(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 245 397 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
05.04.2017 Bulletin 2017/14

(21) Application number: **08866850.4**

(22) Date of filing: **06.12.2008**

(51) Int Cl.:
F25D 23/02 *(2006.01)*

(86) International application number:
PCT/EP2008/066970

(87) International publication number:
WO 2009/083404 (09.07.2009 Gazette 2009/28)

(54) A COOLING DEVICE

KÜHLVORRICHTUNG

DISPOSITIF DE REFROIDISSEMENT

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

(30) Priority: **31.12.2007 TR 200709227**

(43) Date of publication of application:
03.11.2010 Bulletin 2010/44

(73) Proprietor: **Arçelik Anonim Sirketi**
34950 Istanbul (TR)

(72) Inventors:
- **CELIK, Ridvan Kadir**
  34950 Istanbul (TR)
- **MUTLU, Sati**
  34950 Istanbul (TR)
- **MUTLU, Sunay**
  34950 Istanbul (TR)
- **KAHRAMAN, Soner**
  34950 Istanbul (TR)

(56) References cited:
EP-A- 1 184 532
EP-A- 1 273 750
EP-A- 1 691 153
DE-U1-202005 005 533

EP 2 245 397 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to a cooling device that comprises a door-in-door situated on the door thereof.

[0002] A door is used for the access of the user to the objects loaded in cooling devices. In the state of the art, a gasket is secured on the surface of the cooling device door in contact with the cooling device main body, surrounding the periphery entirely, thus the heat transfer is prevented between the cooling device interior and the outside environment, wherein the cooling device is located, when the door is closed thereby providing airtightness by means of this gasket.

[0003] The interior of the cooling device, cooler than the outside, begins to get warmer when the cooling device door is opened and the operation period of the compressor is affected depending on the frequency of opening, closing the cooling device door and the duration of being left open. For example, for taking out a beverage bottle, the cooling device door is opened and this bottle is taken out, thereby causing the temperature of the entire cooling device interior to increase unnecessarily, the operation period of the compressor and respectively the energy consumption of the cooling device increases. In order to overcome this problem, solutions are provided in the state of the art, allowing access of the user inside the cooling device without requiring opening the door of the cooling device. The most widespread embodiment in the technique is using a small door-in-door mounted pivotally on the door of the cooling device.

[0004] Of these embodiments, the door-in-doors that open by tilting forward are particularly preferred for providing alternative access means and ease of use. Various embodiments are developed in the technique for the assembly and movement of the door-in-doors that open by tilting forward.

[0005] However, a problem is encountered for the pivotally forward opening door-in-door which is falling uncontrollably and more rapidly than required by the effect of gravity.

[0006] One of the embodiments known in the technique for the solution of this problem, in the Korean Patent Application No 20070015337, a hinge mechanism is explained comprising spring pairs that are deformed and released during the opening and closing motion of the door.

[0007] In another state of the art embodiment, the European Patent Application No EP1691153, a cooling device according to the preamble of claim 1 is disclosed, said cooling device comprises an auxiliary door that is opened smoothly with a cam and a hinge device having a helical spring pressed on by the said cam while opening the auxiliary door.

[0008] The aim of the present invention is the realization of a cooling device comprising a door-in-door that opens controllably by tilting forward.

[0009] In the cooling device of the present invention, the door-in-door is fastened to the door by means of a hinge as defined in claim 1.

[0010] The opening motion of the door-in-door slows down and the door-in-door is enabled to open smoothly since the pressing element deforms the elastic element and consumes energy as the door-in-door opens.

[0011] In an embodiment of the present invention, the elastic element comprises two curvilinear arms, secured pivotally from one of their ends and a spring stretched between the free ends of the arms. The pressing element is disposed between the arms and when the longer axis is in the vertical position, the arms are in the closed and the spring is in the released position. When the pressing element rotates, and the longer axis changes from the vertical to the horizontal position, the arms open by pushing of the pressing element and the spring is deformed. The force consumed for deforming the spring slows down opening of the door-in-door enabling a smooth opening.

[0012] In another embodiment of the present invention, the elastic element comprises two curvilinear arms, secured pivotally from one of their ends and two springs that fasten these arms to the door from their free ends. Each spring pulls the arm whereto it is fastened towards the other with the effect of the force applied by the pressing element disposed between the arms.

