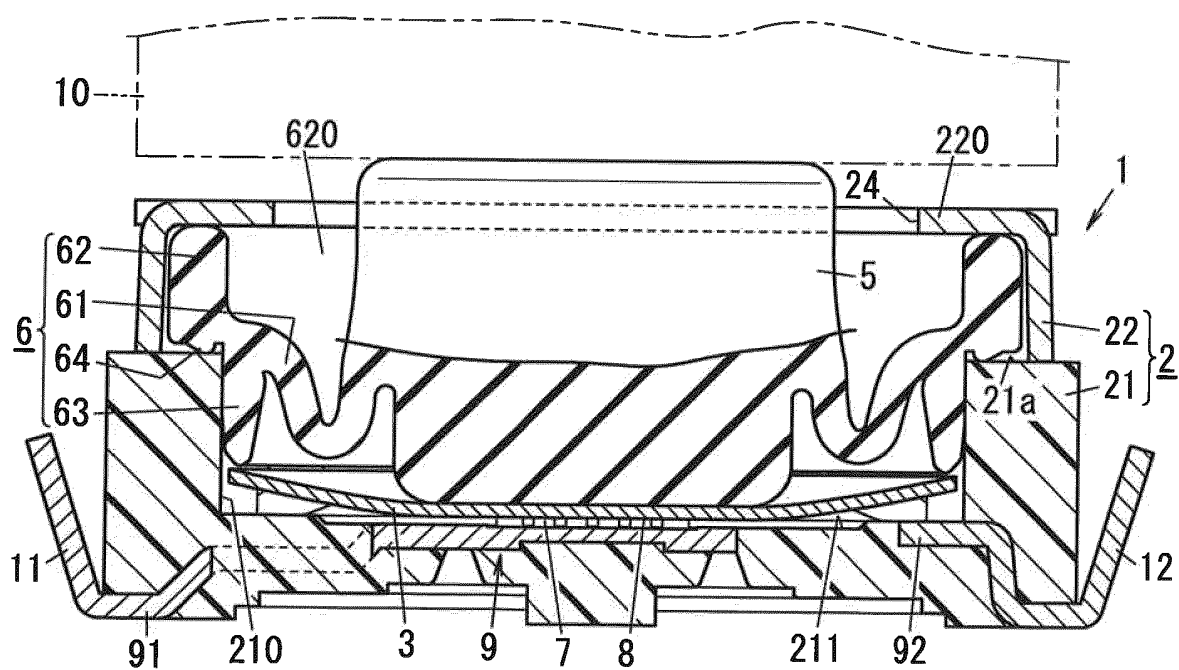


FIG. 3

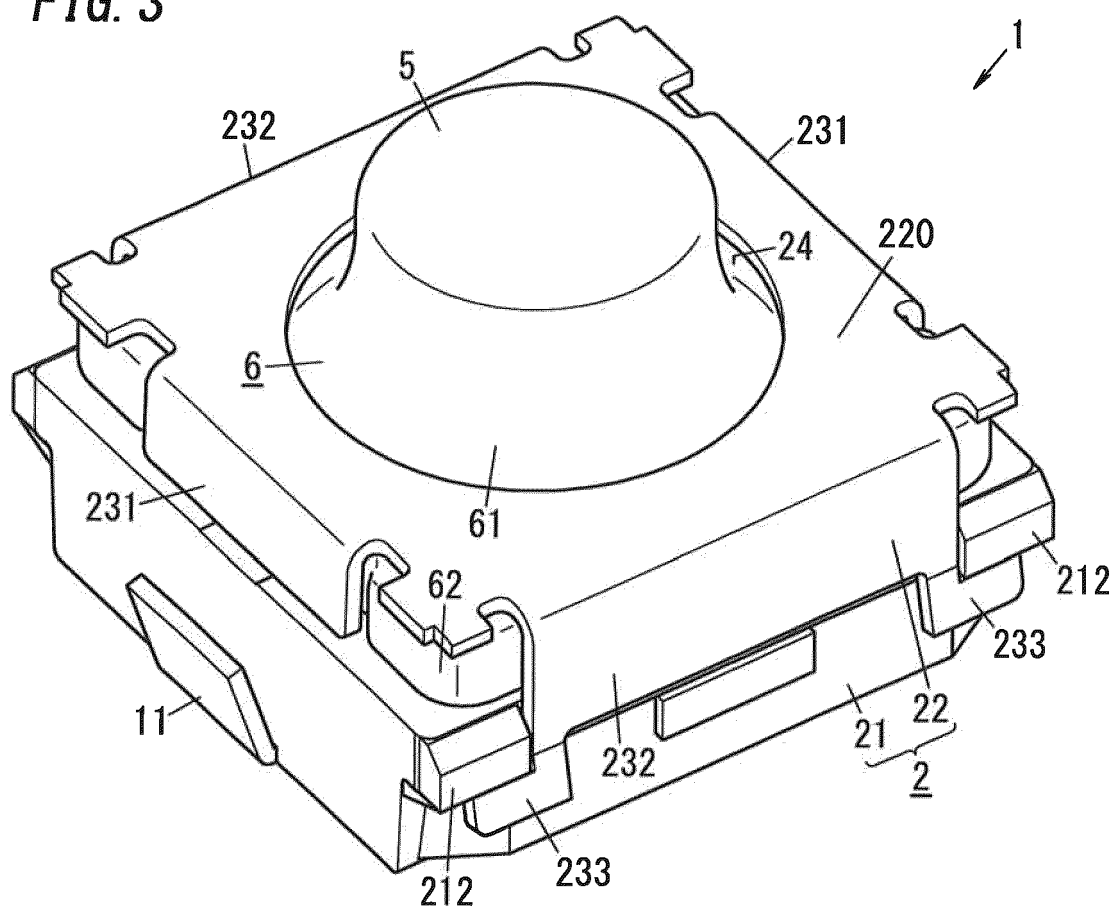


FIG. 4

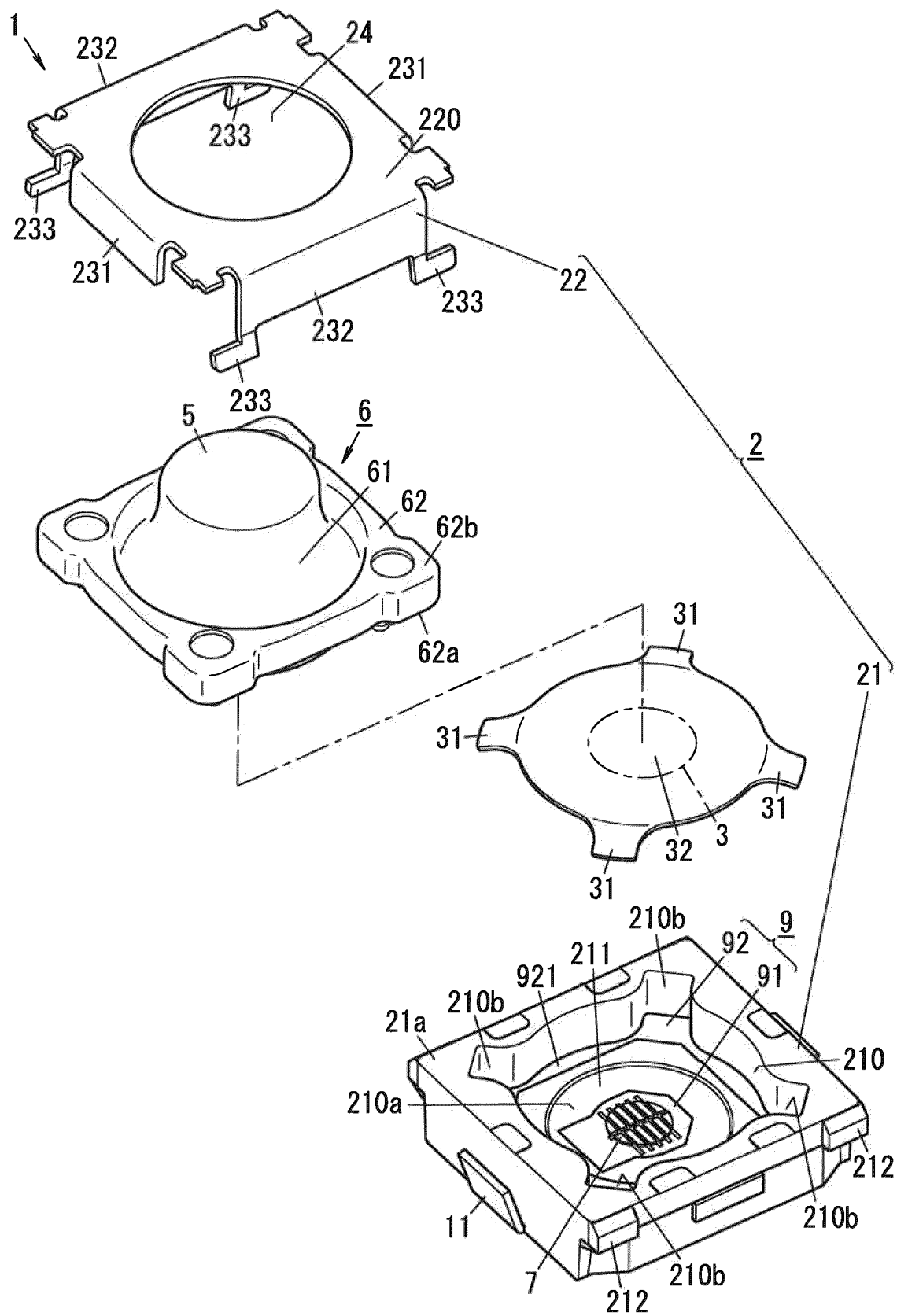


