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(71) Applicant: **Indesit Company Beyaz Esya Sanayi ve Ticaret Anonim Sirketi**
Manisa (TR)

(72) Inventors:
- **Kahraman, Volkan**
  Manisa (TR)
- **Devrim, Bora**
  Izmir (TR)

(74) Representative: **Iskender, Ibrahim**
Destek Patent, Inc.
Lefkose Cad. NM Ofis Park
B Block No: 36/5 Besevler
16110 Bursa (TR)

(54) **Mechanism for pressure balancing**

(57) Present invention relates to a mechanism for pressure balancing (2), activated by using the movement of the doors (11) pulled towards the refrigerator(1)/freezer (3) body under the influence of the vacuum formed due to the pressure difference resulting from the inflow of the air into said refrigerator(1)/freezer(3), as a result of opening and closing of the refrigerator(1)/freezer (3) doors (11), and enabling opening of the door (11) without exerting a force greater than the normal one by allowing inflow of the air into the refrigerator(1)/freezer (3) section until inner and outer pressures are balanced, comprising at least an air duct (21) through which the ambient air proceeds to be conveyed into the refrigerator (1)/freezer (3) by the action of the pulled door as a result of the vacuum formed upon opening and closing of said door (11), at least a movable piece (23) constituting the air inlet of said air duct (21), at least a pushing part connected on the door (11), enabling conveyance of the ambient air into the refrigerator(1)/freezer (3) through the formed opening by pushing said (26) movable piece (23) towards the air duct (21), at least a spring (22) enabling the movable piece that is pushed by said pushing piece (26) to head for backwards and enabling the movable piece (23) to cover the air duct (21) inlet by taking its initial position once the pressure balance is achieved.

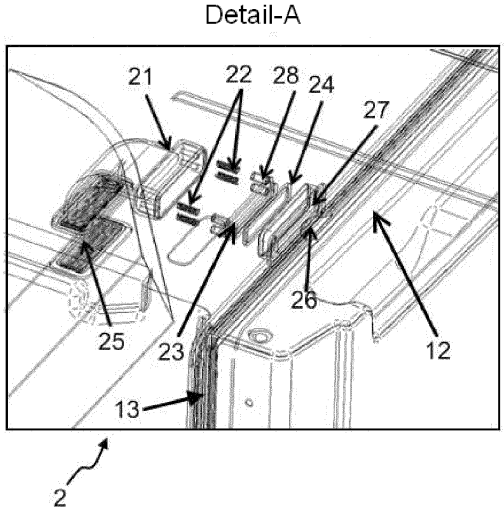

Figure-2

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Description

Technical Field

[0001] The present invention relates to refrigerator doors.

[0002] The present invention particularly relates to a mechanism for balancing the pressure eliminating the need for a waiting period in order for the refrigerator door to be opened for the second time due to the pressure difference between the refrigerating section and the outer environment, resulting from the vacuum formed during opening and closing of the freezer doors of the refrigerators.

Prior Art

[0003] When the doors of the refrigerators, especially those of the freezers are opened and closed once, there occurs a pressure difference between the inner part of the freezer and the outer environment. This results from inflow of the hot air into the freezer via opening of the door. Hot air in the inner chamber gives rise to formation of low pressure once it gets cold following the closing of the door. In this case, there occurs a suction force causing the door to stick to the refrigerator body. Said low pressure significantly hampers re-opening of the door until the pressure difference between the inner chamber and the outer environment balances.

[0004] A long time is to pass in order for pressure to be balanced. Because the gaskets used between the body and the door are not suitable for allowing a hermetical closing. For this reason, some air still keeps flowing into the freezer and this air, upon cooling, causes formation of low pressure. Although gaskets that leak as little as possible are used in order to prevent this, there is not a structure hindering the pressure difference between the inner space and outside environment.

[0005] There exist some applications in the prior art, intending the solution of this problem. In one of these, auxiliary mechanisms for opening and closing are employed in order for the freezer door to be opened. Proposed solution is to employ lever mechanisms enabling exerting a force greater than the normal one despite the low pressure inside the freezer. Such mechanisms however begin to breakdown as being exposed to the exerted force since they contain movable parts inside their structure.