[0013] In this embodiment, the arm, opposite the pressing element in the closing direction of the door-in-door, comprises a protrusion extending towards the pressing element. Accordingly, the pressing element presses on the protrusion as the door-in-door closes and stretches the other spring fastened to the end of this arm. Since the door-in-door resists against closing as the spring is stretched, the door-in-door is prevented from closing by slamming.

[0014] In an embodiment of the present invention, the pressing element also serves as a pin providing the door-in-door to be beared on the door. Thus, the requirement of using an additional element for bearing is eliminated.

[0015] In an embodiment of the present invention, the hinge comprises a recess disposed on at least one of the arms. The pressing element, when changed to the horizontal position, is seated in the recess and thus the door-in-door is locked in the open position.

[0016] In another embodiment of the present invention, the pressing element is configured as a housing on the door-in-door. The elastic element comprises at least one spring, disposed on the door, hence not rotating together with the door-in-door, with one end situated inside the pressing element.

[0017] The door-in-door used in the cooling device of the present invention, is enabled to move controllably during opening by tilting forward thereby providing a convenient and safe utilization means.

[0018] A cooling device realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the perspective view of a cooling device

when the door-in-door is ajar.

Figure 2 - is the detailed schematic view of a cooling device when the door-in-door is closed.

Figure 3 - is the detailed schematic view of a cooling device when the door-in-door is ajar.

Figure 4 - is the detailed schematic view of a cooling device when the door-in-door is closed.

Figure 5 - is the schematic view of the hinge when the door-in-door is closed in an embodiment of the present invention.

Figure 6 - is the schematic view of the hinge when the door-in-door is ajar in an embodiment of the present invention.

Figure 7 - is the schematic view of the hinge when the door-in-door is open in an embodiment of the present invention.

Figure 8 - is the schematic view of the hinge when the door-in-door is closed in another embodiment of the present invention.

Figure 9 - is the schematic view of the hinge when the door-in-door is ajar in another embodiment of the present invention.

Figure 10 - is the schematic view of the hinge when the door-in-door is open in another embodiment of the present invention.

Figure 11 - is the schematic view of the hinge when the door-in-door is closed in another embodiment of the present invention.

Figure 12 - is the schematic view of the hinge when the door-in-door is ajar in another embodiment of the present invention.

Figure 13 - is the schematic view of the hinge when the door-in-door is open in another embodiment of the present invention.

[0019] The elements illustrated in the figures are numbered as follows:

1. Cooling device
2. Body
3. Door
4. Door-in-door
5. Opening
6. Hinge
7. Pressing element
8. Elastic element
9. 109. Arm
10. Spring
11. Recess
12. Protrusion

[0020] The cooling device (1) of the present invention comprises a body (2), a door (3) allowing access of the user to the items emplaced inside body (2), an opening (5) arranged on the door (3), a door-in-door (4) fastened to the door (3) rotatable around a horizontal rotational axis situated at the lower end of the opening (5), covering the opening (5) when closed and allowing access from the opening (5) to the interior volume of the cooling device (1) when opened by tilting and a hinge (6) that fastens the door-in-door (4) to the door (3) such that it opens controllably (Figures 1 to 4).

[0021] The hinge (6) comprises:

- an oval shaped pressing element (7) situated on the door-in-door (4), rotating together with the door-in-door (4) such that the longer axis of the said pressing element (7) is in vertical position when the door-in-door (4) is in the closed position, and the longer axis of the said pressing element (7) is horizontal when the door-in-door (4) is in the open position, and
- an elastic element (8) situated on the door (3) that is deformed as the pressing element (7) applies pressure, with its longer axis changing from the vertical to the horizontal position while the door-in-door (4) is opened.

[0022] The door-in-door (4) is enabled to open softly and controllably since the amount of force exerted for deforming the elastic element (8) while the door-in-door (4) is opened counterbalances the gravity. Thus, the door-in-door (4) is prevented from opening rapidly by its own weight and to be damaged duly.