FIG. 5

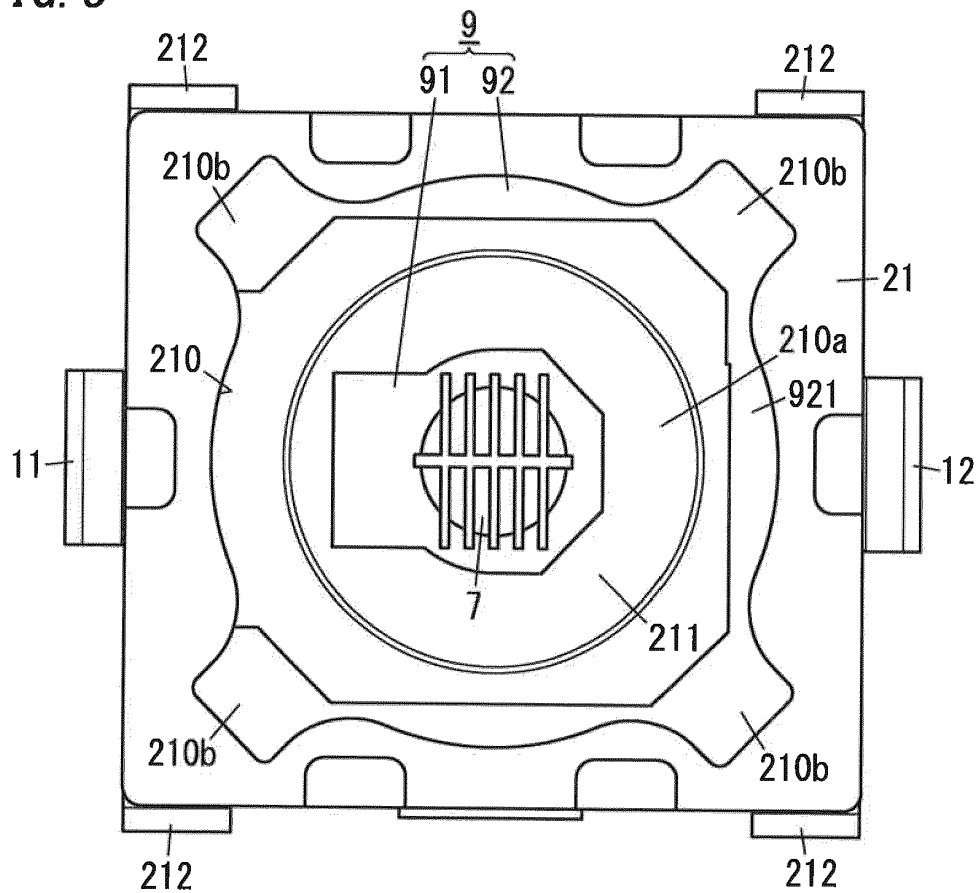


FIG. 6

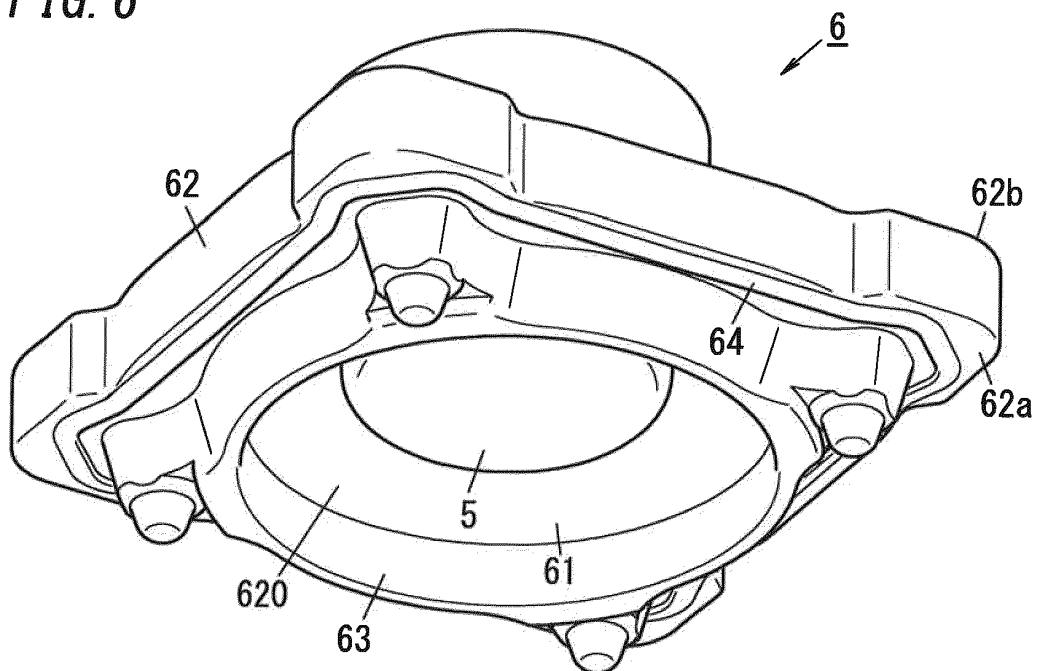


FIG. 7