[0006] In order to overcome this, some improvements have been made in the prior art. One of the patents in the literature, regarding this subject is a Japanese Patent Application numbered JP2000111237 (A). Said invention relates to the structure of the opening section developed for preventing the deformation of the freezer door due to the temperature and pressure difference of the air, inside and outside of the freezer.

[0007] European Patent application numbered EP2059737 (B1) relates to a freezer. Said invention comprises a housing having a body surrounding a cooler inner area and a door and a pressure-balancing valve. Said valve allows inflow of the air from the outside environment to the inner area and prevents outflow of the air from the inside area.

[0008] Another invention is a German patent application DE10203425 (A2). This invention relates to an assembly formed on the door or the body and balancing the pressure between the inner chamber and outside of the refrigerator. Said assembly is activated, however, by manually controlling a valve mounted on the body or the door.

[0009] The applications of DE29912563 (U), EP0598979 and EP1174668 disclose mechanisms in which the body is moved and the refrigerator door is easily opened by moving the arm that is movable around an axis upon rotating thereof.

[0010] Eventually, there have been made some improvements in a pressure balancing assembly which is controlled by pulling the door with the intention of opening it, and therefore there is a need for novel constructions overcoming aforementioned inconveniencies and proposing solutions to the state of art systems.

Object of the Invention

[0011] Present invention relates to a mechanism for pressure balancing meeting the aforementioned requirements, overcoming all the inconveniencies and providing further advantages.

[0012] An object of the invention is to employ a mechanism for pressure balancing enabling re-opening of the freezer door easily following opening and closing thereof once. By means of said mechanism, upon balancing the inner and outer pressures of the freezer section, freezer door can be easily opened and closed each time.

[0013] Another object of the invention is to prevent the problematic opening of the door due to the vacuum formed inside the freezer section resulting from opening and closing of the doors of the freezer sections of the refrigerators.

[0014] In order to achieve aforementioned objects, present invention relates to a mechanism for pressure balancing,

- activated by using the movement of the door pulled towards the refrigerator/freezer body under the influence of the vacuum formed due to the pressure difference resulting from the inflow of the air into said refrigerator/freezer, as a result of opening and closing of the refrigerator/freezer doors, and

■ enabling opening of the door without exerting a force greater than the normal one by allowing inflow of the air into the refrigerator/freezer section until inner and outer pressures are balanced,
wherein said mechanism comprises,

- At least an air duct through which the ambient air is conveyed into the refrigerator/freezer section by closing of the said door,
- At least a movable piece constituting the air inlet of said air duct,
- At least a pushing piece connected on the door, enabling conveyance of the ambient air into the refrigerator/freezer through the formed opening by pushing said movable piece towards the air duct,
- At least a spring enabling the movable piece that is pushed by said pushing piece to head for backwards and enabling the movable piece to cover the air duct inlet by taking its initial position once the pressure balance is achieved.

[0015] In order to achieve mentioned objectives, said mechanism for pressure balancing comprises at least one hermetic element, preferably a gasket, which prevents further inflow of the air into the refrigerator/freezer upon balancing the inner and outer pressures in the refrigerator/freezer section.

[0016] Mechanism for pressure balancing, in order to achieve mentioned objectives, comprises at least a grate connected to the tip through which the air coming from said air duct enters into the refrigerator/freezer section.

[0017] Structural and characteristic features and the advantages of the present invention will be understood more clearly in light of the detailed description with reference to the following figures and thus the evaluation should be carried out considering these figures and the detailed description.

Brief Description of the Drawings

[0018] In order for present invention to be constructed and for its advantages to be understood alongside with additional components, it is needed to be evaluated with the drawings disclosed herein below.

Figure 1: Perspective side view of the door in its closed position, belonging to the freezer section of the refrigerator having the mechanism for pressure balancing according to present invention.
Figure 2: Detailed view of A shown in Figure 1.
Figure 3: Perspective side view of the door of the refrigerator according to present invention in its closed position.
Figure 3a: Plan view of the freezer door of said refrigerator before it is opened and closed. In this way, gasket is in its original position, and the door and the body are parallel to each other.
Figure 3b: Plan view of the freezer door of said refrigerator after it is opened and closed. In this way, the gasket between the door and the body is pressed due to the suction force, and the door and the body are angled relative to each other.
Figure 4: Detailed view of the pushing piece connected to the freezer door.
Figure 5: View that shows the location of the air duct inside the cooler that is used to balance the pressure.
Figure 6: Sectional side view of said refrigerator doors in their closed position. Doors are not opened and closed here. Thus, the body and the doors are positioned in parallel to each other.
Figure 7: Sectional side view of said refrigerator doors after they are opened and closed. In this case, formation of vacuum inside is prevented by the air entering into the air duct.

