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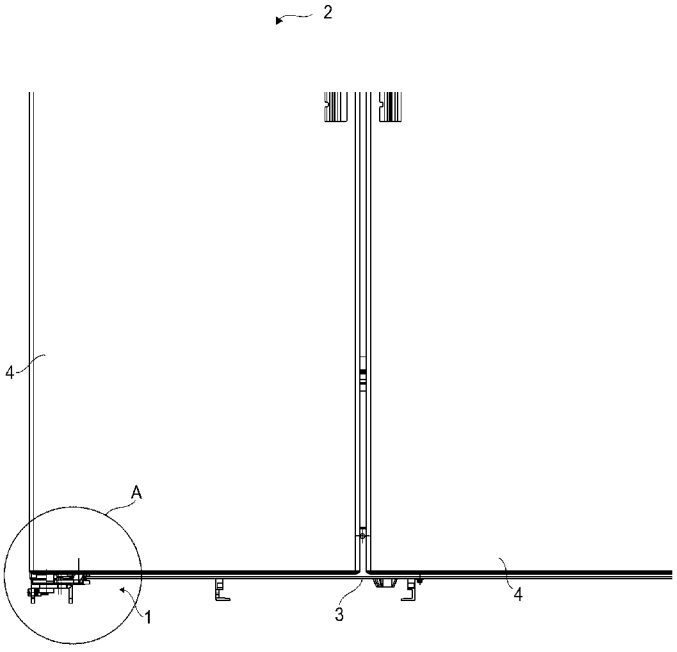
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(54) Title: ADJUSTABLE HINGE ASSEMBLY FOR USE IN A REFRIGERATOR

Fig. 1



(57) Abstract: The present invention relates to an adjustable hinge assembly (1) for use in a refrigerator (2) comprising a main body (3) which includes one or more refrigeration compartments and respective pivotable doors (4). The adjustable hinge assembly (1) comprises a base bracket (5) that is fixable to the main body (3). The adjustable hinge assembly (1) of the present invention further comprises an intermediate bracket (6) which is horizontally movably disposed onto the base bracket (5) and a bearing bracket (7) which is vertically movably disposed onto the intermediate bracket (6), wherein the bearing bracket (7) includes a pivot (8) for the respective pivotable door (4).

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Description

ADJUSTABLE HINGE ASSEMBLY FOR USE IN A REFRIGERATOR

[0001] The present invention relates to a refrigerator. The present invention more particularly relates to the hinge assembly which supports the pivotable door of the refrigerator.

[0002] Refrigerators are commonly known in the art. A refrigerator generally comprises a main body which includes one or more refrigeration compartments for refrigerating the articles and one or more pivotable doors for accessing the respective refrigeration compartments. The pivotable doors are mounted to the main body through respective hinge assemblies. The refrigeration compartments and the pivotable doors may be arranged side by side or alternatively one above the other.

[0003] US 8,491,070 B2 discloses a side by side refrigerator.

[0004] A common problem with the prior art refrigerator is that the relative position of each pivotable door must be adjusted during the assembly process by the assembly operator due to the manufacturing tolerances. The adjustment process is very time consuming and complicated. Moreover, after the assembly process, the service person as well as the user has no possibility to readjust the pivotable doors during the installation of the refrigerator in case of need.

[0005] An objective of the present invention is to provide an adjustable hinge assembly for use in a refrigerator which overcomes the aforementioned problems of the prior art in a cost-effective way and which enables the hinge assembly to be easily and quickly adjusted at any time and as often as required through the assembly operator, the service person or the user.

[0006] This objective has been achieved by the adjustable hinge assembly as defined in claim 1, and the refrigerator as defined in claim 14. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.

[0007] The adjustable hinge assembly of the present invention comprises an intermediate bracket which is horizontally movably disposed onto the base bracket, a bearing bracket which is vertically movably disposed onto the intermediate bracket, wherein the bearing bracket includes a pivot which is

adapted to engage with the counterpart pivot of the respective pivotable door, a first adjustment mechanism which is adapted to move the intermediate bracket relative to the base bracket in the horizontal direction that is parallel to the front of the main body and a second adjustment mechanism which is adapted to move the bearing bracket relative to the intermediate bracket in the vertical direction.

[0008] A major advantageous effect of the present invention is that the pivotable doors can be easily and quickly adjusted at any time and as often as required through the assembly operator, the service person or the user. Another major advantageous effect of the present invention is that each pivotable door can be continuously adjusted both in the horizontal direction and in the vertical direction. Thereby, the pivotable doors can be mutually aligned, and thus the appearance of the refrigerator can be improved. Another major advantageous effect of the present invention is that the adjustable hinge assembly can be easily accessed from the outside and can be entirely mounted/demounted for service. With the present invention, the assembly and the maintenance of the pivotable doors have been improved.

[0009] In an embodiment, the horizontal distance between the intermediate bracket and the base bracket can be increased or decreased through accordingly rotating the horizontal adjustment screw of the first adjustment mechanism. This embodiment is particularly advantageous as the horizontal adjustment can be immediately performed through the single horizontal adjustment screw.

[0010] In another embodiment, the horizontal adjustment screw is threadably received in a first threaded horizontal hole on the base bracket and accommodated at the first narrow diameter section in a horizontal notch on the intermediate bracket. This embodiment is particularly advantageous as the first narrow diameter section can stably drive the intermediate bracket through accordingly rotating the horizontal adjustment screw.

[0011] In another embodiment, the vertical distance between the intermediate bracket and the bearing bracket can be increased or decreased through accordingly rotating the vertical adjustment screw of the second

adjustment mechanism. This embodiment is particularly advantageous as the vertical adjustment can be immediately performed through the single vertical adjustment screw.