[0023] In an embodiment of the present invention, the elastic element (8) comprises two curvilinear arms (9), fastened pivotally to each other and to the body (2) from one of their ends and a spring (10) that fastens the free ends of the arms (9) to each other. The pressing element (7) used in this embodiment, is configured as an extension extending from the door-in-door (4) to the door (3) and is disposed between the arms (9, 109). The pressing element (7), while the longer axis changes from the vertical to the horizontal position, exerts a force on the arms (9, 109) causing the spring (10) to stretch and the arms (9) to open (Figure 5, Figure 6 and Figure 7). The door-in-door (4) opens slowly, since the spring (10) stretches resisting against opening while the door-in-door (4) opens.

[0024] In another embodiment of the present invention, the elastic element (8) comprises two curvilinear arms (9, 109), fastened pivotally to each other and to the body (2) from one of their ends and at least two springs (10) that fasten these two arms (9, 109) to the door (3) from their free ends (Figure 8, Figure 9 and Figure 10). The pressing element (7) is again disposed between the arms (9, 109). Each spring (10) pulls the arm (9) whereto it is fastened towards the other arm (109) against the force applied by the pressing element (7).

[0025] In this embodiment, the pressing element (7) rotating such that the longer axis changes from the vertical to the horizontal position as the door-in-door (4) opens, pushes the arm (9) opposite thereto in the opening direction, stretches the spring (10) attached to the end of this arm (9). The door-in-door (4) is prevented from falling rapidly since the stretching of the spring (10) resists against the opening of the door-in-door (4).

[0026] In this embodiment, the arm (109), opposite the pressing element (7) in the closing direction of the door-in-door (4), comprises a protrusion (12) at its end, extending towards the pressing element (7). The pressing element (7) presses on the protrusion (12) as the door-in-door (4) closes and stretches the other spring (10) fastened to the end of this arm (109). The door-in-door (4) is prevented from closing by slamming since the stretching of this spring (10) resists against closing of the door-in-door (4).

[0027] In an embodiment of the present invention, the pressing element (7) also serves as a pin providing the door-in-door (4) to bear on the door (3). Accordingly, the requirement of using an additional element for bearing is eliminated (Figures 5 to 10).

[0028] In an embodiment of the present invention, the hinge (6) comprises a recess (11) disposed on at least one of the arms (9, 109) and the pressing element (7), when changed to the horizontal position, is seated therein thus the door-in-door (4) can be locked in the open position (Figure 7 and Figure 10).

[0029] In another embodiment of the present invention, the pressing element (7) is configured as a housing situated on the door-in-door (4). In this embodiment, the elastic element (7) comprises at least one spring (10), disposed on the door (3), with one end situated inside the pressing element (7). The pressing element (7), moving together with the door-in-door (4), and when the longer axis changes from the vertical to the horizontal position, exerts a pressure on the elastic element (8) and deforms thereof. The opening motion of the door-in-door (4) slows down and is prevented from opening rapidly since the elastic element (8) receives energy while being deformed (Figures 11, 12, 13).

[0030] By means of present invention, the door-in-door (4), openable by tilting forward, is prevented from opening uncontrollably by its own weight and the door-in-door (4) is enabled to move controllably and smoothly for changing to the open position.

Claims

1. A cooling device (1) that comprises:

a body (2), a door (3) allowing access for a user to the items emplaced inside the body (2), an opening (5) arranged on the door (3), a door-in-door (4) fastened to the door (3) rotatable around a horizontal rotational axis situated at a lower end of the opening (5), said door-in-door covering Luuehnu the opening (5) when closed and allowing access from the opening (5) to an interior volume of the cooling device (1) when opened by tilting, and a hinge (6) that fastens the door-in-door (4) to the door (3) such that it can open controllably, said cooling device being **characterized in that** the hinge (6) has:

- an oval shaped pressing element (7) situated on the door-in-door (4), rotating together with the door-in-door (4) such that a longer axis of said pressing element (7) is in vertical position when the door-in-door (4) is in the closed position, and the longer axis of said pressing element (7) is in horizontal position when the door-in-door (4) is in the open position; and
- an elastic element (8) situated on the door (3), said elastic element being deformed as the pressing element (7) applies pressure while the door-in-door (4) is opened, with the longer axis thereof changing from the vertical to the horizontal position, wherein the elastic element (8) comprises two curvilinear arms (9, 109) fastened pivotally to each other and to the body (2) from one of their ends and a pressing element (7) disposed between the arms (9, 109).