[0019] The drawings are not necessarily to be scaled and the details that are not needed to comprehend present invention may have been neglected. Additionally, at least substantially identical elements or at least the elements substantially of identical functions, are shown by same numbers.

Reference Numbers

[0020]

1. Refrigerator	**23.** Movable piece
11. Door	**24.** Hermetic element
12. Door profile	**25.** Grate
13. Hermetic element	**26.** Pushing piece
14. Mid strap	**27.** Front door
2. Pressure balancing mechanism	**28.** Spring housing

(continued)

21. Air duct	**29.** Opening
22. Spring	**3**. Freezer

Detailed Description of the Invention

[0021] In this detailed description, preferred embodiments of the mechanism for pressure balancing (2) according to present invention is merely disclosed with the intent of providing a clearer understanding of the subject and in a non-limitative manner.

[0022] Mechanism for pressure balancing (2) according to present invention facilitates re-opening of the door (11) of the freezer section (3) of a refrigerator (1) following an opening and closing. In said freezer section (3), in case that the inner and outer pressures are balanced, the door (11) of the freezer section (3) becomes parallel to the freezer (1) body. In this case, the door (11) can be easily opened in succession as well. By this means, the door profile (12) is positioned so as to be parallel to the freezer (1) body in its initial position, after the first opening and closing.

[0023] Said mechanism for pressure balancing (2) comprises;

- At least an air duct (21) through which the ambient air proceeds to be conveyed into the refrigerator (1)/freezer (3) by the action of the pulled door as a result of the vacuum formed upon opening and closing of the door (11),
- At least a grate (25) through which the air coming from said air duct (21) enters into the freezer section (3),
- Front door (27) fixedly mounted on the mid strap (14),
- At least one pushing piece (26) connected to the door profile (12), enabling the formation of an opening (29) in the said front door (27) upon closing of the door (11) and enabling the inflow of the ambient air into the freezer section (3), enabling thusly the inner and outer pressures to be balanced,
- At least a movable piece (23) pushed by said pushing piece (26) and moving backwards with this movement, whereby an opening is formed between said piece and said front door (27),
- At least a spring (22) ensuring said movable piece (23) to return to its previous position upon balancing of the inner and outer pressures,
- At least a hermetic element (24) mounted on the movable piece (23) and enabling the inflow of the air into the freezer section (3) following the balancing of the inner and outer pressures.

[0024] In Figure 1 and Figure 2, a general view of the refrigerator (1) and a detailed view of the mechanism (2) for pressure balancing used in the freezer section (3) are given respectively. As seen in Figure 2 and Figure 5, there is a pushing piece (26) attached on the door profile (12). Said pushing piece (26), pushes the movable piece (23) in the mechanism for pressure balancing (2) by the angular movement of the door (11) during closing of the same. This pushing action, presses the springs (22) attached to the movable piece (23) via spring housings (28) backwardly. By this means the air, enters into the freezer section (3) over the grate (25) by passing through the said air duct (21). In comparison with the state of art, air inflow here is a desired phenomenon, carried out in a controlled manner. Inflow of air continues until the inner and outer pressure balance is achieved.

[0025] In figure 6, the position of elements of the mechanism (2) for pressure balancing is shown before the door (11) of the refrigerator (1) is opened and closed. At first, springs (22) exert a pressure to the moving piece (23). The hermetic element, gasket (13), on the door (11) is in its first position, so a compression caused by a vacuum is beside the point. Therefore the door (11) is closed and there is no air flow into the freezer (3). But once after the door (11) is opened and closed, a vacuum occurs. This vacuum causes the door (11) of the freezer section (3) to get closer to the body. The pushing piece (26) on the door (11) creates an opening (29) by contacting with the moving piece (23). This case is shown in details in Figure 7. In figure 4, position of the pushing piece (26) on the door (11) is shown. Due to the position of the said pushing piece (26) on the door (11), it cannot push the moving piece (23) in case that there is no vacuum formation.