[0012] In another embodiment, the vertical adjustment screw is threadably received in a first threaded vertical hole on the intermediate bracket and accommodated at the second narrow diameter section in a first threadless vertical hole on the bearing bracket. This embodiment is particularly advantageous as the second narrow diameter section can stably drive the bearing bracket through accordingly rotating the vertical adjustment screw.

[0013] In another embodiment, the pivot is concentrically formed into the vertical adjustment screw. This embodiment is particularly advantageous as the counterpart pivot of the pivotable door can be immediately engaged with vertical adjustment screw, and thus the structure of the adjustable hinge assembly can be simplified. Alternatively, the pivot can be formed off the vertical adjustment screw at another location on the bearing bracket.

[0014] In another embodiment, the vertical adjustment screw and the bearing bracket are releasably joined through a form-fitting connection. This embodiment is particularly advantageous as the vertical adjustment screw can be easily assembled with the bearing bracket.

[0015] In another embodiment, the upward movement of the bearing bracket is limited through a limiting mechanism. This embodiment is particularly advantageous as the bearing bracket can be prevented from dislodging.

[0016] In another embodiment, the upward movement of the bearing bracket is limited through at least one limiting screw which is threadably received in the respective second threaded vertical threaded hole on the intermediate bracket and accommodated in the respective second threadless vertical hole on the bearing bracket. This embodiment is particularly advantageous as the limitation can be easily and securely performed through the limiting screws, and thus the bearing bracket can be stably driven.

[0017] In another embodiment, the intermediate bracket can be fixed after the adjustment to the base bracket through the fixing mechanism. This embodiment is particularly advantageous as the pivotable door can be securely maintained at its adjusted position.

[0018] In another embodiment, the intermediate bracket can be fixed after the adjustment to the base bracket through a horizontal fixing screw which is threadably received in a second threaded horizontal hole on the base bracket and accommodated in a threadless horizontal hole on the intermediate bracket. This embodiment is particularly advantageous as the fixing can be immediately performed through the single horizontal fixing screw.

[0019] In another embodiment, the intermediate bracket is horizontally aligned and reinforced through at least a vertical alignment screw of the alignment mechanism, which is threadably received in a respective third threaded vertical hole on the base bracket and slidably accommodated in respective horizontal slot on the intermediate bracket. This embodiment is particularly advantageous as the alignment mechanism improves the mechanical strength of the adjustable hinge assembly and enables a smooth adjustment of the pivotable door.

[0020] In another embodiment, the adjustable hinge assembly has a threaded foot that carries the refrigerator. The threaded foot is threadably received in a fourth threaded vertical hole on the base bracket. This embodiment is particularly advantageous as the adjustable hinge assembly can also be used at the bottom of the main body so to engage with the pivot of the respective pivotable door.

[0021] In another embodiment, the threaded foot has a grip. This embodiment is particularly advantageous as the grip facilitates the manual height adjustment of the threaded foot, and thus the need for using a hand tool has been obviated.

[0022] In another embodiment, the refrigerator comprises two side by side refrigeration compartments and two side by side pivotable doors for accessing the respective refrigeration compartments. In this embodiment, the side by side pivotable doors are supported through two adjustable hinge assemblies which are disposed onto the bottom of the main body. This embodiment is particularly advantageous as the relative positions of the side by side pivotable doors can be correctly adjusted.

[0023] In other alternative embodiments, the adjustable hinge assembly is used

at the top of the main body, at the bottom of the main body or between the top and the bottom of the main body in accordance with the particular arrangement of the pivotable doors. These embodiments are particularly advantageous as the adjustable hinge assemblies can be flexibly used at different locations on the main body.

[0024] In other alternative embodiments, each of the vertical/horizontal adjustment screw comprises a commonly used screw head that matches a commonly used screw driver and/or a wrench. These embodiments are particularly advantageous as the adjustment can be easily performed through the user by way of using a universal hand tool that matches the screw head.

[0025] Additional features and additional advantageous effects of the adjustable hinge assembly and the refrigerator of the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

[0026] Figure 1 – is a schematic partial front view of a refrigerator which has two adjustable hinge assemblies at the bottom of the main body according to an embodiment of the present invention;

[0027] Figure 2 – is a schematic enlarged front view of the detail A of Fig. 1;

[0028] Figure 3 – is a schematic perspective view of an adjustable hinge assembly according to an embodiment of the present invention;

[0029] Figure 4 – is a schematic exploded perspective view of the adjustable hinge assembly of Fig. 3;

[0030] Figure 5 – is a schematic bottom view of the adjustable hinge assembly according to an embodiment of the present invention;

[0031] Figure 6 – is a schematic enlarged bottom view of the detail B of Fig. 5.

[0032] The reference signs appearing on the drawings relate to the following technical features.

1. Adjustable hinge assembly
2. Refrigerator
3. Main body
4. Pivotable door
5. Base bracket

[0033] 5a. Mounting means
6. Intermediate bracket
[0034] 7. Bearing bracket
[0035] 8. Pivot
[0036] 9. Counterpart pivot
[0037] 10. 1st adjustment mechanism
[0038] 11. 2nd adjustment mechanism
[0039] 12. Horizontal adjustment screw
[0040] 12a. 1st narrow diameter section
[0041] 12b. 1st screw driver slot
[0042] 13. 1st threaded horizontal hole
[0043] 14. Horizontal notch
[0044] 15. Vertical adjustment screw
[0045] 15a. 2nd narrow diameter section
[0046] 15b. Hexagonal head
[0047] 16. 1st threaded vertical hole
[0048] 17. 1st threadless vertical hole
[0049] 18. Form-fitting connection
[0050] 18a. Radial protrusion
18b. Radial recess
[0051] 19. Limiting mechanism
[0052] 20. 2nd threaded vertical hole
[0053] 21. 2nd threadless vertical hole
[0054] 22. Limiting screw
[0055] 23. Fixing mechanism
[0056] 24. Horizontal fixing screw
[0057] 24a. 2nd screw driver Slot
[0058] 25. 2nd threaded horizontal hole
[0059] 26. Threadless horizontal hole
[0060] 27. Alignment mechanism
[0061] 28. 3rd threaded vertical hole
[0062] 29. Horizontal slot
[0063] 30. 4th threaded vertical hole

[0064] The adjustable hinge assembly (1) is suitable for use in a refrigerator (2) (Fig. 1).