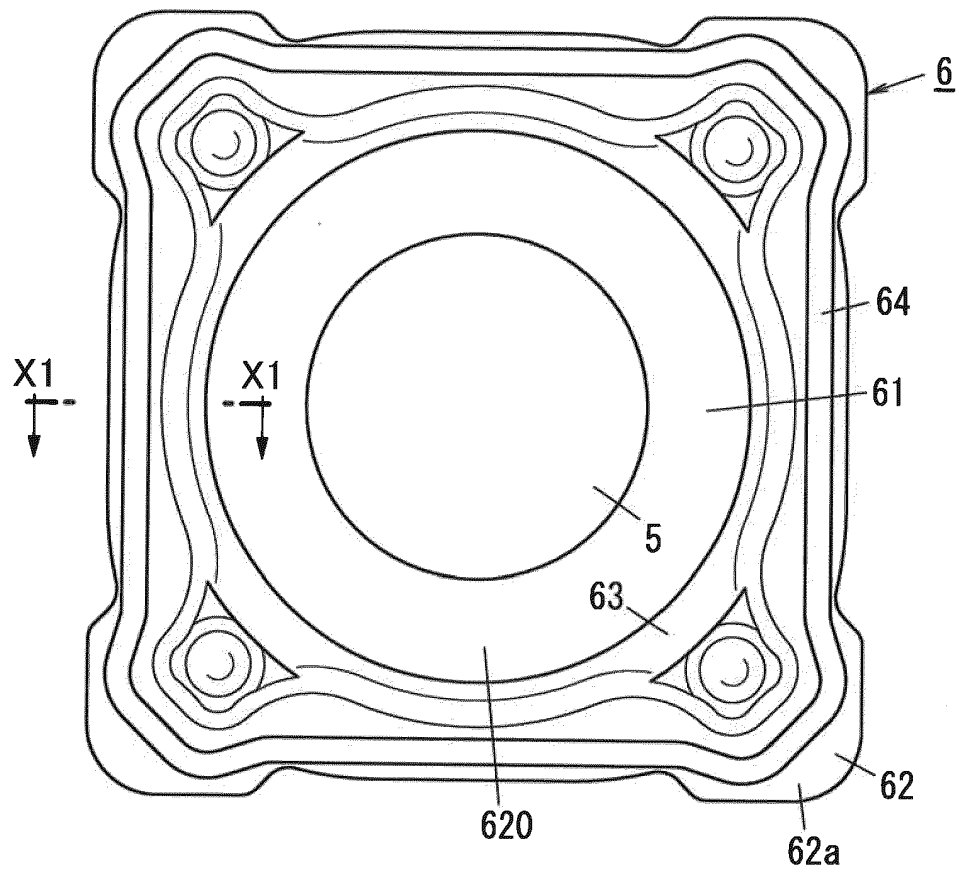


FIG. 8

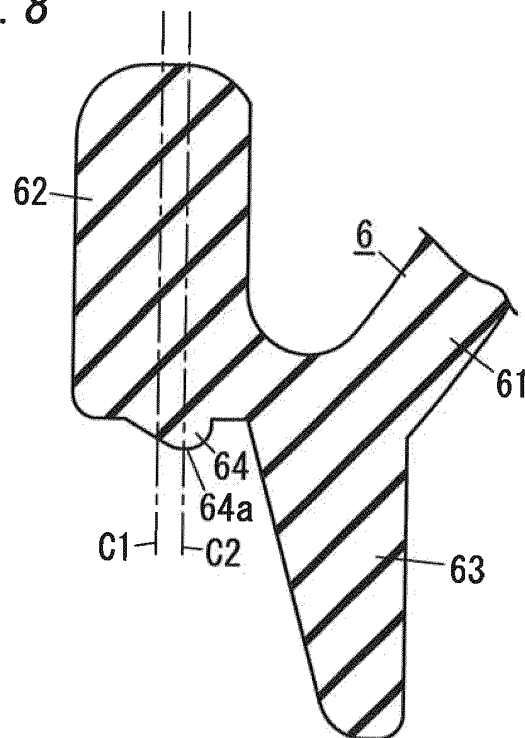


FIG. 9

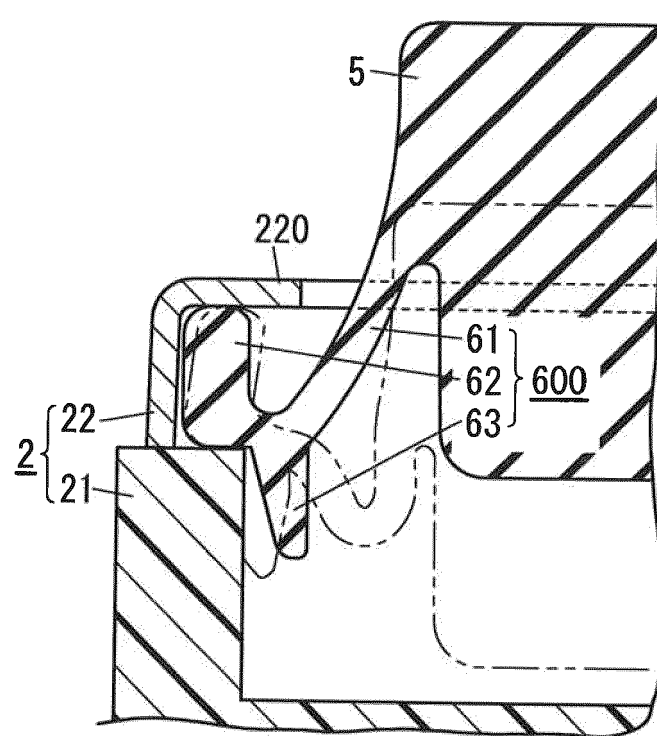