2. A cooling device (1) as in Claim 1 , **characterized in that** a spring (10) fastens the free ends of the arms (9, 109) to each other and the pressing element (7) is configured as an extension extending from the door-in-door (4) towards the door (3).

3. A cooling device (1) as in Claim 1 , **characterized in that** at least two springs (10) fasten these two arms (9, 109) to the door (3) from their free ends, thereby pulling the arm (9) whereto they are fastened towards the other arm (109).

4. A cooling device (1) as in Claim 3, **characterized in that** the arm (109) comprises a protrusion (12) disposed opposite to the pressing element (7) in a closing direction of the door-in-door (4) and extending towards the pressing element (7), whereon the pressing element (7) exerts force while the door-in-door (4) closes.

5. A cooling device (1) as in any one of the above Claims, **characterized in that** the pressing element (7) also serves as a pin enabling the door-in-door (4) to bear on the door (3).

6. A cooling device (1) as in any one of the above Claims, **characterized in that** the hinge (6) comprises a recess (11) disposed on at least one of the arms (9, 109), wherein the pressing element (7) is seated when changed to the horizontal position, thereby locking the door-in-door (4) in the open position.

Patentansprüche

1. Kühlvorrichtung (1), umfassend:

einen Gehäusekörper (2), eine Tür (3), die einem Benutzer Zugriff auf die in den Gehäusekörper (2) gelegten Artikel gestattet, eine Öffnung (5), die an der Tür (3) angeordnet ist, eine Tür-in-Tür (4), die an der Tür (3) befestigt ist und um eine horizontale Drehachse am unteren Ende der Öffnung (5) drehbar ist, wobei die Tür-in Tür die Öffnung (5) abdeckt, wenn sie geschlossen ist, und über die Öffnung (5) Zugriff auf ein Innenvolumen der Kühlvorrichtung (1) gestattet, wenn sie durch Kippen geöffnet wird, und ein Scharnier (6), das die Tür-in-Tür (4) an der Tür (3) befestigt, derart, dass sie sich in kontrollierter Weise öffnen kann, wobei die Kühlvorrichtung **dadurch gekennzeichnet ist, dass** das Scharnier (6) Folgendes aufweist:

- ein oval geformtes Druckelement (7), das an der Tür-in-Tür (4) angeordnet ist und sich zusammen mit der Tür-in-Tür (4) dreht, derart, dass eine längere Achse des Druckelements (7) in vertikaler Stellung ist, wenn die Tür-in-Tür (4) in der geschlossenen Stellung ist, und die längere Achse des Druckelements (7) in horizontaler Stellung ist, wenn die Tür-in-Tür (4) in der offenen Stellung ist; und
- ein elastisches Element (8), das an der Tür (3) angeordnet ist, wobei das elastische Element verformt wird, wenn das Druckelement (7) Druck ausübt, während die Tür-in-Tür (4) geöffnet wird, wobei seine längere Achse von der vertikalen in die horizontale Stellung wechselt, **wobei** das elastische Element (8) zwei gekrümmte Arme (9, 109), die schwenkend aneinander und von einem ihrer Enden an dem Gehäusekörper (2) befestigt sind, und ein Druckelement (7) umfasst, das zwischen den Armen (9, 109) angeordnet ist.

2. Kühlvorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** eine Feder (10) die freien Enden der Arme (9, 109) aneinander befestigt und das Druckelement (7) als eine Verlängerung konfiguriert ist, die sich von der Tür-in-Tür (4) zur Tür (3).

3. Kühlvorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** wenigstens zwei Federn (10) die zwei Arme (9, 109) von ihren freien Enden an der Tür (3) befestigen und dadurch den Arm (9), an dem sie befestigt sind, zu dem anderen Arm (109) ziehen.