[0065] The refrigerator (2) comprises a main body (3) which includes one or more refrigeration compartments (not shown), a refrigeration circuit (not shown) for refrigerating each refrigeration compartment and one or more pivotable doors (4) for accessing the respective refrigeration compartments (Fig. 1).

[0066] The adjustable hinge assembly (1) comprises a base bracket (5) which is adapted to be fixed to the main body (3) from the outside through a mounting means (5a) (Fig. 2 and Fig. 3).

[0067] The adjustable hinge assembly (1) of the present invention further comprises an intermediate bracket (6) which is horizontally movably disposed onto the base bracket (5), a bearing bracket (7) which is vertically movably disposed onto the intermediate bracket (6), wherein the bearing bracket (7) includes a pivot (8) which is adapted to engage with the counterpart pivot (9) of the respective pivotable door (4), a first adjustment mechanism (10) which is adapted to move the intermediate bracket (6) relative to the base bracket (5) in the horizontal direction (H) that is parallel to the front of the main body (3) and a second adjustment mechanism (11) which is adapted to move the bearing bracket (7) relative to the intermediate bracket (6) in the vertical direction (V) (Fig. 2 and Fig. 3).

[0068] The refrigerator (2) of the present invention comprises one or more adjustable hinge assemblies (1) (Fig. 1).

[0069] In an embodiment, the first adjustment mechanism (10) comprises a horizontal adjustment screw (12) that is adapted to connect intermediate bracket (6) to the base bracket (5) and to change the horizontal distance between the intermediate bracket (6) and the base bracket (5) upon rotation (Fig. 4).

[0070] In another embodiment, the first adjustment mechanism (10) further comprises a first threaded horizontal hole (13) which is formed into the base bracket (5) and adapted to threadably receive the horizontal adjustment screw (12) and a horizontal notch (14) which is formed into the intermediate bracket (6) and adapted to accommodate a first narrow

diameter section (12a) of the horizontal adjustment screw (12) (Fig. 4 and Fig. 6).

[0071] In another embodiment, the horizontal adjustment screw (12) comprises a first screw driver slot (12b) for receiving a flat bladed screw driver (not shown) (Fig. 4).

[0072] In another embodiment, the second adjustment mechanism (11) comprises a vertical adjustment screw (15) which is adapted to connect the intermediate bracket (6) to the bearing bracket (7) and to change the vertical distance between the intermediate bracket (6) and the bearing bracket (7) upon rotation (Fig. 4).

[0073] In another embodiment, the second adjustment mechanism (11) further comprises a first threaded vertical hole (16) which is formed into the intermediate bracket (6) and adapted to threadably receive the vertical adjustment screw (15) and a first threadless vertical hole (17) which is formed into the bearing bracket (7) and adapted to accommodate a second narrow diameter section (15a) of the vertical adjustment screw (15) (Fig. 4).

[0074] In another embodiment, the pivot (8) is formed into the vertical adjustment screw (15) and is concentric with the first threadless vertical hole (17) on the bearing bracket (7) (Fig. 4).

[0075] In another embodiment, the vertical adjustment screw (15) comprises a hexagonal head (15b) for receiving a wrench (not shown) (Fig. 4).

[0076] In another embodiment, the adjustable hinge assembly (1) further comprises a form-fitting connection (18) which is adapted to releasably connect the vertical adjustment screw (15) to the bearing bracket (7) (Fig. 3).

[0077] In another embodiment, the form-fitting connection (18) comprises radial protrusions (18a) which are arc shaped and formed onto the inner surface of the first threadless vertical hole (17) and radial recesses (18b) which are arc shaped and formed onto the outer surface of the vertical adjustment screw (15) which rotatably lock with the radial protrusions (18a) after the insertion (Fig. 4).

[0078] In another embodiment, the adjustable hinge assembly (1) further

comprises a limiting mechanism (19) which is adapted to limit the upward movement of the bearing bracket (7) (Fig. 3).

[0079] In another embodiment, the limiting mechanism (19) comprises at least a second vertical threaded hole (20) which is formed into the intermediate bracket (6), at least a second threadless vertical hole (21) which is formed into the bearing bracket (7) and at least a limiting screw (22) which is accommodated in the respective second threadless vertical hole (21) on the bearing bracket (7) and threadably received by the respective second threaded vertical hole (20) on the intermediate bracket (6) (Fig. 4).

[0080] In another embodiment, the adjustable hinge assembly (1) further comprises a fixing mechanism (23) which is adapted to fix the intermediate bracket (6) to the base bracket (5) after the adjustment (Fig. 3).

[0081] In another embodiment, the fixing mechanism (23) comprises a horizontal fixing screw (24) which is adapted to connect the intermediate bracket (6) to the base bracket (5) and to fix, after the adjustment, the intermediate bracket (6) to the base bracket (5) upon rotation; a second threaded horizontal hole (25) which is formed into the base bracket (5) and adapted to threadably receive the horizontal fixing screw (24) and a threadless horizontal hole (26) which is formed into the intermediate bracket (6) and adapted to accommodate the horizontal fixing screw (24) (Fig. 4 and Fig. 6).