FIG. 10

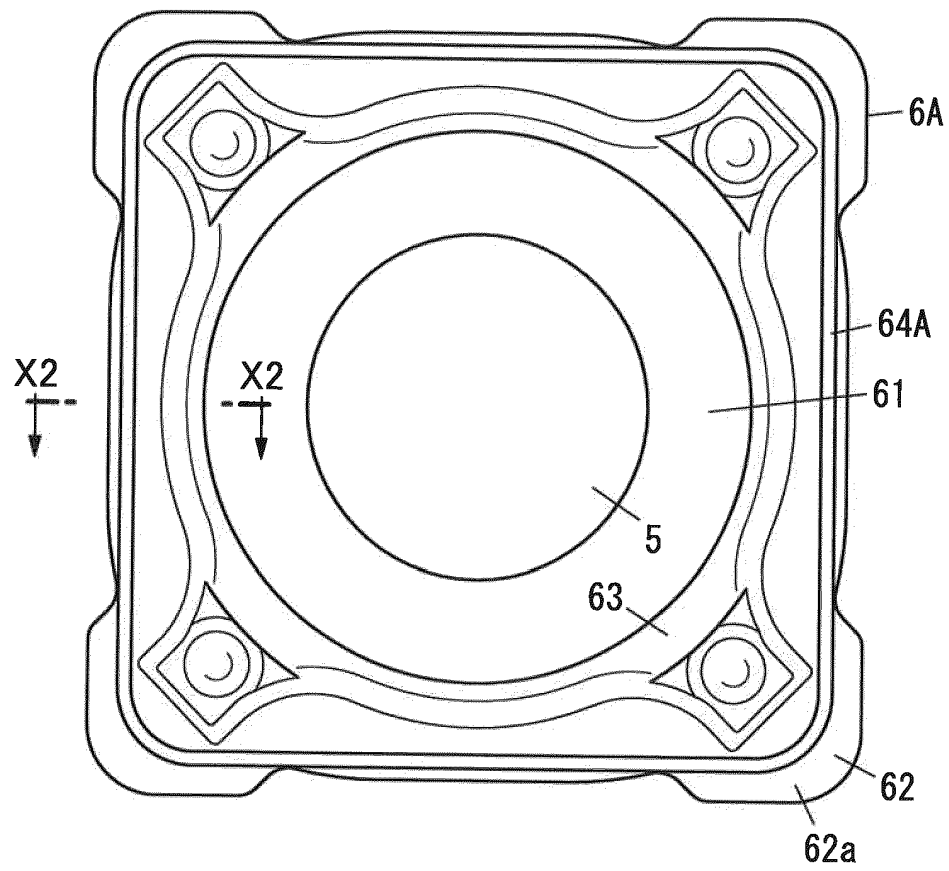


FIG. 11

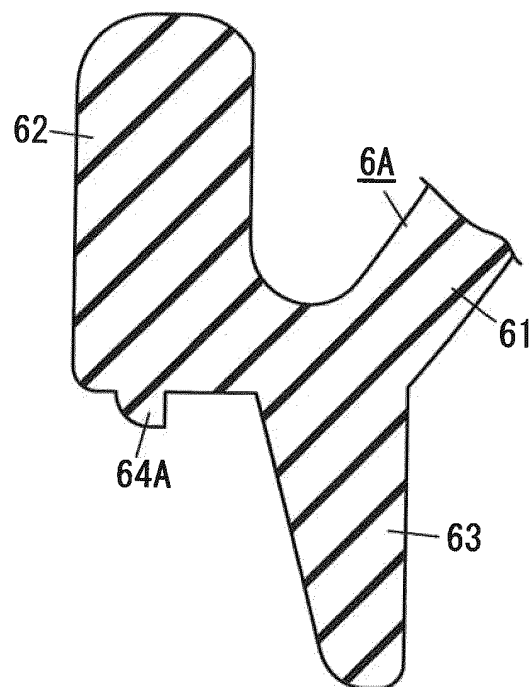


FIG. 12