4. Kühlvorrichtung (1) nach Anspruch 3, **dadurch gekennzeichnet, dass** der Arm (109) einen Vorsprung (12) umfasst, der gegenüber dem Druckelement (7) in einer Schließrichtung der Tür-in-Tür (4) angeordnet ist und sich zu dem Druckelement (7) hin erstreckt und auf den das Druckelement (7) Kraft ausübt, wenn sich die Tür-in-Tür (4) schließt.

5. Kühlvorrichtung (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Druckelement (7) auch als ein Zapfen dient, der es ermöglicht, dass die Tür-in-Tür (4) an der Tür (3) anliegt.

6. Kühlvorrichtung (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Scharnier (6) eine Vertiefung (11) umfasst, die an wenigstens einem der Arme (9, 109) angeordnet ist und in die das Druckelement (7) eingesetzt ist, wenn es in der horizontalen Stellung ist, und dadurch die Tür-in-Tür (4) in der offenen Stellung arretiert.

Revendications

1. Un dispositif de refroidissement (1) comprenant un corps (2), une porte (3) qui permet à un utilisateur d'accéder les articles placés dans le corps (2), une ouverture (5) qui est arrangée sur la porte (3), une porte dans la porte (4) qui est attachée à la porte (3) et qui peut être tournée autour d'un axe horizontal de rotation situé à une extrémité inférieure de l'ouverture (5), ladite porte dans la porte recouvrant l'ouverture (5) lorsqu'elle est fermée et permettant l'accès à travers l'ouverture (5) à un volume intérieur du dispositif de refroidissement (1) lorsqu'elle est ouverte en se penchant, et une charnière (6) qui fixe la porte dans la porte (4) à la porte (3) de manière à s'ouvrir de manière contrôlable, ledit dispositif de refroidissement étant **caractérisé en ce que** la charnière (6) présente:

- un élément de pression ovale (7) qui est disposé sur la porte dans la porte (4) et qui tourne avec la porte dans la porte (4) de telle sorte qu'un axe plus long dudit élément de pression (7) est dans la position verticale lorsque la porte dans la porte (4) est dans la position fermée, et que l'axe plus long dudit élément de pression (7) est dans la position horizontale lorsque la porte dans la porte (4) est dans la position ouverte, et
- un élément élastique (8) qui est disposé sur la porte (3), ledit élément élastique étant déformé lorsque l'élément de pression (7) exerce une pression lors de l'ouverture de la porte dans la porte (4), l'axe plus long de celui-ci passant de la position verticale à position horizontale, **où** l'élément élastique (8) comprend deux bras curvilignes (9, 109) fixés de manière pivotante l'un à l'autre et au corps (2) à partir de l'une de leurs extrémités et un élément de pression (7) disposé entre les bras (9, 109).

2. Un dispositif de refroidissement (1) selon la Revendication 1, **caractérisé en ce qu**'un ressort (10) fixe les extrémités libres des bras (9, 109) l'une à l'autre et l'élément de pression (7) est configuré comme une extension s'étendant à partir de la porte dans la porte (4) vers la porte (3).

3. Un dispositif de refroidissement (1) selon la Revendication 1, **caractérisé en ce qu**'au moins deux ressorts (10) fixent ces deux bras (9, 109) à la porte (3) à partir de leurs extrémités libres, donc tirant le bras (9) auquel ils sont fixés vers l'autre bras (109).

4. Un dispositif de refroidissement (1) selon la Revendication 3, **caractérisé en ce que** le bras (109) comprend une protubérance (12) disposée à l'opposé de l'élément de pression (7) dans une direction de fermeture de la porte dans la porte (4) et s'étendant vers l'élément de pression (7), sur laquelle l'élément de pression (7) exerce une force lors de la fermeture de la porte dans la porte (4).

5. Un dispositif de refroidissement (1) selon l'une quelconque des revendications, **caractérisé en ce que** l'élément de pression (7) sert également de goupille permettant à la porte dans la porte (4) de s'appuyer sur la porte (3).

6. Un dispositif de refroidissement (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la charnière (6) comprend un évidement (11) arrangé sur au moins un des bras (9, 109), où l'élément de pression (7) est placé lorsqu'il est passé à la position horizontale, donc verrouillant la porte dans la porte (4) dans la position ouverte.

