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(54) VIBRATION DETECTION DEVICE AND METHOD

VIBRATIONSDETEKTIONSVORRICHTUNG UND -VERFAHREN

DISPOSITIF ET PROCÉDÉ DE DÉTECTION DE VIBRATIONS

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(56) References cited:
JP-A- H1 025 945
JP-A- H10 317 772
JP-A- 2006 194 078
US-A1- 2015 240 542

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Description

Field of the Invention

[0001] The present invention relates to a detection device and more particularly to a vibration detection device that works in response to a force.

Background of the Invention

[0002] Generally speaking, when a piece of furniture (e.g., a drawer, cabinet, or door) or equipment undergoes an earthquake of a certain magnitude, some moving part or parts of the furniture or equipment tend to move (e.g., open or close) on their own with respect to a stationary part. To prevent accidents that could arise from such unintended operation, safety devices were developed. For example, US Patent No. 6,550,827 B1 discloses a closing device of a hinged door, wherein the hinged door (32) is provided in a storing device main body (31). The closing device includes a case (33), a locking member (38), and at least one spherical member (37) above the locking member (38). When an earthquake takes place, the spherical member (37) prevents the locking member (38) from moving upward and thereby controls the angle by which the hinged door (32) may be opened by the earthquake.

[0003] Document JP 2006-194078 A describes a locking device, the device including a housing receiving a ball and a tilting lock actuated by a movement of the ball in response to a vibration.

[0004] Document JP H10 317772 A describes a lock actuated by a vibration, the lock including a ball rotating above a tilting lock.

[0005] Document JP H10 25945 A describes a locking device wherein a suspended body, in response to a vibration, blocks two locking pins.

[0006] Document US 2015/0240542 A1 describes a locking device, including a housing and a suspended part inside the housing, wherein the suspended part, in response to a vibration, actuates a tilting lock.

[0007] As furniture or equipment that requires such a safety device varies widely, it is important to develop different products so that consumers are supplied with more choices.

Summary of the Invention

[0008] The present invention relates to a vibration detection device that works in response to a force.

[0009] According to one aspect of the present invention, a vibration detection device is provided as specified in claim 1.

[0010] Preferably, the second component has a smaller size than the space.

[0011] Preferably, the vibration detection device further includes a rolling member to facilitate movement of the second component with respect to the first component.

[0012] Preferably, the supporting structure of the second component receives a portion of the detecting member.

[0013] Preferably, the inner wall of the supporting structure is tilted with respect to the bottom portion of the supporting structure.

[0014] Preferably, a wall portion of the first component is adjacent to the supporting structure.

[0015] Preferably, the first component and the second component are configured to be moved with respect to each other in a direction different from the direction in which the detecting member is moved from the position.

[0016] Preferably, the vibration detection device further includes a cable element by which the second component is suspended from the first component. Preferably, the cable element is flexible.

[0017] According to another aspect of the present invention, a vibration detection method is provided as specified in claim 11.

Brief Description of the Drawings

[0018]

FIG. 1 is an exploded perspective view of the vibration detection device in the first embodiment of the present invention;

FIG. 2 is an assembled perspective view, taken from the first viewing angle, of the vibration detection device in the first embodiment of the present invention;

FIG. 3 is an assembled perspective view, taken from the second viewing angle, of the vibration detection device in the first embodiment of the present invention;

FIG. 4 is a sectional view of the vibration detection device in the first embodiment of the present invention, showing that a force has yet to be applied to the vibration detection device;

FIG. 5 is another sectional view of the vibration detection device in the first embodiment of the present invention, showing that the vibration detection device is subjected to a force and that the detecting member is driven;

FIG. 6 is a sectional view of the vibration detection device in the second embodiment of the present invention, showing that a force has yet to be applied to the vibration detection device; and

FIG. 7 is another sectional view of the vibration detection device in the second embodiment of the present invention, showing that the vibration detection device is subjected to a force.

Detailed Description of the Invention

[0019] Referring to FIG. 1, FIG. 2, and FIG. 3, the vibration detection device 10 in an embodiment of the present invention includes a first component 12, a second component 14, and a detecting member 16.

[0020] The first component 12 includes a main body 18 and a position-limiting wall 20. The position-limiting wall 20 is connected to, and located on one side of, the main body 18. The main body 18 has an opening 22, and the position-limiting wall 20 defines a space 24 in communication with the opening 22. The first component 12 includes a wall portion 26 located on the opposite side of the main body 18 and adjacent to the opening 22. Here, the wall portion 26 is substantially C-shaped.

[0021] The second component 14 is movably mounted to the first component 12.

[0022] The second component 14 is received in the space 24 of the first component 12 and has a smaller size than the space 24. In this embodiment, the second component 14 includes a first side 28 and a second side 30. Preferably, the second side 30 is the opposite side of the first side 28. The second component 14 further includes a supporting structure 32 and a mounting portion 34.