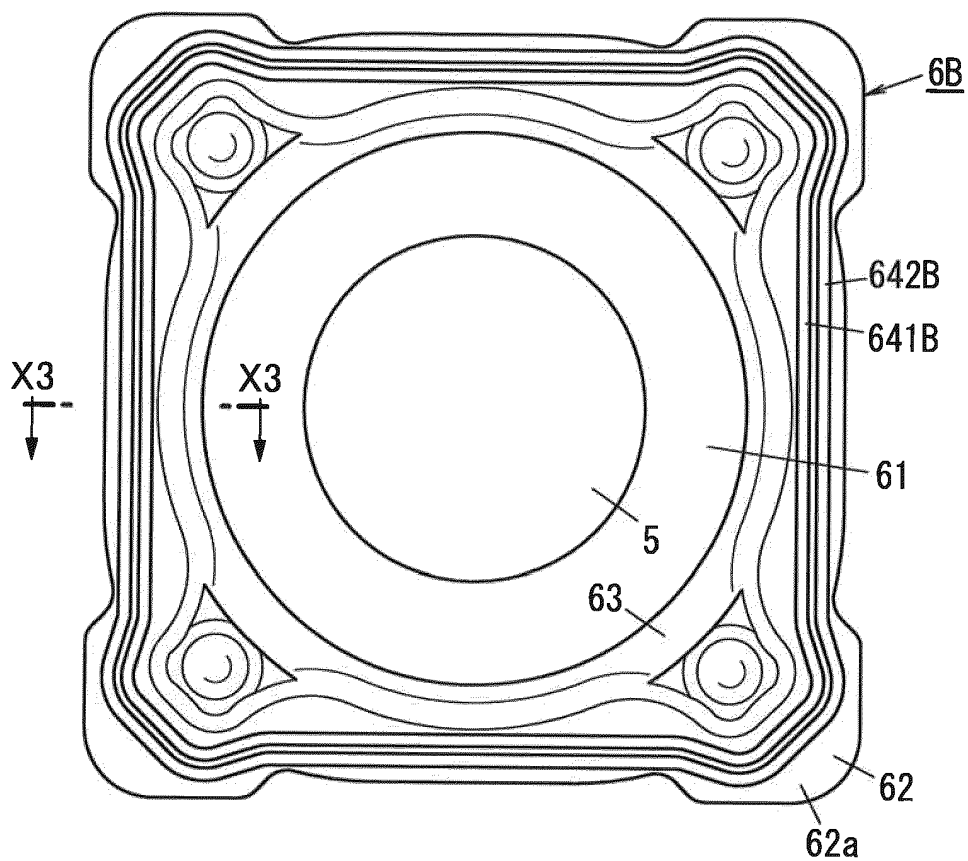


FIG. 13

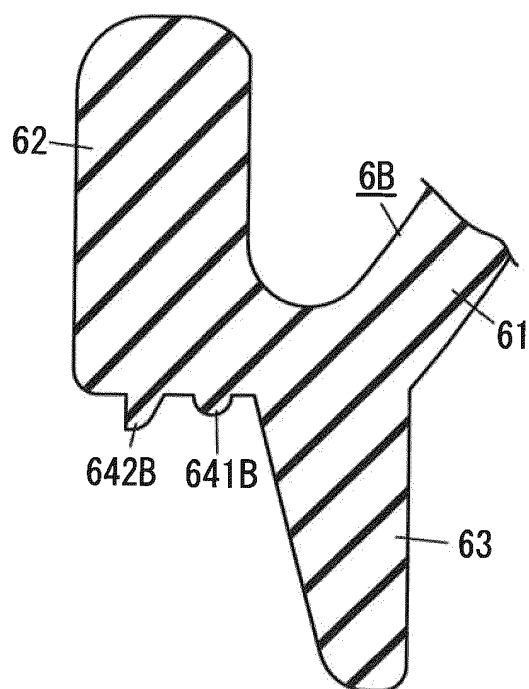


FIG. 14

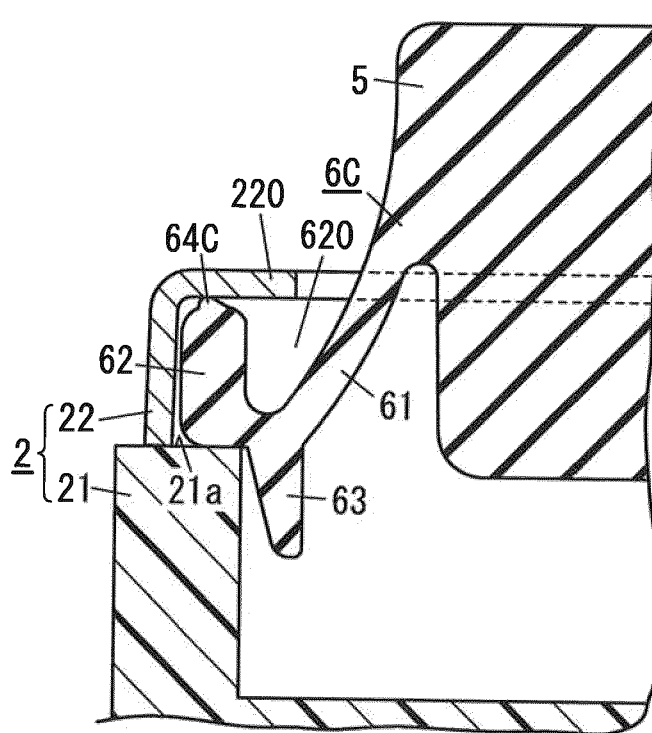