Figure 1

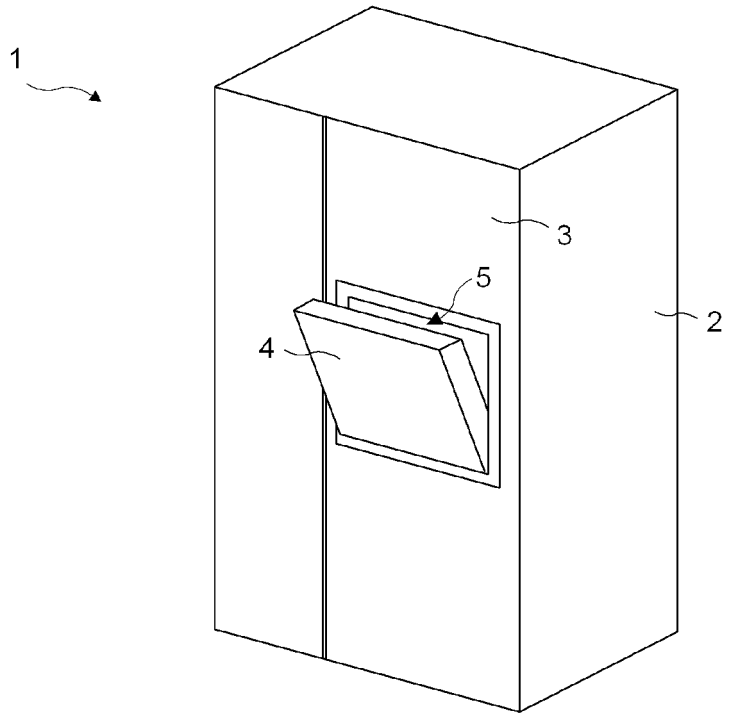


Figure 2

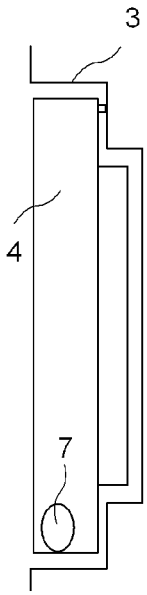


Figure 3

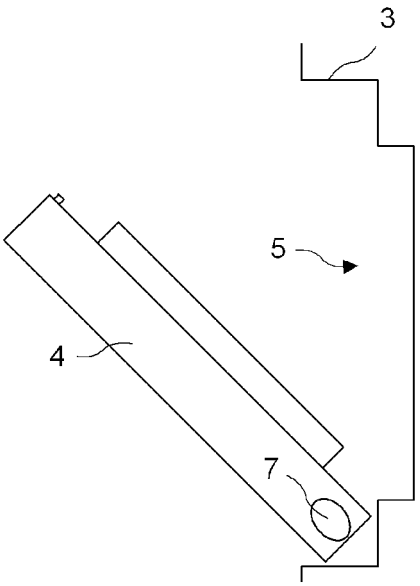


Figure 4

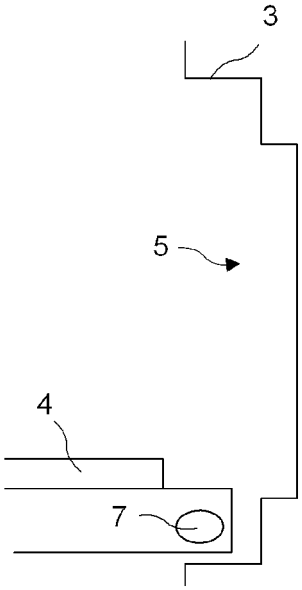


Figure 5

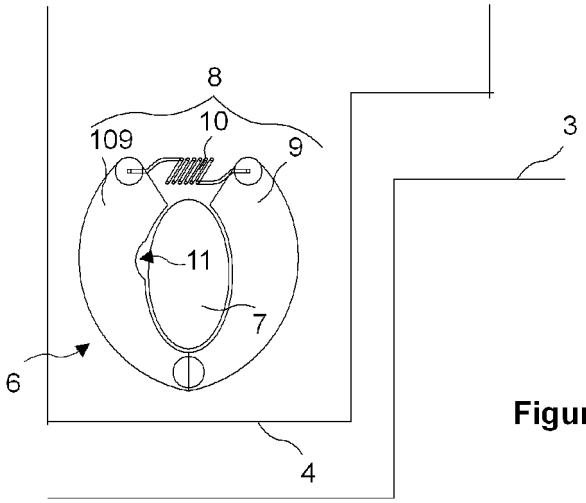