[0023] The supporting structure 32 is located at the first side 28 and substantially corresponds in position to the opening 22 of the first component 12. Here, the supporting structure 32 has a substantially conical shape. More specifically, the supporting structure 32 includes a bottom portion 36, a top portion 38, and an inner wall 40 between the bottom portion 36 and the top portion 38. There is a receiving space between the bottom portion 36 and the inner wall 40. The top portion 38 is wider than the bottom portion 36 and is adjacent to the opening 22 of the first component 12. Moreover, the inner wall 40 is tilted with respect to the bottom portion 36. In this embodiment, the inner wall 40 is an inclined or curved surface with respect to the bottom portion 36.

[0024] The mounting portion 34 is located at the second side 30 and may be a sunken area. Preferably, the vibration detection device 10 further includes a rolling member 42, and the rolling member 42 is partially received in the mounting portion 34. The rolling member 42 may be a ball or a roller. In this embodiment, there are a plurality of mounting portions 34 and a plurality of rolling members 42 by way of example.

[0025] The detecting member 16 lies between the first component 12 and the second component 14. The detecting member 16 may be a ball or other similar spherical element without limitation.

[0026] As shown in FIG. 4, the wall portion 26 of the first component 12 is adjacent to the periphery of the supporting structure 32. In addition, the detecting member 16 is arranged between the supporting structure 32 of the second component 14 and the wall portion 26 of the first component 12. More specifically, a portion of the detecting member 16 is received in the supporting structure 32 of the second component 14 and is adjacent to the bottom portion 36 of the supporting structure 32. On the other hand, the other portion of the detecting member 16 juts out of the top portion 38 of the supporting structure 32 and is adjacent to the wall portion 26 of the first component 12.

[0027] The first component 12 and the second component 14 can be moved with respect to each other. More specifically, it is feasible to fix the first component 12 to an object and allow the second component 14 to be moved with respect to the first component 12. Alternatively, the first component 12 may be movable with respect to the second component 14 while the second component 14 is fixed to an object. Here, by way of example, the first component 12 is fixed, and the second component 14 can be moved with respect to the first component 12.

[0028] Referring to FIG. 5, when a force such as an externally applied force or the vibrating force of an earthquake is applied to the vibration detection device 10 in a first direction D1, the second component 14 is subjected to the force and is moved with respect to the first component 12 in the first direction D1. The rolling members 42 (which are, for example, in contact with the aforesaid object) make it easier for the second component 14 to move with respect to the first component 12.

[0029] Furthermore, the detecting member 16 is moved from a first position P1 to a second position P2 in response to the force. It should be pointed out that the second position P2 is variable with respect to the first position P1, depending on the magnitude of the force. Simply put, the detecting member 16 can leave the first position P1 and reach another position in response to forces (e.g., externally applied forces or vibrating forces) of different magnitudes. More specifically, the detecting member 16 is moved from the first position P1 to the second position P2 in a second direction D2 in response to the second component 14 moving with respect to the first component 12. For example, when the second component 14 is moved in response to the force, the detecting member 16 is pressed against the wall portion 26 of the first component 12 and is driven in the second direction D2 from the first position P1 to the second position P2 by the inner wall 40 of the supporting structure 32 of the second component 14. Please note that the second direction D2 is different from the first direction D1. In other words, the direction in which the second component 14 is moved with respect to the first component 12 is different from the direction in which the detecting member 16 is moved from the first position P1.

[0030] FIG. 6 and FIG. 7 show the vibration detection device 200 in another embodiment of the present invention. The vibration detection device 200 is different from the vibration detection device 10 in the previous embodiment generally in that the former includes a flexible cable element 202 such as a spring wire. Here, the second component 204 is suspended from the first component 206 via a plurality of cable elements 202 by way of ex-

ample. According to this arrangement, the second component 204 is movable with respect to the first component 206 when subjected to a force in the first direction D1, in order to drive the detecting member 208. The working principle of this embodiment is similar to that of the previous embodiment and, for the sake of brevity, will not be stated repeatedly.

[0031] In addition, the present invention provides a vibration detection method as disclosed in the embodiments described above. For the sake of brevity, the steps of the method will not be repeated.

[0032] While the present invention has been disclosed through the foregoing embodiments, it should be understood that the embodiments are not intended to be restrictive of the invention. The scope of patent protection sought by the applicant is defined by the appended claims.

Claims

1. A vibration detection device (10, 200), comprising:

a first component (12, 206) and a second component (14, 204) movable with respect to cach other; and
a detecting member (16, 208) located at one of the first component (12, 206) and the second component (14, 204);
wherein the detecting member (16, 208) is movable from a position (P1) in response to relative movement between the first component (12, 206) and the second component (14, 204):

wherein the first component (12, 206) includes a main body (18) and a position-limiting wall (20), and the positioning limiting wall (20) is connected to and located on one side of the main body (18), and wherein the main body (18) has an opening (22) and the position-limiting wall (20) defines a space (24) in communication with the opening (22), and
wherein the first component (12, 206) includes a wall portion (26) located on the opposite side of the main body (18) and adjacent to the opening (22), and
wherein the second component (14, 204) is received in the space (24) of the first component (12, 206),
the vibration detection device being **characterized in that**:

the second component (14, 204) includes a first side (28), a second side (30) and a supporting structure (32), wherein the supporting structure (32) is located at the first side (28), substantially corresponds in position to the opening (22), includes a bottom portion (36) and an inner wall (40), and substantially has a conical shape; and
wherein a receiving space is formed between the bottom portion (36) and the inner wall (40) of the supporting structure (32), and
the detecting member (16, 208) is a ball, arranged between the receiving space of the second component (14, 204) and the wall portion (26) of the first component (12, 206).