[0026] A front door (27) is used to constitute the inlet of the mentioned pressure balancing mechanism (2). There is a built-in hole on that front door (27) that allows air inflow which is a fixed piece mounted to the mid strap (14). The element here that prevents air inflow is the hermetic element (24) on the moving piece (23) which closes the hole by pressing to it by means of the force of the springs (22).

[0027] The numbers and sizes used of the elements used in the mentioned pressure balancing mechanism (2) may vary in an alternative embodiment of the present invention. It is available to be used on equipment with a door (11) and a hermetic element (13) that can face vacuum problems. In order for this embodiment of the present invention to serve as an example, it is explained in a way to solve the vacuum problems of the doors (11) of the refrigerators (1), especially those of the freezers (2).

Claims

1. A mechanism for pressure balancing (2)
■ activated by using the movement of the doors (11) pulled towards the refrigerator(1)/freezer (3) body under the influence of the vacuum formed due to the pressure difference resulting from the inflow of the air into said refrigerator (1)/freezer(3), as a result of opening and closing of the refrigerator(1)/freezer (3) doors (11), and
■ enabling opening of the door (11) without exerting a force greater than the normal one by allowing inflow of the air into the refrigerator(1)/freezer (3) section until inner and outer pressures are balanced,
wherein said mechanism (2) comprises,

    - At least an air duct (21) through which the ambient air proceeds to be conveyed into the refrigerator (1)/freezer (3) by the action of the pulled door as a result of the vacuum formed upon opening and closing of said door (11),
    - At least a movable piece (23) constituting the air inlet of said air duct (21),
    - At least a pushing part connected on the door (11), enabling conveyance of the ambient air into the refrigerator (1)/freezer (3) through the formed opening (29) by pushing said (26) movable piece (23) towards the air duct (21),
    - At least a spring (22) enabling the movable piece that is pushed by said pushing piece (26) to head for backwards and enabling the movable piece (23) to cover the air duct (21) inlet by taking its initial position once the pressure balance is achieved.

2. Mechanism for pressure balancing (2) according to Claim 1, wherein the mechanism comprises at least one hermetic element (24) preventing the air to further inflow into the refrigerator(1)/freezer (3) upon balancing of the inner and outer pressure in the refrigerator (1)/freezer section (3).

3. Mechanism for pressure balancing (2) according to Claim 2, wherein said hermetic element (24) is a gasket.

4. Mechanism for pressure balancing (2) according to Claim 1, wherein it comprises at least a grate (25) connected to the tip through which the air coming from said air duct (21) enters into the refrigerator(1)/freezer section (3).

5. Mechanism for pressure balancing (2) according to Claims 1 to 4, wherein it comprises at least a front door (27) mounted fixedly on the mid strap (14) found on the refrigerator body (1) and having over the same a built-in hole ensuring the air inlet into the system.

6. Mechanism for pressure balancing (2) according to Claim 1, wherein it comprises spring housing (28) in which said spring (22) is located and which ensures the connection with the movable piece (23).