Figure 6

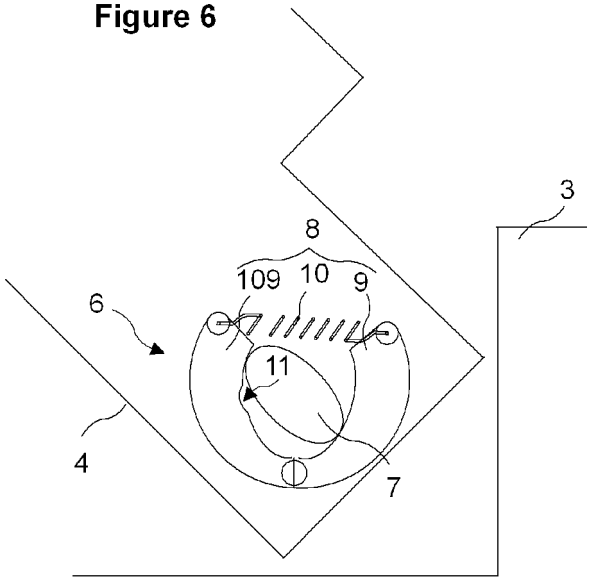


Figure 7

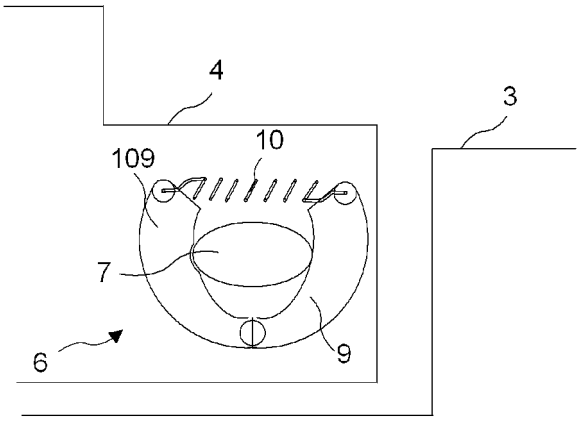


Figure 8

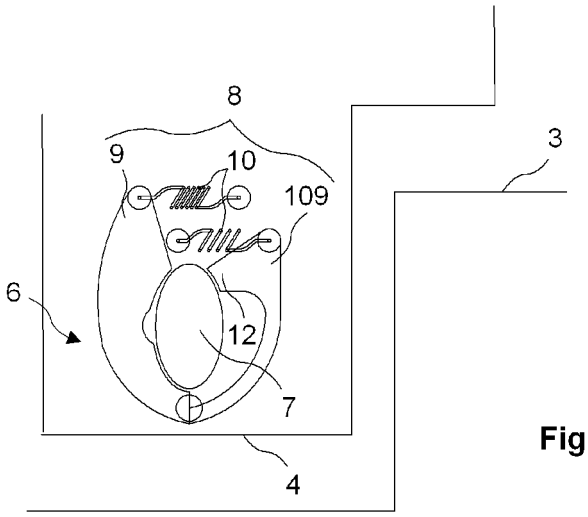


Figure 9

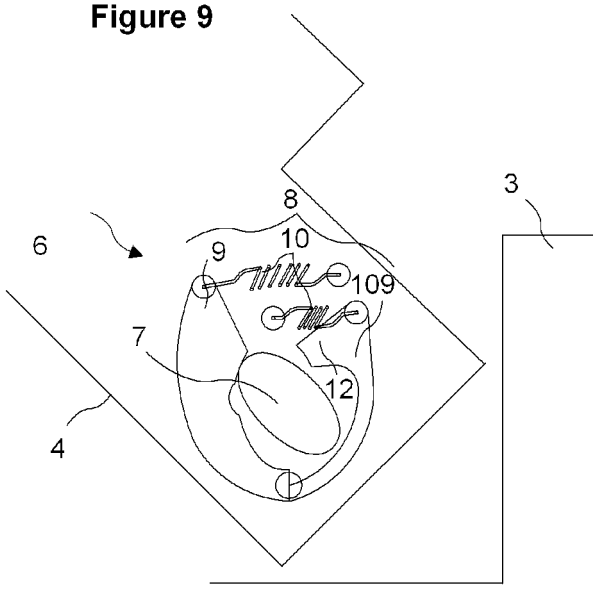


Figure 10

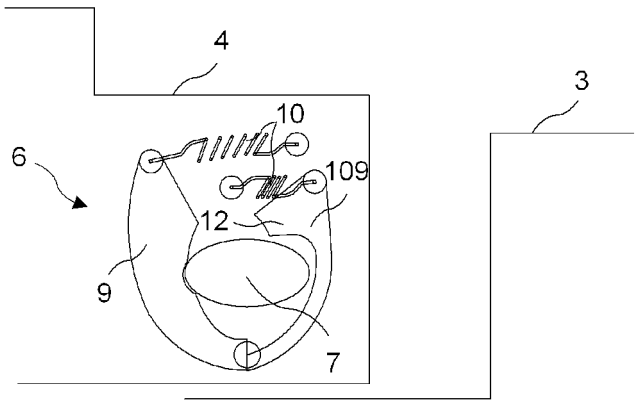