2. The vibration detection device (10, 200) as claimed in claim 1, wherein the second component (14, 204) has a smaller size than the space (24).

3. The vibration detection device (10, 200) as claimed in claims 1 or 2, further comprising a rolling member (42) to facilitate movement of the second component (14, 204) with respect to the first component (12, 206).

4. The vibration detection device (10, 200) as claimed in any of claims 1-3, wherein the supporting structure (32) receives a portion of the detecting member (16, 208).

5. The vibration detection device (10, 200) as claimed in claim 4, wherein the inner wall (40) is tilted with respect to the bottom portion (36).

6. The vibration detection device (10, 200) as claimed in claim 5, wherein the wall portion (26) is adjacent to the supporting structure (32).

7. The vibration detection device (10, 200) as claimed in any of claims 4-6, wherein when the second component (14, 204) is moved with respect to the first component (12, 206), the detecting member (16, 208) is driven by the inner wall (40) of the supporting structure (32) of the second component (14, 204) via the wall portion (26) of the first component (12, 206).

8. The vibration detection device (10, 200) as claimed in any of claims 1-7, wherein the relative movement between the first component (12, 206) and the second component (14, 204) is in a direction different from a direction in which the detecting member (16, 208) is moved from the position (P1).

9. The vibration detection device (200) as claimed in any of claims 1-8, further comprising a cable element (202) whereby the second component (204) is suspended from the first component (206).

10. The vibration detection device (200) as claimed in

claim 9, wherein the cable element (202) is flexible.

11. A vibration detection method, comprising the step of:

providing a first component (12, 206) and a second component (14, 204) which are movable with respect to each other,
wherein the first component (12, 206) includes a main body (18) and a position-limiting wall (20), wherein the positioning limiting wall (20) is connected to and located on one side of the body (18) and the main body (18) has an opening (22) and the position-limiting wall (20) defines a space (24) in communication with the opening (22), and
wherein the first component (12, 206) includes a wall portion (26) located on the opposite side of the main body (18) and adjacent to the opening (22); and
receiving the second component (14, 204) in the space (24) of the first component (12, 206);
the method being **characterized in that**
the second component (14, 204) includes a first side (28), a second side (30) and a supporting structure (32), wherein the supporting structure (32) is located at the first side (28), substantially corresponds in position to the opening (22), includes a bottom portion (36) and an inner wall (40) and substantially has a conical shape ; and
wherein a receiving space is formed between a bottom portion (36) and an inner wall (40) of the supporting structure (32);
and **in that** the vibration detection method further comprises the step of providing a detecting member (16, 208), which is a ball between the wall portion (26) of the first component (12, 206) and the receiving space of the second component (14, 204) such that, when a force is applied to one of the first component (12, 206) and the second component (14, 204), the detecting member (16, 208) is moved from a position (P1) in response to the force.

Patentansprüche

1. Ein Vibrationsdetektionsgerät (10, 200), umfassend:

eine erste Komponente (12, 206) und eine zweite Komponente (14, 204), die zueinander beweglich sind; und
ein Detektionselement (16, 208), das an eine der ersten Komponenten (12, 206) und der zweiten Komponente (14, 204) angeordnet ist;
wobei das Detektionselement (16, 208) von einer Position (P1) als Reaktion auf die relative Bewegung zwischen der ersten Komponente (12, 206) und der zweiten Komponente (14, 204) beweglich ist:

wobei die erste Komponente (12, 206) aus einem Hauptteil (18) und einer positionsbegrenzenden Wand (20) besteht und die positionsbegrenzende Wand (20) mit einer Seite des Hauptteils (18) verbunden und an dieser angeordnet ist, während der Hauptteil (18) eine Öffnung (22) aufweist und mit der positionsbegrenzenden Wand (20) ein Hohlraum (24) gebildet wird, der mit der Öffnung (22) verbunden ist, und
wobei die erste Komponente (12, 206) einen Wandabschnitt (26) umfasst, der auf der Seite gegenüber des Hauptteils (18) und neben der Öffnung (22) angeordnet ist, und
wobei die zweite Komponente (14, 204) im Hohlraum (24) der ersten Komponente (12, 206) aufgenommen ist, sich das Vibrationsdetektionsgerät dadurch auszeichnet, dass: die zweite Komponente (14, 204) eine erste Seite (28), eine zweite Seite (30) und ein Tragwerk (32) aufweist, wobei das Tragwerk (32) auf der ersten Seite (28) angeordnet ist, dessen Position im Wesentlichen der Öffnung (22) entspricht, aus einem unteren Abschnitt (36) und einer Innenwand (40) besteht und im Wesentlichen eine Kegelform aufweist; und wobei ein aufnehmender Hohlraum zwischen dem unteren Abschnitt (36) und der Innenwand (40) des Tragwerks (32) gebildet ist, und
das Detektionselement (16, 208) eine Kugel ist, die zwischen dem aufnehmenden Hohlraum der zweiten Komponente (14, 204) und dem Wandabschnitt (26) der ersten Komponente (12, 206) aufgenommen ist.