[0082] In another embodiment, the horizontal fixing screw (24) comprises a second screw driver slot (24a) for receiving a flat bladed screw driver (not shown) (Fig. 4).

[0083] In another embodiment, the adjustable hinge assembly (1) further comprises an alignment mechanism (27) which comprises at least a vertical alignment screw (not shown) which is adapted to connect the intermediate bracket (6) to the base bracket (5), at least a third threaded vertical hole (28) which is formed into the base bracket (5) and adapted to threadably receive the respective vertical alignment screw and at least a horizontal slot (29) which is formed into the intermediate bracket (6) and adapted to slidably accommodate the respective vertical alignment screw (Fig. 3 to 5).

[0084] In another embodiment, the adjustable hinge assembly (1) further comprises a threaded foot (not shown) and a fourth threaded vertical hole (30) which is formed into the base bracket (5) and adapted to threadably receive the threaded foot (Fig. 4).

[0085] In another embodiment, the threaded foot has a grip (not shown).

[0086] In another embodiment, the refrigerator (2) comprises at least two side by side refrigeration compartments and at least two side by side pivotable doors (4) for accessing the respective compartments. In this embodiment, the two adjustable hinge assemblies (1) are each disposed onto the bottom of the main body (3) in close proximity to the opposite side walls of the main body (3) respectively (Fig. 1).

[0087] A major advantageous effect of the present invention is that the pivotable doors (4) can be easily and quickly adjusted at any time and as often as required through the assembly operator, the service person or the user (Fig. 1). Another major advantageous effect of the present invention is that each pivotable door (4) can be continuously adjusted both in the horizontal direction (H) and in the vertical direction (V) (Fig. 2). Thereby, the pivotable doors (4) can be mutually aligned, and thus the appearance of the refrigerator (2) can be improved (Fig. 1). Another major advantageous effect of the present invention is that the adjustable hinge assembly (1) can be easily accessed from the outside and can be entirely mounted/demounted for service (Fig. 2 and Fig. 3). With the present invention, the assembly and the maintenance of the pivotable doors (4) have been improved (Fig. 1). Other advantageous effects of the present invention can be taken from the above described embodiments.

Claims

1. An adjustable hinge assembly (1) for use in a refrigerator (2) comprising a main body (3) which includes one or more refrigeration compartments and one or more pivotable doors (4) for accessing the respective compartments, the adjustable hinge assembly (1) comprising a base bracket (5) which is adapted to be fixed to the main body (3), the adjustable hinge assembly (1) being **characterized in that** an intermediate bracket (6) which is horizontally movably disposed onto the base bracket (5), a bearing bracket (7) which is vertically movably disposed onto the intermediate bracket (6), wherein the bearing bracket (7) includes a pivot (8) which is adapted to engage with the counterpart pivot (9) of the respective pivotable door (4), a first adjustment mechanism (10) which is adapted to move the intermediate bracket (6) relative to the base bracket (5) in the horizontal direction (H) that is parallel to the front of the main body (3) and a second adjustment mechanism (11) which is adapted to move the bearing bracket (7) relative to the intermediate bracket (6) in the vertical direction (V).
2. The adjustable hinge assembly (1) according to claim 1, **characterized in that** the first adjustment mechanism (10) comprises a horizontal adjustment screw (12) that is adapted to connect intermediate bracket (6) to the base bracket (5) and to change the horizontal distance between the intermediate bracket (6) and the base bracket (5) upon rotation.
3. The adjustable hinge assembly (1) according to claim 2, **characterized in that** the first adjustment mechanism (10) further comprises a first threaded horizontal hole (13) which is formed into the base bracket (5) and adapted to threadably receive the horizontal adjustment screw (12) and a horizontal notch (14) which is formed into the intermediate bracket (6) and adapted to accommodate a first narrow diameter section (12a) of the horizontal adjustment screw (12).
4. The adjustable hinge assembly (1) according to any one of claims 1 to 3, **characterized in that** the second adjustment mechanism (11) comprises a vertical adjustment screw (15) which is adapted to connect the intermediate bracket (6) to the bearing bracket (7) and to change the vertical distance between the intermediate bracket (6) and the bearing bracket (7) upon rotation.

5. The adjustable hinge assembly (1) according to claim 4, **characterized in that** the second adjustment mechanism (11) further comprises a first threaded vertical hole (16) which is formed into the intermediate bracket (6) and adapted to threadably receive the vertical adjustment screw (15) and a first threadless vertical hole (17) which is formed into the bearing bracket (7) and adapted to accommodate a second narrow diameter section (15a) of the vertical adjustment screw (15).
6. The adjustable hinge assembly (1) according to claim 5, **characterized in that** the pivot (8) is formed into the vertical adjustment screw (15) and is concentric with the first threadless vertical hole (17) on the bearing bracket (7)
7. The adjustable hinge assembly (1) according to claim 1, **characterized in that** a form-fitting connection (18) which is adapted to releasably connect the vertical adjustment screw (15) to the bearing bracket (7).
8. The adjustable hinge assembly (1) according to claim 1, **characterized in that** a limiting mechanism (19) which is adapted to limit the upward movement of the bearing bracket (7).
9. The adjustable hinge assembly (1) according to claim 8, **characterized in that** the limiting mechanism (19) comprises at least a second threaded vertical hole (20) which is formed into the intermediate bracket (6) at least a second threadless vertical hole (21) which is formed into the bearing bracket (7) and at least a limiting screw (22) which is accommodated in the respective second threaded vertical hole (21) on the bearing bracket (7) and threadably received by the respective second threaded vertical hole (20) on the intermediate bracket (6).
10. The adjustable hinge assembly (1) according to claim 1, **characterized in that** a fixing mechanism (23) which is adapted to fix the intermediate bracket (6) to the base bracket (5) after the adjustment.
11. The adjustable hinge assembly (1) according to claim 10, **characterized in that** the fixing mechanism (23) comprises a horizontal fixing screw (24) which is adapted to connect the intermediate bracket (6) to the base bracket (5) and to fix, after the adjustment, the intermediate bracket (6) to the base bracket (5) upon rotation, a second threaded horizontal hole (25) which is formed into the base bracket (5) and adapted to threadably receive the horizontal fixing screw

(24) and a threadless horizontal hole (26) which is formed into the intermediate bracket (6) and adapted to accommodate the horizontal fixing screw (24).