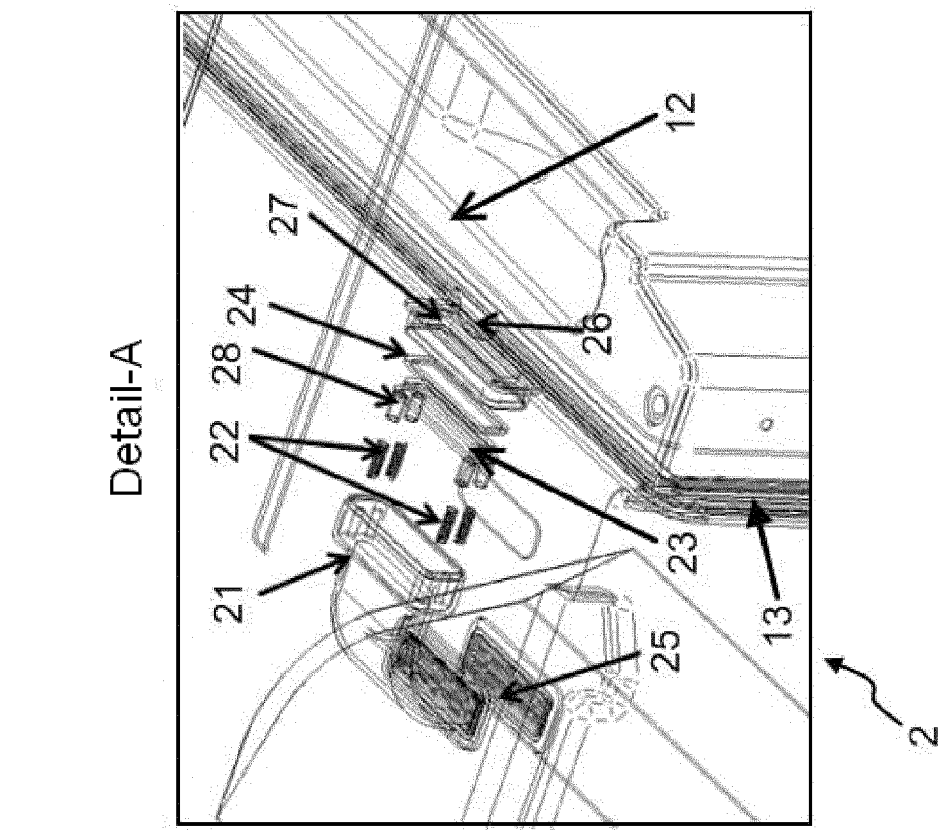

Figure-2

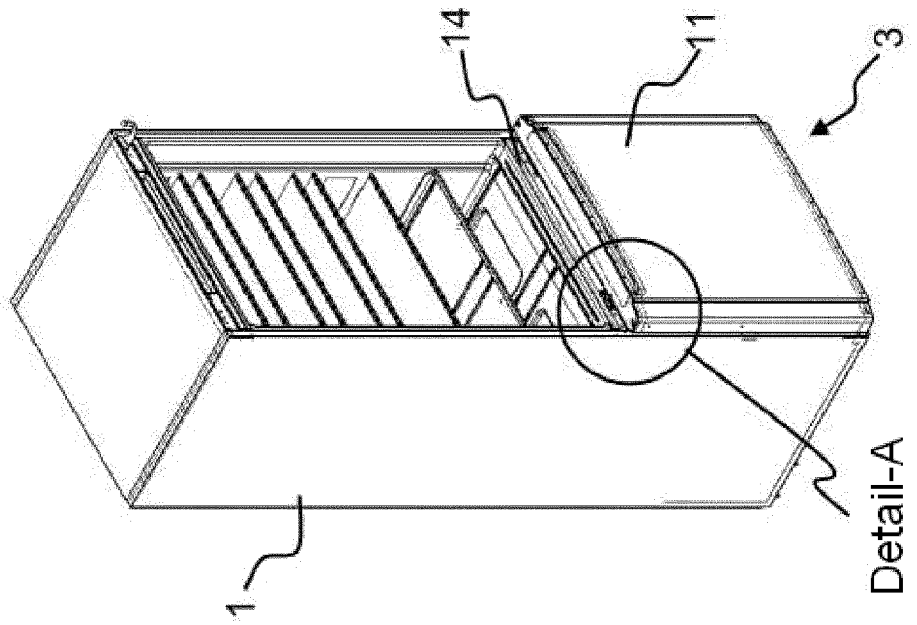

Figure-1

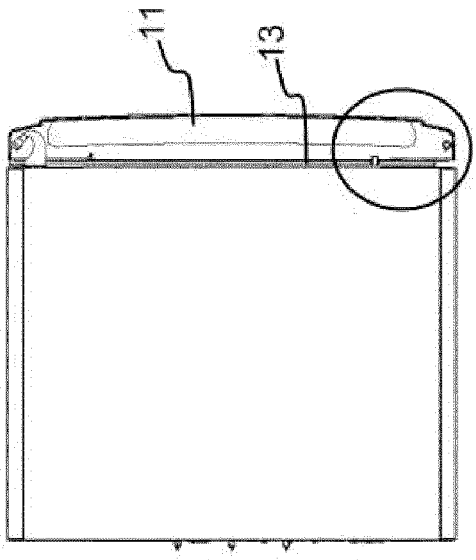