2. Das Vibrationsdetektionsgerät (10, 200) nach Anspruch 1, wobei die zweite Komponente (14, 204) eine kleinere Größe als der Hohlraum (24) aufweist.

3. Das Vibrationsdetektionsgerät (10, 200) nach Ansprüchen 1 oder 2, weiter umfassend ein Rollelement (42) zum Erleichtern der Bewegung der zweiten Komponente (14, 204) zur ersten Komponente (12, 206).

4. Das Vibrationsdetektionsgerät (10, 200) nach einem der Ansprüche 1-3, wobei das Tragwerk (32) einen Teil des Detektionselements (16, 208) aufnimmt.

5. Das Vibrationsdetektionsgerät (10, 200) nach Anspruch 4, wobei die Innenwand (40) zum unteren Abschnitt (36) geneigt ist.

6. Das Vibrationsdetektionsgerät (10, 200) nach An-

spruch 5, wobei der Wandabschnitt (26) an das Tragwerk (32) angrenzt.

7. Das Vibrationsdetektionsgerät (10, 200) nach einem der Ansprüche 4-6, wobei beim Bewegen der zweiten Komponente (14, 204) zur ersten Komponente (12, 206) das Detektionselement (16, 208) mit der Innenwand (40) des Tragwerks (32) der zweiten Komponente (14, 204) über den Wandabschnitt (26) der ersten Komponente (12, 206) angetrieben wird.

8. Das Vibrationsdetektionsgerät (10, 200) nach einem der Ansprüche 1-7, wobei die relative Bewegung zwischen der ersten Komponente (12, 206) und der zweiten Komponente (14, 204) von einer Richtung, in die das Detektionselement (16, 208) aus der Position (P1) bewegt wird, erfolgt.

9. Das Vibrationsdetektionsgerät (200) nach einem der Ansprüche 1-8, weiter umfassend ein Kabel (202), wobei die zweite Komponente (204) an der ersten Komponente (206) aufgehängt ist.

10. Das Vibrationsdetektionsgerät (200) nach Anspruch 9, wobei das Kabel (202) flexibel ist.

11. Eine Vibrationsdetektionsmethode, umfassend die Schritte:

eine erste Komponente (12, 206) und eine zweite Komponente (14, 204), die zueinander beweglich sind,
wobei die erste Komponente (12, 206) aus einem Hauptteil (18) und einer positionsbegrenzenden Wand (20) besteht und die positionsbegrenzenden Wand (20) mit einer Seite des Hauptteils (18) mit einer Seite verbunden und an dieser angeordnet ist, während mit dem Hauptteil (18) eine Öffnung (22) und die positionsbegrenzende Wand (20) ein Hohlraum (24) gebildet ist, die mit der Öffnung (22) verbunden sind, und
wobei die erste Komponente (12, 206) aus einem Wandabschnitt (26) auf der Seite gegenüber dem Hauptteil (18) besteht und eine Öffnung (22) aufweist; die zweite Komponente (14, 204) im Hohlraum (24) der ersten Komponente (12, 206) aufgenommen ist; sich die Methode dadurch auszeichnet, dass die zweite Komponente (14, 204) eine erste Seite (28) und eine zweite Seite (30) aufweist und aus einem Tragwerk (32) besteht, wobei das Tragwerk (32) auf der ersten Seite (28) angeordnet ist, im Wesentlichen der Position der Öffnung (22) entspricht, aus einem unteren Abschnitt (36) und einer Innenwand (40) besteht und im Wesentlichen eine Kegelform aufweist; und wobei ein aufnehmender Hohlraum zwischen einem unteren Abschnitt (36) und einer Innenwand (40) des Tragwerks (32) gebildet ist; und dass die Vibrationsdetektionsmethode weiter den Schritt umfasst, mit einem Detektionselement (16, 208) gebildet zu sein, das als eine Kugel zwischen dem Wandabschnitt (26) der ersten Komponente (12, 206) und mit einem aufnehmenden Hohlraum der zweiten Komponente (14, 204) gebildet ist, so dass beim Ausüben einer Kraft auf eine der ersten Komponenten (12, 206) und auf die zweite Komponente (14, 204) das Detektionselement (16, 208) als Reaktion auf die Kraft aus einer Position (P1) bewegt wird.