12. The adjustable hinge assembly (1) according to claim 1, **characterized in that** an alignment mechanism (27) which comprises at least a vertical alignment screw which is adapted to connect the intermediate bracket (6) to the base bracket (5), at least a third threaded vertical hole (28) which is formed into the base bracket (5) and adapted to threadably receive the respective vertical alignment screw and at least a horizontal slot (29) which is formed into the intermediate bracket (6) and adapted to slidably accommodate the respective vertical alignment screw.
13. The adjustable hinge assembly (1) according to claim 1, **characterized in that** a threaded foot and a fourth threaded vertical hole (30) which is formed into the base bracket (5) and adapted to threadably receive the threaded foot.
14. A refrigerator (2) comprising a main body (3) which includes one or more refrigeration compartments and one or more pivotable doors (4) for accessing the respective refrigeration compartments, **characterized in that** one or more adjustable hinge assemblies (1) each as defined in any one of claims 1 to 13.
15. The refrigerator (2) according to claim 14, comprising at least two side by side refrigeration compartments and at least two side by side pivotable doors (4) for accessing the respective compartments, **characterized in that** two adjustable hinge assemblies (1) each disposed onto the bottom of the main body (3) in close proximity to the opposite side walls of the main body (3) respectively.

Fig. 1

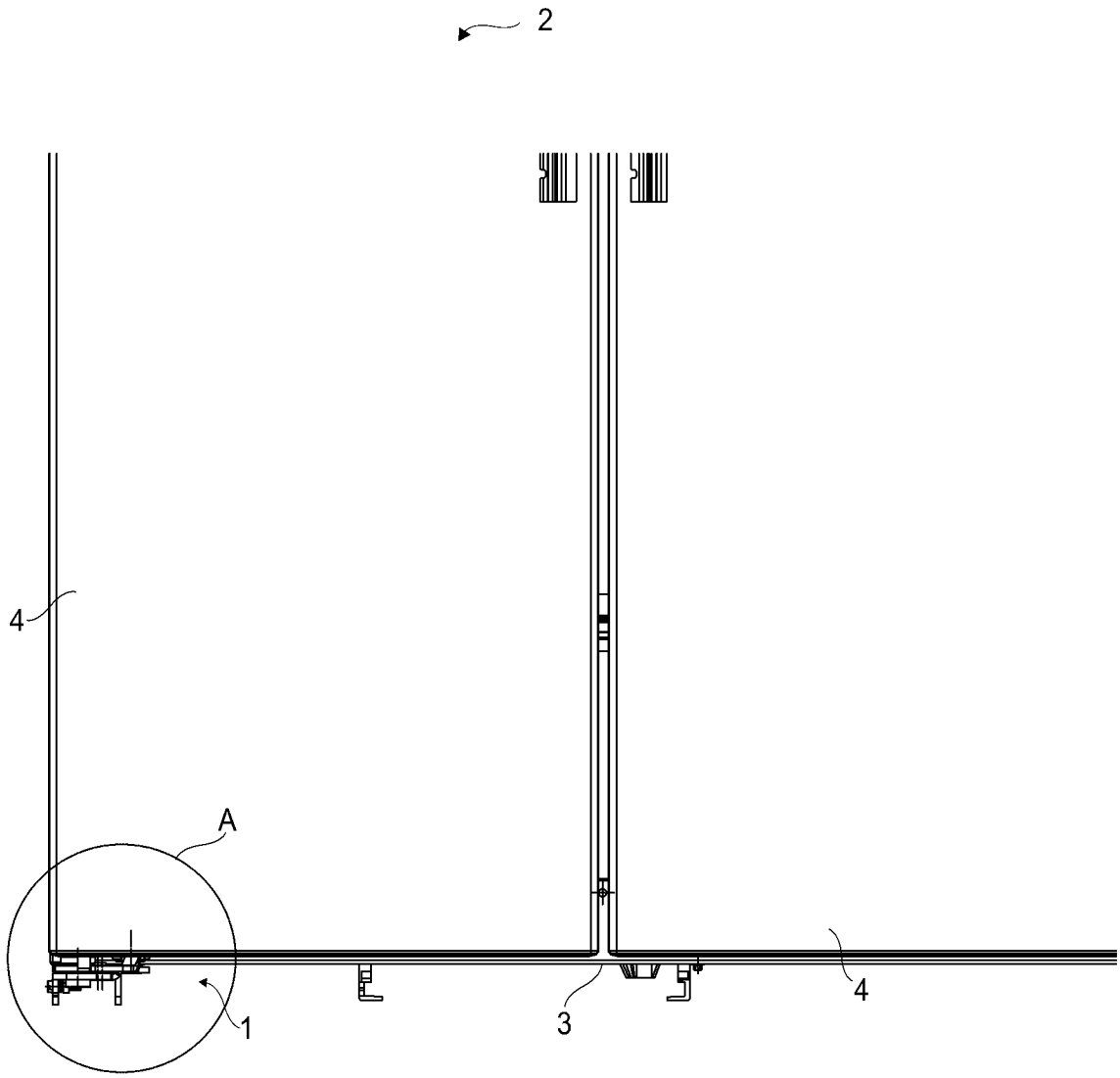


Fig. 2

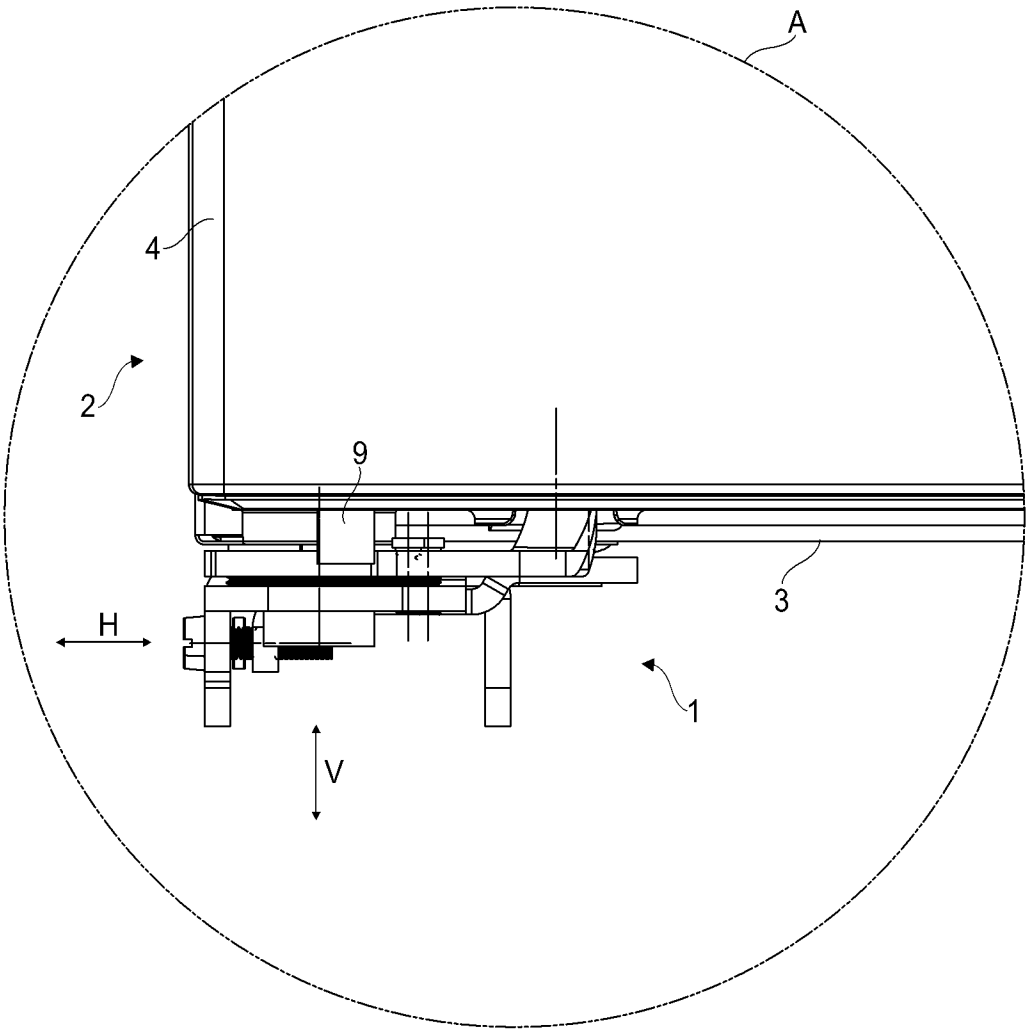


Fig. 3

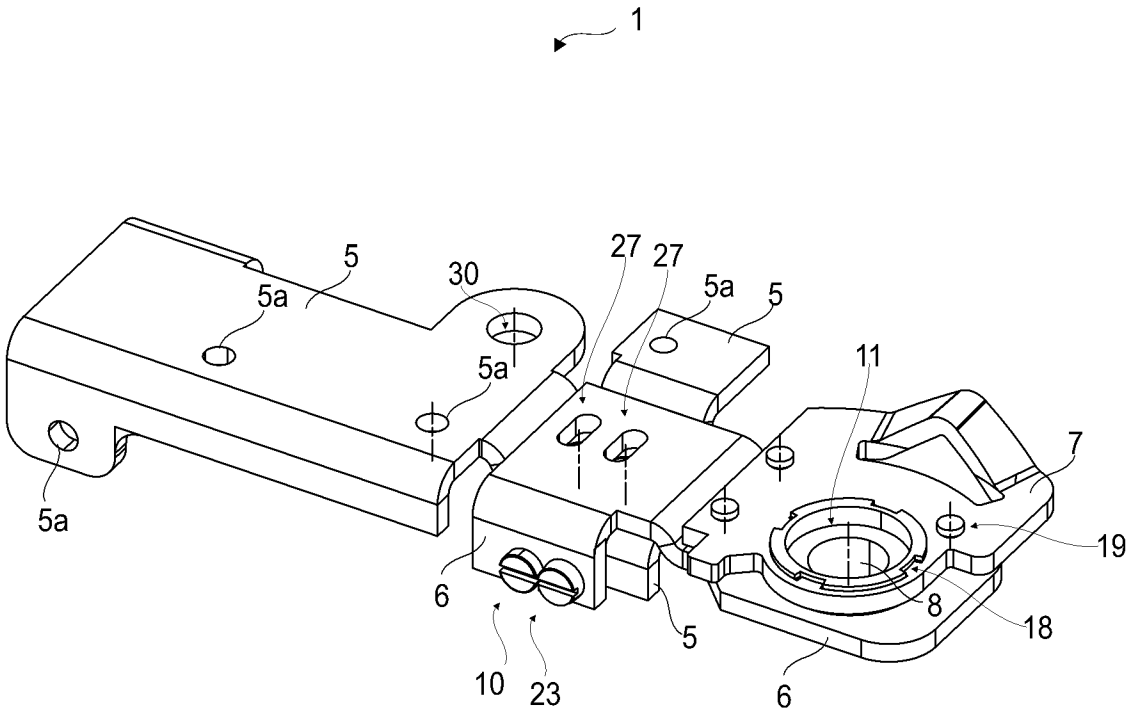


Fig. 4

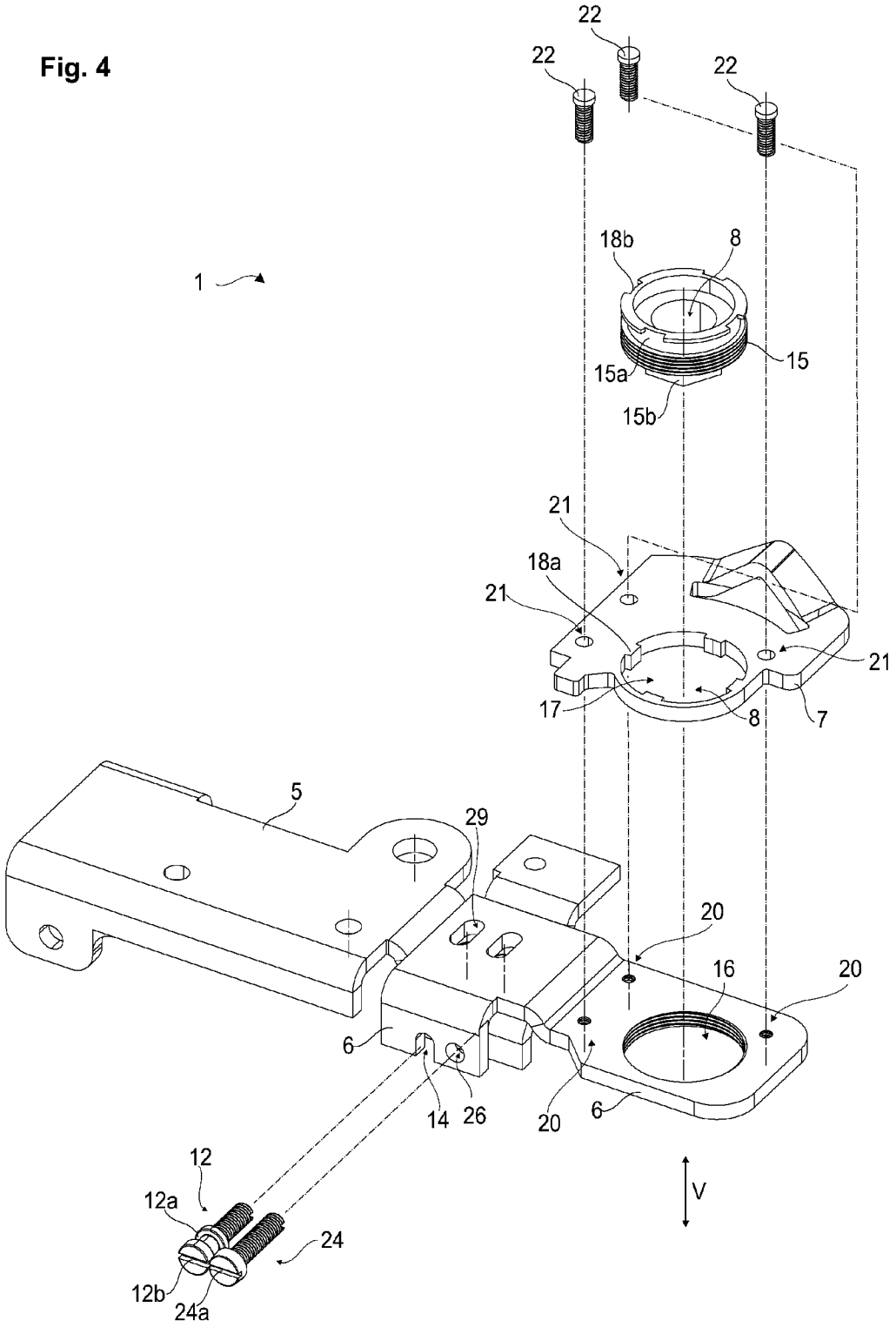

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Fig. 5

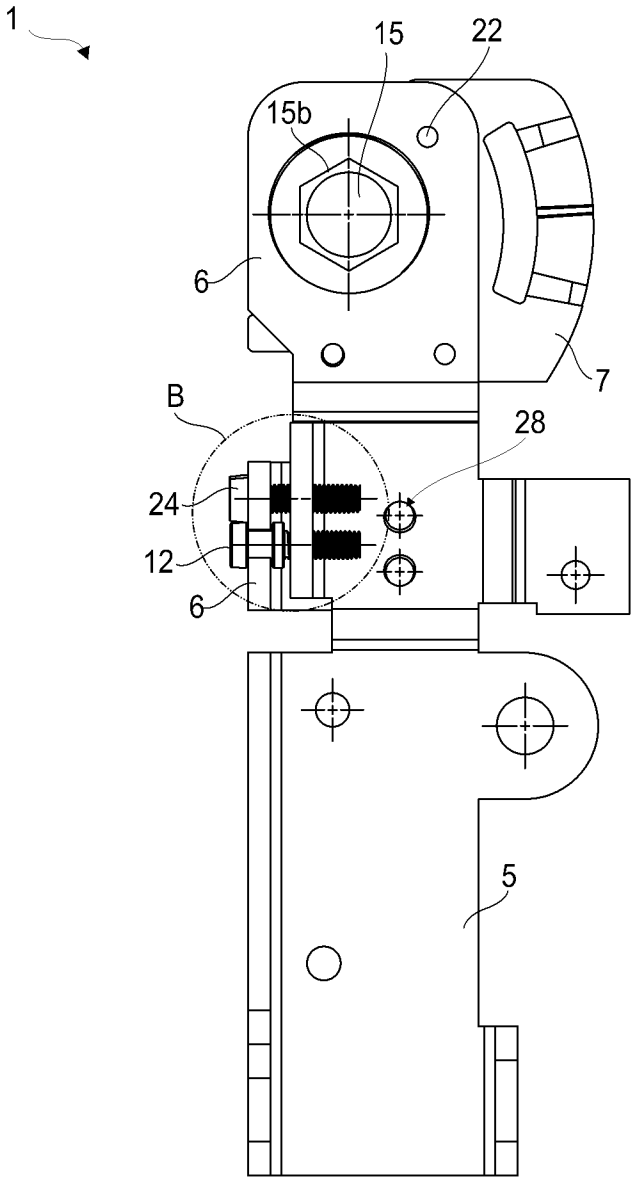
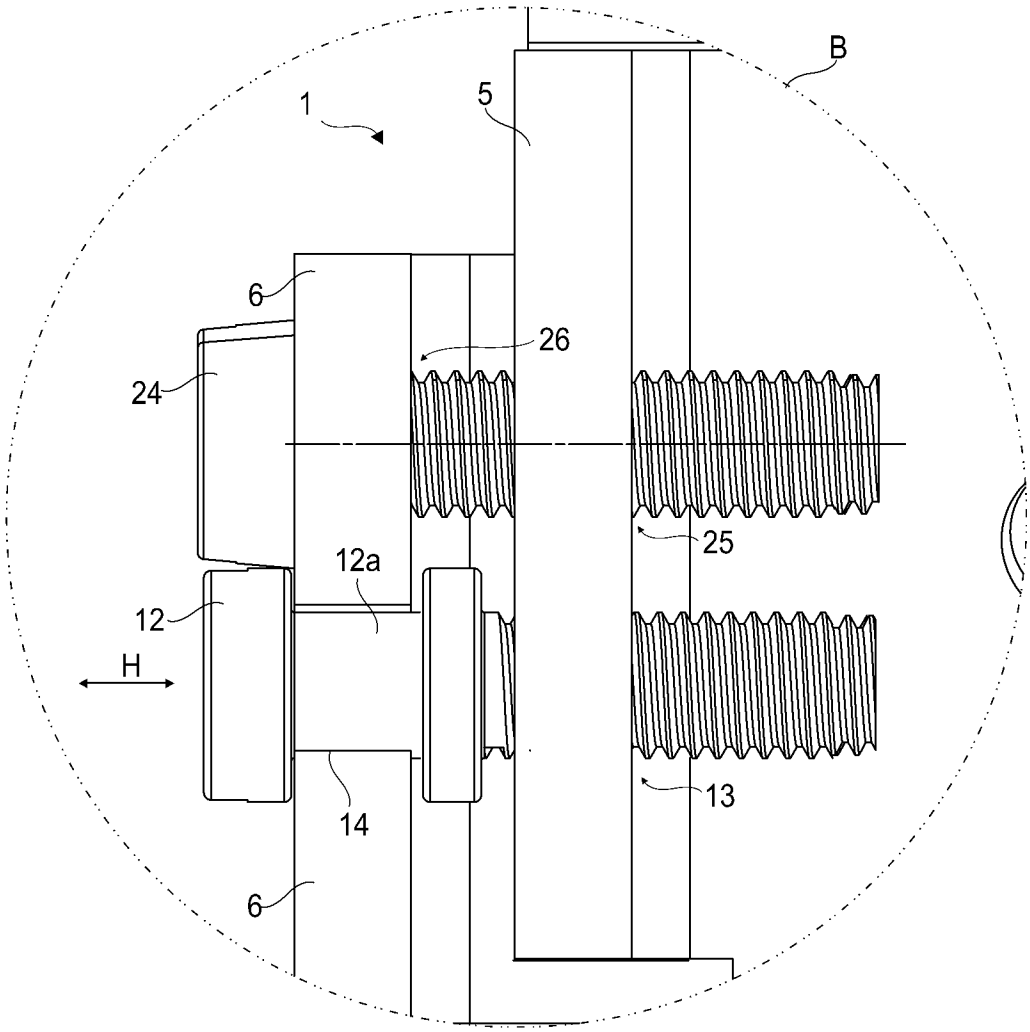


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/073253

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25D23/02 E05D7/00 E05D7/04 E05D7/081
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25D E05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 788 351 A (PRUNTY JEFFREY L [US] ET AL) 4 August 1998 (1998-08-04) column 1, line 42 - column 5, line 52; figures 1-9	1-5,7-15
X	US 2008/034539 A1 (LYVERS DANIEL W [US] ET AL) 14 February 2008 (2008-02-14) paragraphs [0006] - [0019]; figures 1-5	1,2,4,6, 8,10,14
A	US 2014/259529 A1 (JENKINSON PETER [US]) 18 September 2014 (2014-09-18) paragraphs [0004] - [0072]; figures 1-12	1

☐ Further documents are listed in the continuation of Box C.

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Date of the actual completion of the international search	Date of mailing of the international search report
25 May 2016	07/06/2016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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