Figure-3a

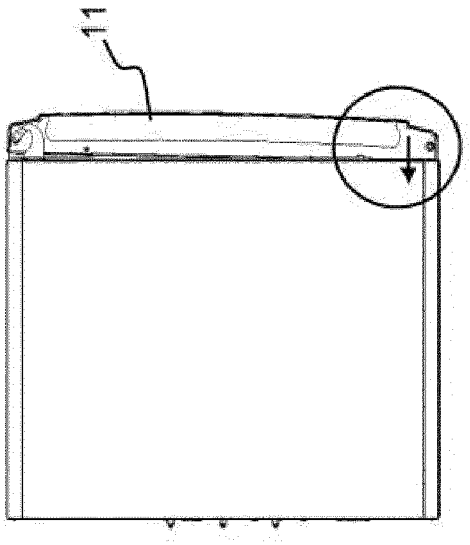

Figure-3b

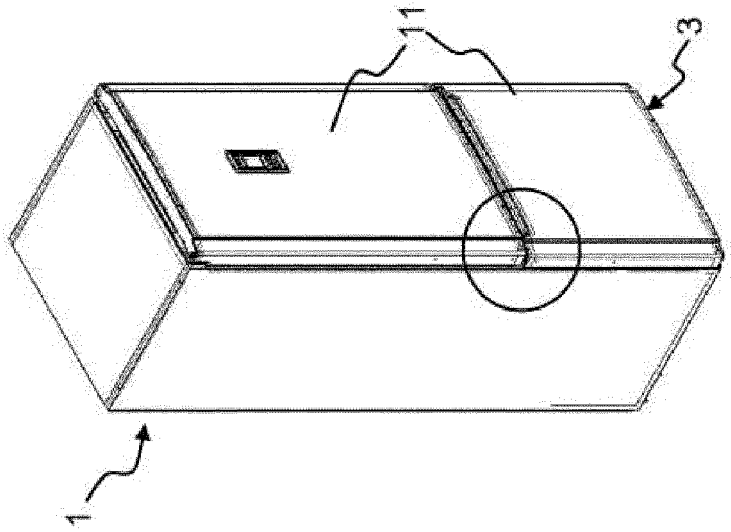

Figure-3