Revendications

1. Dispositif de détection de vibrations (10, 200), **caractérisé par le fait qu'**il comprend :

un premier composant (12, 206) et un second composant (14, 204) mobiles l'un par rapport à l'autre ; et
un élément de détection (16, 208) situé sur l'un des premier composant (12, 206) et second composant (14, 204) ;
l'élément de détection (16, 208) est mobile depuis une position (P1) en réponse au mouvement relatif entre le premier composant (12, 206) et le second composant (14, 204) :

le premier composant (12, 206) inclut un corps principal (18) et une paroi de limitation de la position (20), et la paroi de limitation de la position (20) est raccordée à et située sur un côté du corps principal (18), et le corps principal (18) comporte une ouverture (22) et la paroi de limitation de la position (20) définit un espace (24) en communication avec l'ouverture (22), et
le premier composant (12, 206) inclut une partie de paroi (26) située sur le côté opposé du corps principal (18) et adjacente à l'ouverture (22), et
le second composant (14, 204) est reçu dans l'espace (24) du premier composant (12, 206), le dispositif de détection de vibrations **se caractérisant en ce que** : le second composant (14, 204) inclut un premier côté (28), un second côté (30) et une structure de support (32), la structure de support (32) est située sur le premier côté (28), correspond sensiblement en position à l'ouverture (22), inclut une partie inférieure (36) et une paroi intérieure (40), et présente une forme sensiblement conique ; et un espace de réception est formé entre la partie inférieure (36) et la paroi intérieure (40) de la

structure de support (32), et
l'élément de détection (16, 208) est une boule, disposée entre l'espace de réception du second composant (14, 204) et la partie de paroi (26) du premier composant (12, 206).

2. Dispositif de détection de vibrations (10, 200) selon la revendication 1, **caractérisé par le fait que** le second composant (14, 204) présente une taille plus petite que l'espace (24).

3. Dispositif de détection de vibrations (10, 200) selon les revendications 1 ou 2, **caractérisé par le fait qu'**il comprend en outre un élément roulant (42) pour faciliter le mouvement du second composant (14, 204) par rapport au premier composant (12, 206).

4. Dispositif de détection de vibrations (10, 200) selon l'une quelconque des revendications 1-3, **caractérisé par le fait que** la structure de support (32) reçoit une partie de l'élément de détection (16, 208).

5. Dispositif de détection de vibrations (10, 200) selon la revendication 4, **caractérisé par le fait que** la paroi interne (40) est inclinée par rapport à la partie inférieure (36).

6. Dispositif de détection de vibrations (10, 200) selon la revendication 5, **caractérisé par le fait que** la partie de paroi (26) est adjacente à la structure de support (32).

7. Dispositif de détection de vibrations (10, 200) selon l'une quelconque des revendications 4-6, **caractérisé par le fait que** lorsque le second composant (14, 204) est déplacé par rapport au premier composant (12, 206), l'élément de détection (16, 208) est entraîné par la paroi intérieure (40) de la structure de support (32) du second composant (14, 204) via la partie de paroi (26) du premier composant (12, 206).

8. Dispositif de détection de vibrations (10, 200) selon l'une quelconque des revendications 1-7, **caractérisé par le fait que** le mouvement relatif entre le premier composant (12, 206) et le second composant (14, 204) s'effectue dans une direction différente d'une direction dans laquelle l'élément de détection (16, 208) est déplacé depuis la position (P1).

9. Dispositif de détection de vibrations (200) selon l'une quelconque des revendications 1-8, **caractérisé par le fait qu'**il comprend en outre un élément de câble (202) par lequel le second composant (204) est suspendu depuis le premier composant (206).

10. Dispositif de détection de vibrations (200) selon la revendication 9, **caractérisé par le fait que** l'élément de câble (202) est flexible.

11. Méthode de détection de vibrations, comprenant l'étape de :

fournir un premier composant (12, 206) et un second composant (14, 204) qui sont mobiles l'un par rapport à l'autre,
le premier composant (12, 206) inclut un corps principal (18) et une paroi de limitation de la position (20), la paroi de limitation de la position (20) est raccordée à et située sur un côté du corps principal (18) et le corps principal (18) comporte une ouverture (22) et la paroi de limitation de la position (20) définit un espace (24) en communication avec l'ouverture (22), et
le premier composant (12, 206) inclut une partie de paroi (26) située sur le côté opposé du corps principal (18) et adjacente à l'ouverture (22) ; et recevant le second composant (14, 204) dans l'espace (24) du premier composant (12, 206) ;
le procédé étant **caractérisé en ce que**, le second composant (14, 204) inclut un premier côté (28), un second côté (30) et une structure de support (32), la structure de support (32) est située sur le premier côté (28), correspond sensiblement en position à l'ouverture (22), inclut une partie inférieure (36) et une paroi intérieure (40), et présente une forme sensiblement conique ; et un espace de réception est formé entre une partie inférieure (36) et une paroi intérieure (40) de la structure de support (32) ; et **en ce que** dans le procédé de détection de vibration comprend en outre l'étape consistant à fournir un élément de détection (16, 208), qui est une boule entre la partie de paroi (26) du premier composant (12, 206) et l'espace de réception du second composant (14, 204) de sorte que, lorsqu'une force est appliquée à l'un des premier composant (12, 206) et second composant (14, 204), l'élément de détection (16, 208) est déplacé depuis une position (P1) en réponse à la force.