Figure 11

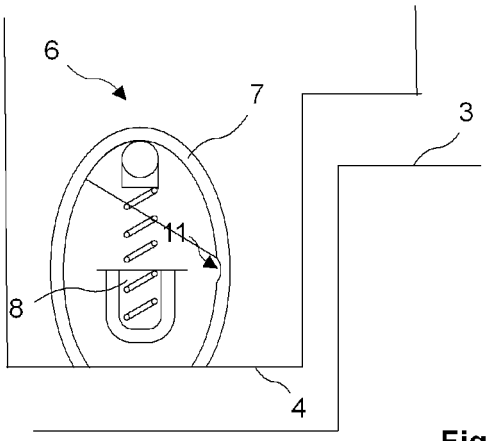


Figure 12

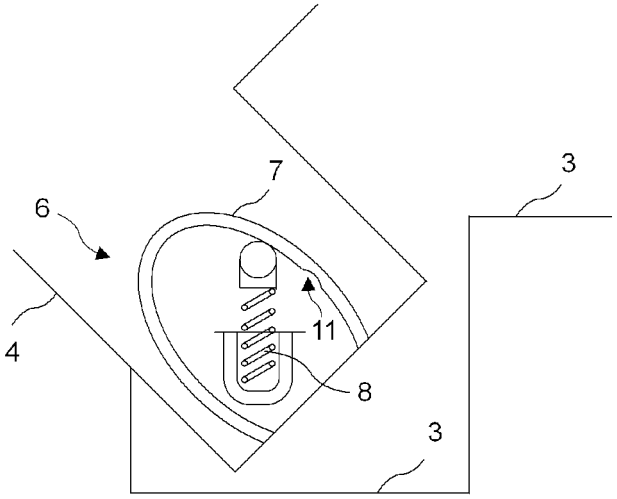
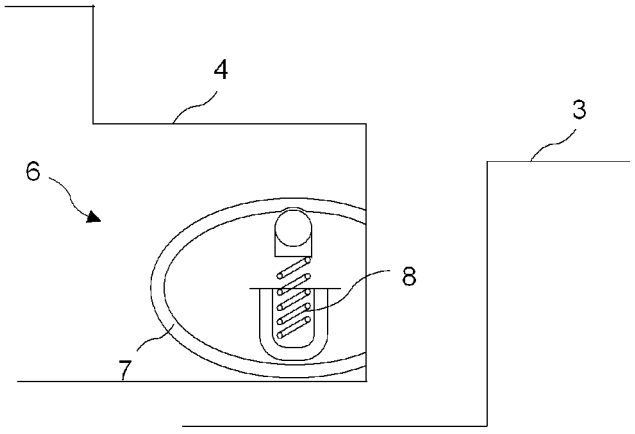


Figure 13



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 20070015337 **[0006]**
- EP 1691153 A **[0007]**