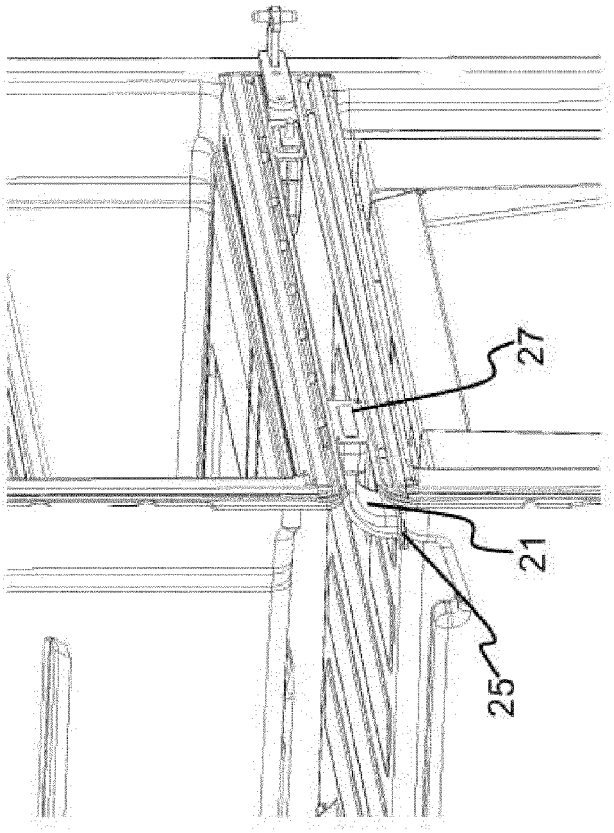

Figure-5

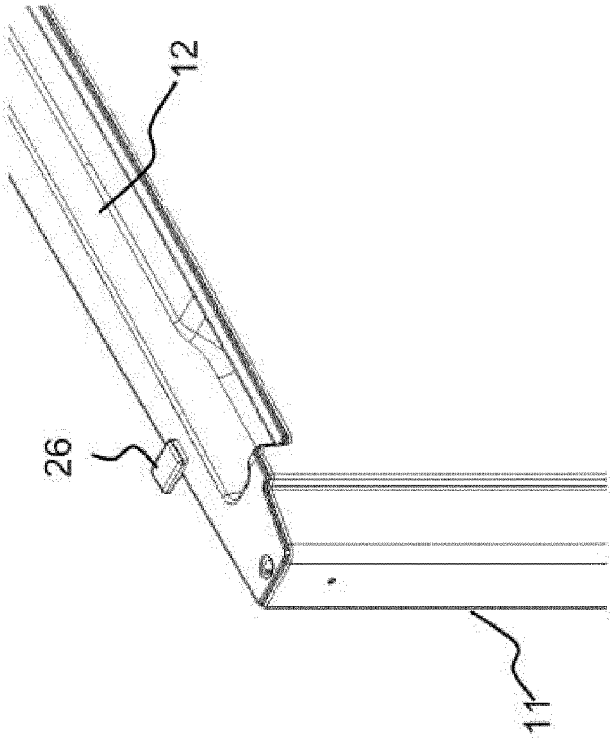

Figure-4

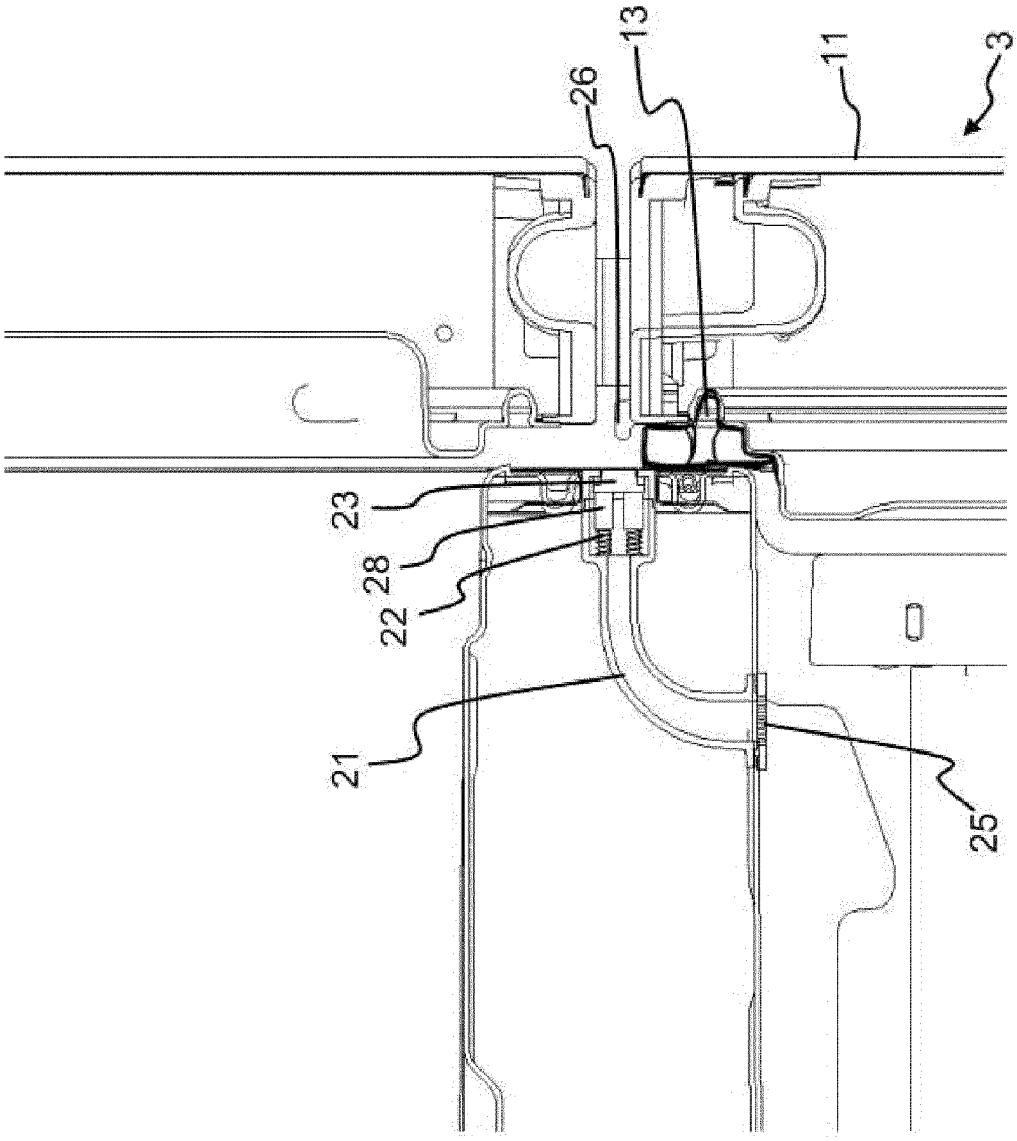

Figure-6