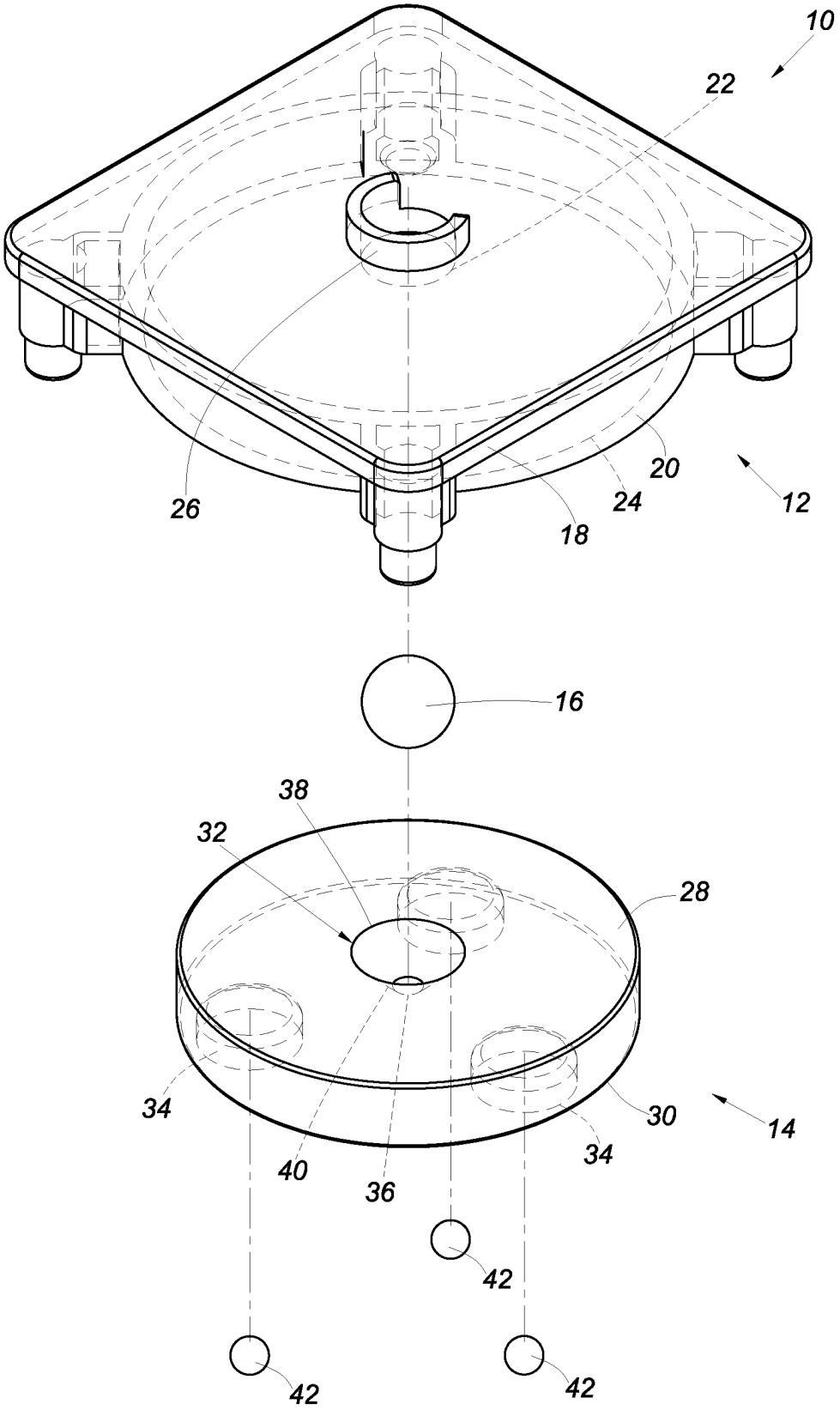

FIG. 1

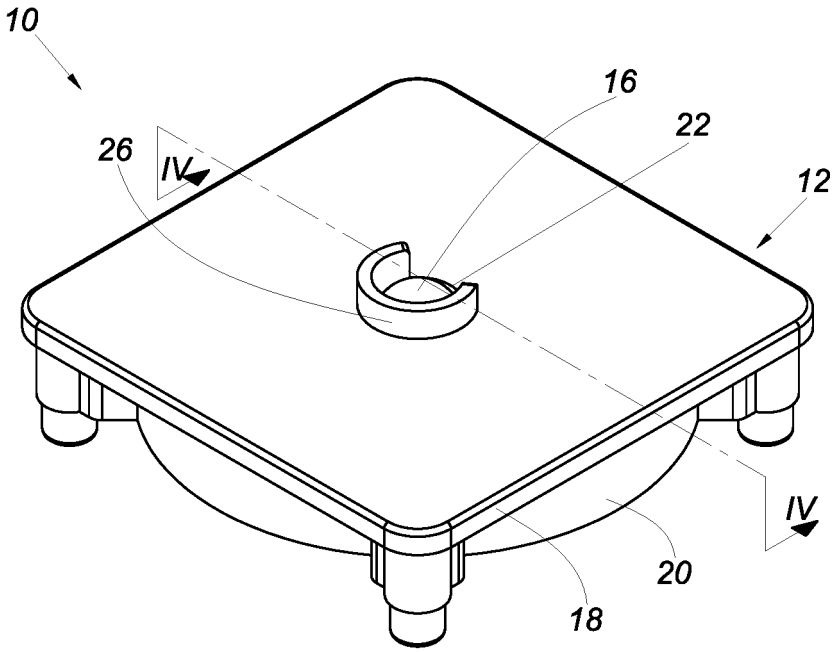

FIG. 2

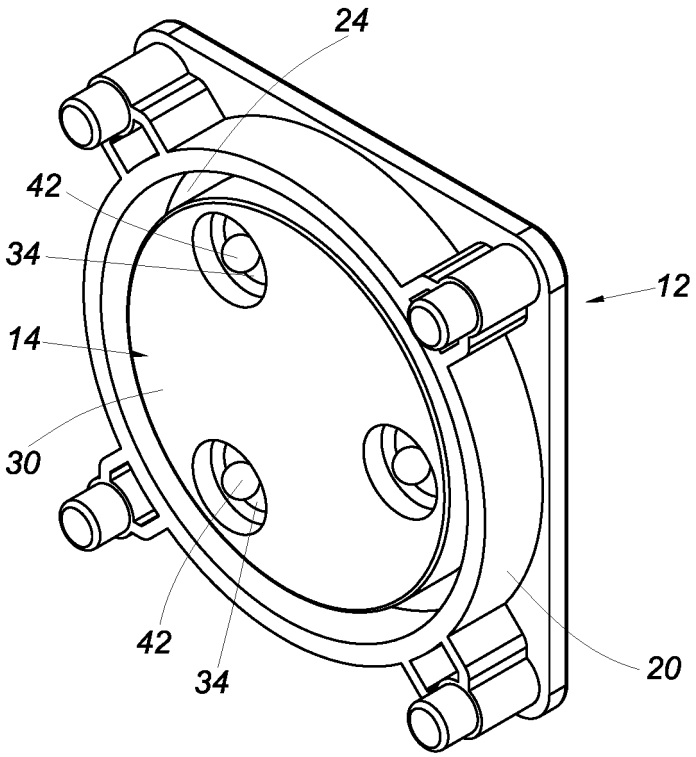

FIG. 3

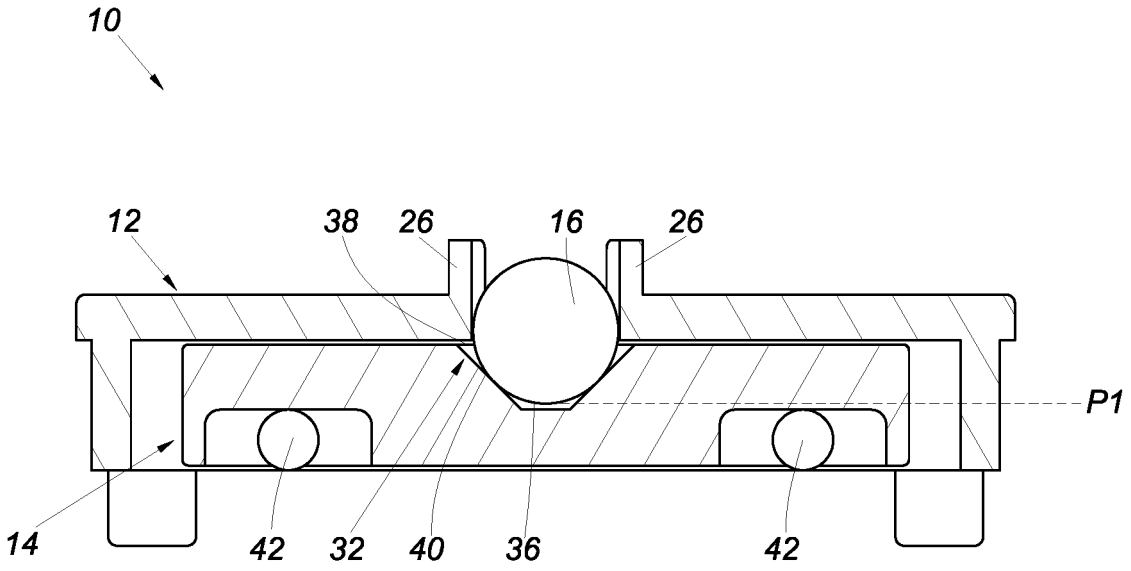
10
12
38
26