FIG. 15

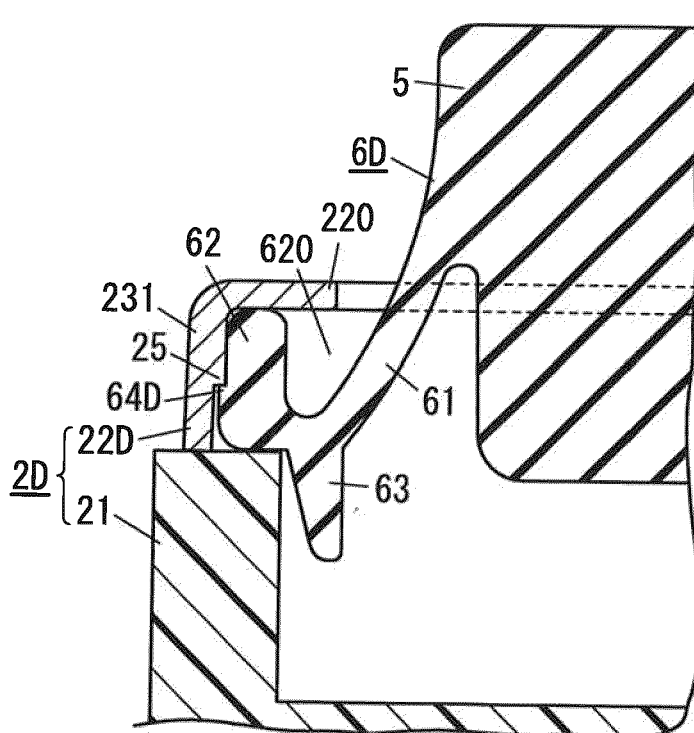


FIG. 16

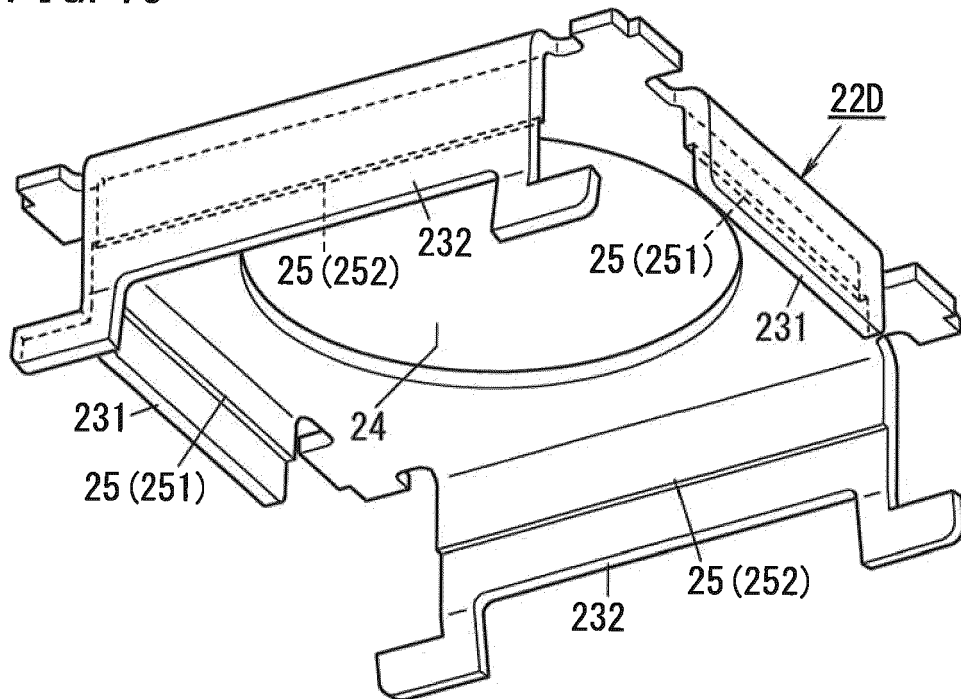


FIG. 17