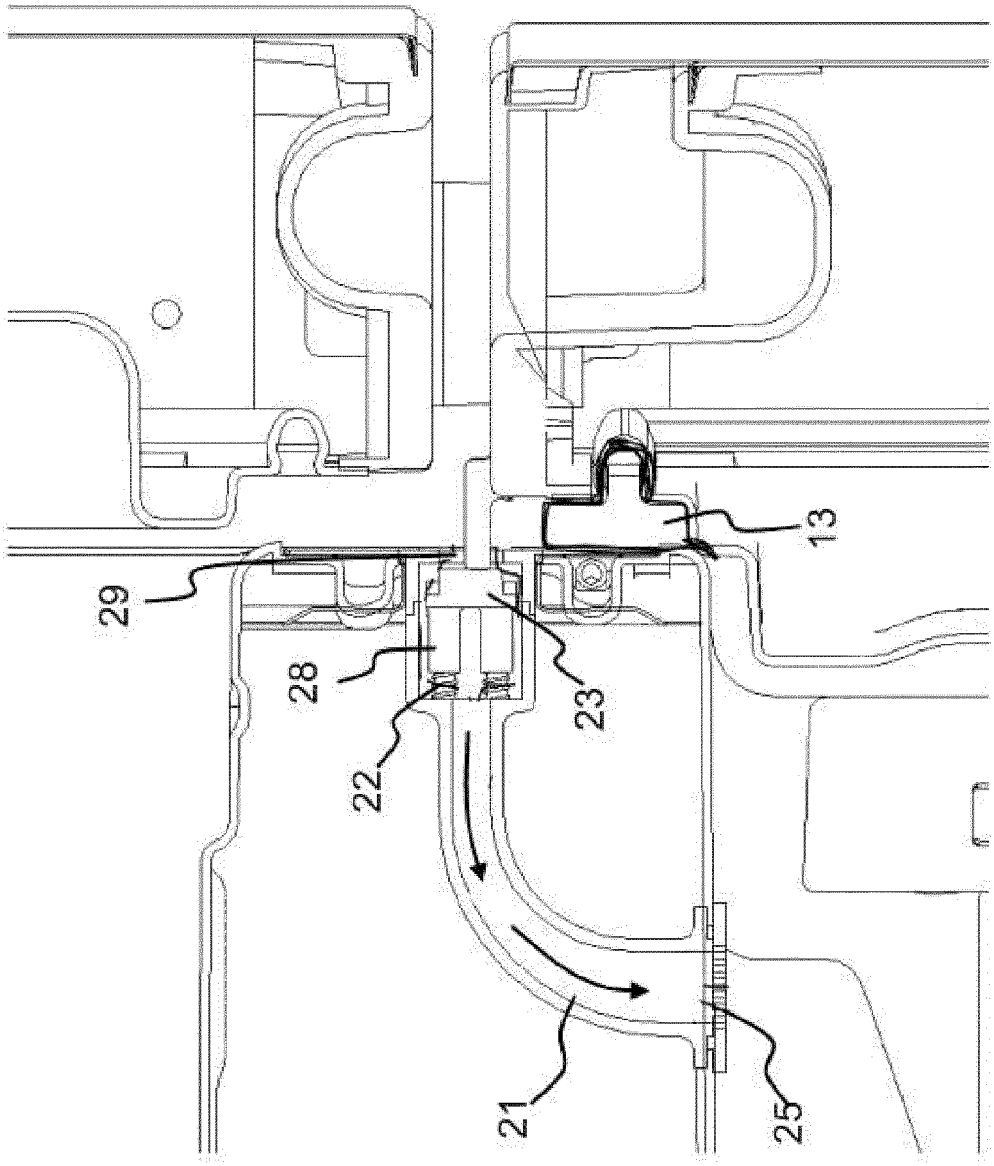

Figure-7

REFERENCES CITED IN THE DESCRIPTION

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