16
26
P1
14
42
32
40
36
42

FIG. 4

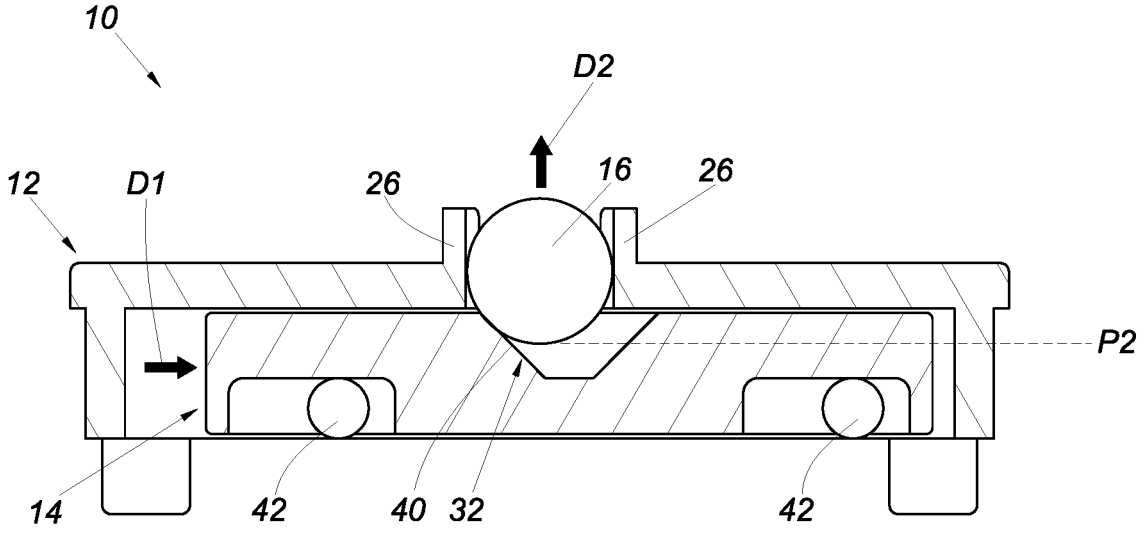
10
D2
12
D1
26
16
26
P2
14
42
40
32
42

FIG. 5

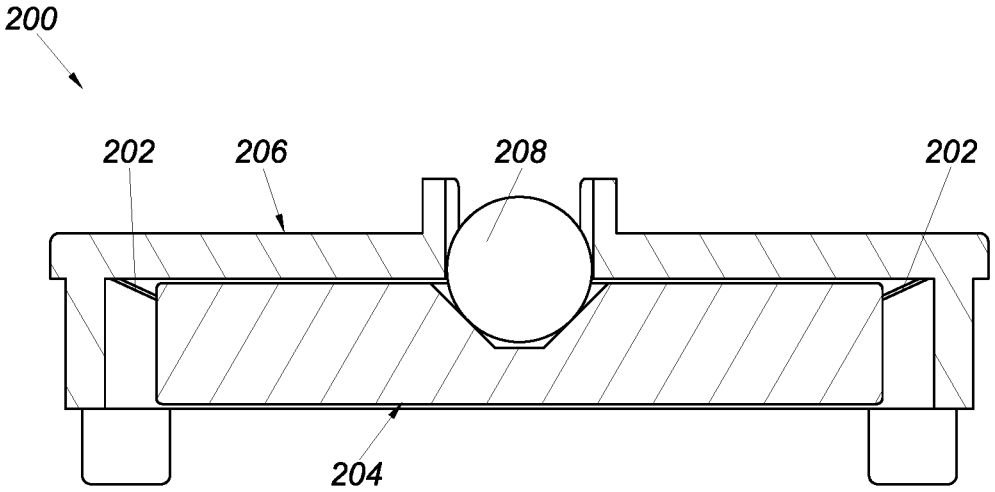

FIG. 6

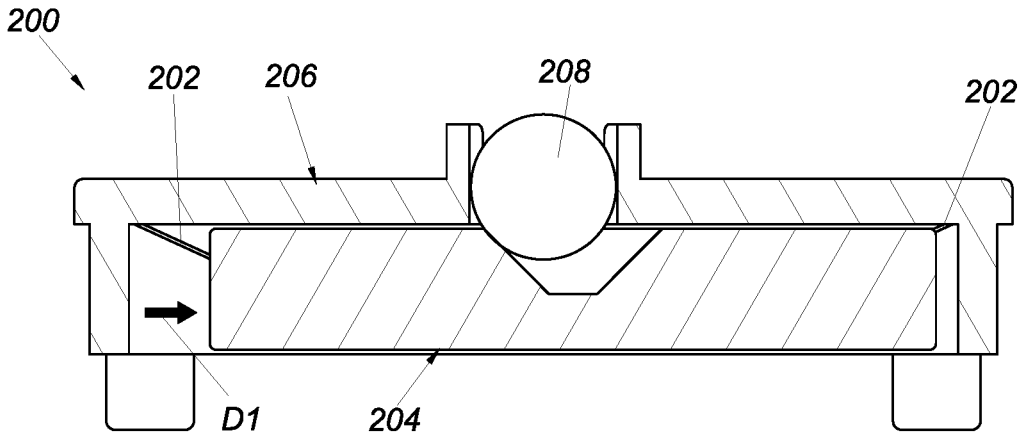

FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6550827 B1 **[0002]**
- JP 2006194078 A **[0003]**
- JP H10317772 A **[0004]**
- JP H1025945 A **[0005]**
- US 20150240542 A1 **[0006]**