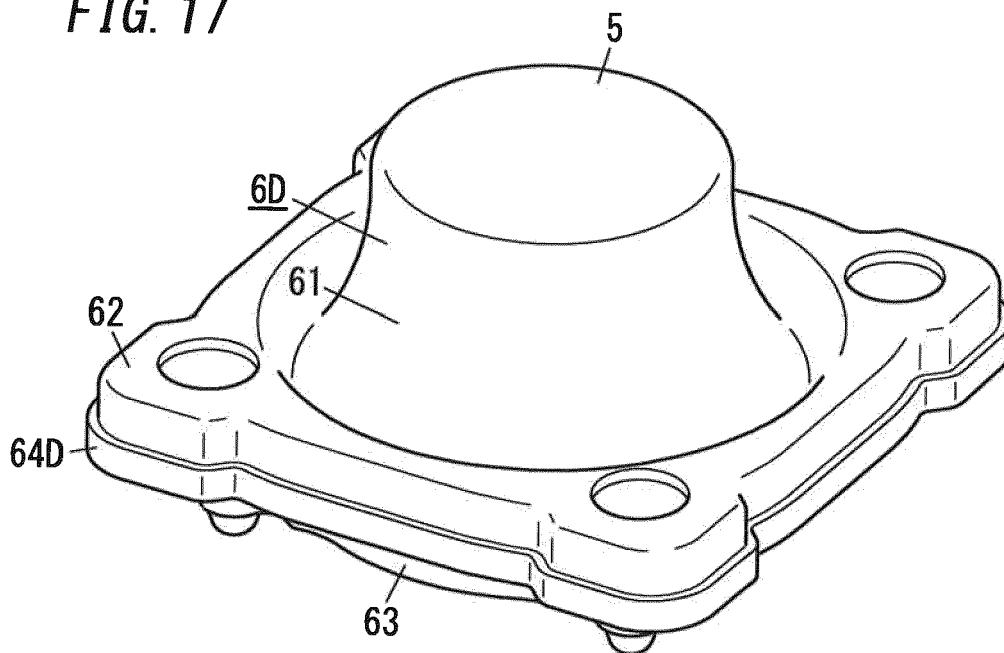


FIG. 18

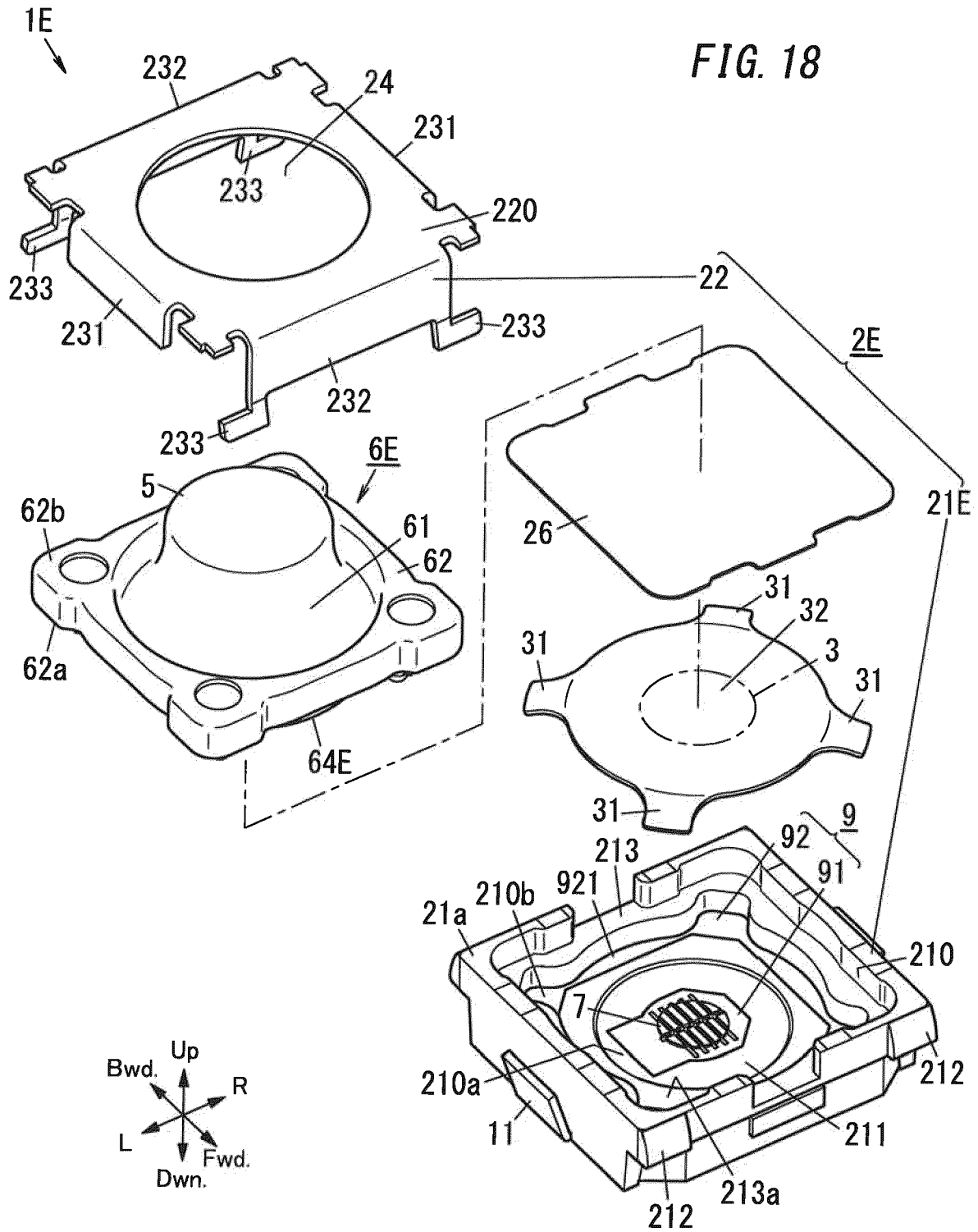
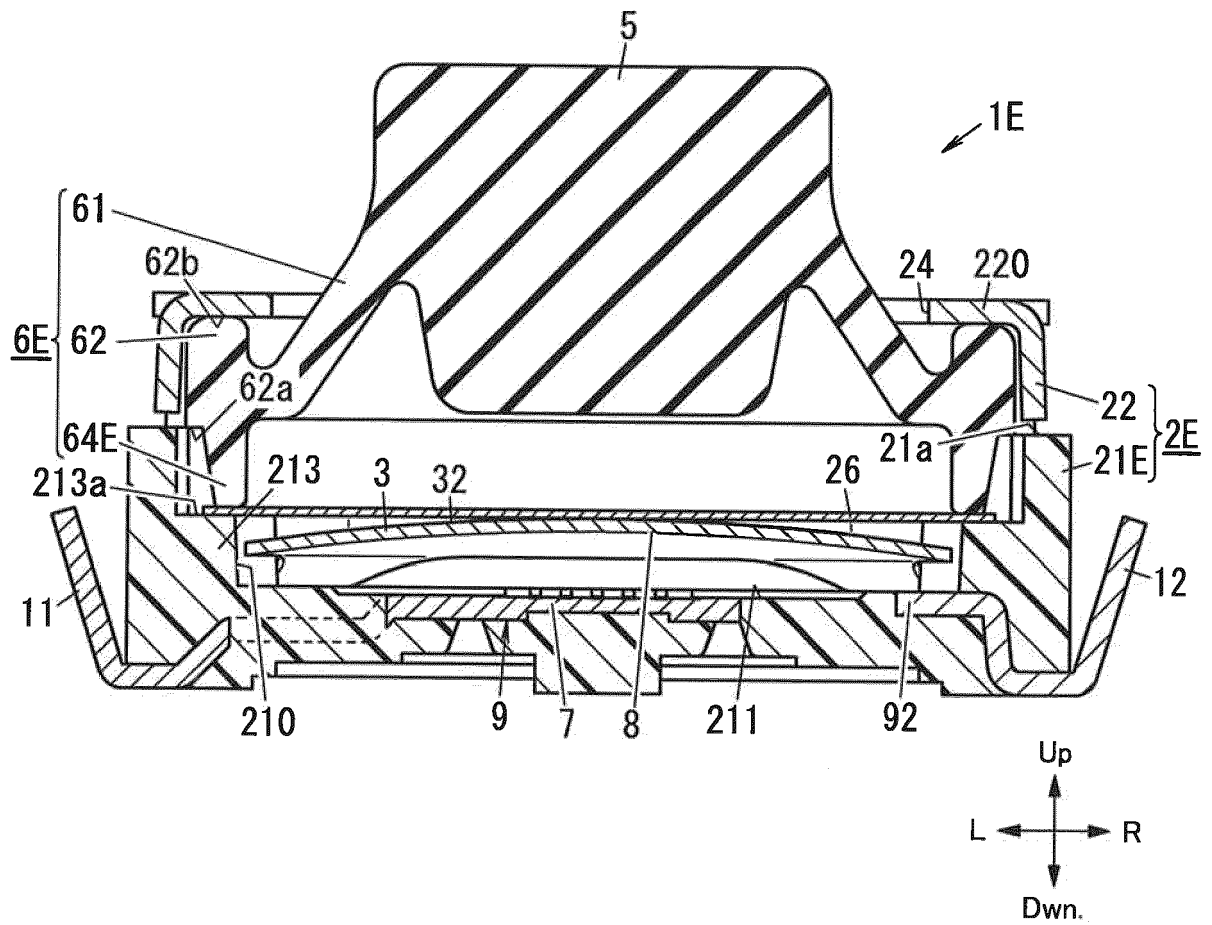


FIG. 19



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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