



(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.07.2014 Bulletin 2014/29

(51) Int Cl.:

F25D 23/02^(2006.01)

F25D 23/10^(2006.01)

(21) Application number: 13151047.1

(22) Date of filing: 11.01.2013

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

(71) Applicant: Electrolux Home Products Corporation
N.V.
1130 Brussel (BE)

(72) Inventors:
• Buosi, Augusto
33080 Porcia (PN) (IT)
• Beni, Marco
33080 Porcia (PN) (IT)
• Velli, Vittorio
31021 Mogliano Veneto (TV) (IT)

(74) Representative: Markovina, Paolo et al
Electrolux Italia S.p.A.
Corso Lino Zanussi 30
33080 Porcia (PN) (IT)

(54) Refrigerating appliance

(57) A refrigerating appliance (1) comprises: a cabi-
net (2) defining two separate compartments (9, 10) for
food storing located one on top of the other and separated
by a horizontal divider (5), and two separate doors (12,
13) apt to open and close said compartments (9, 10),
wherein said doors are pivotally mounted on said cabinet

by means of at least a common hinge (20), said common
hinge comprising a mounting base (21) fixed to a front
surface (5a) of the horizontal divider (5) and two inde-
pendent articulated joints (30, 31), forming respective
four-bar linkage mechanisms, movably coupling the two
doors to the mounting base (21).

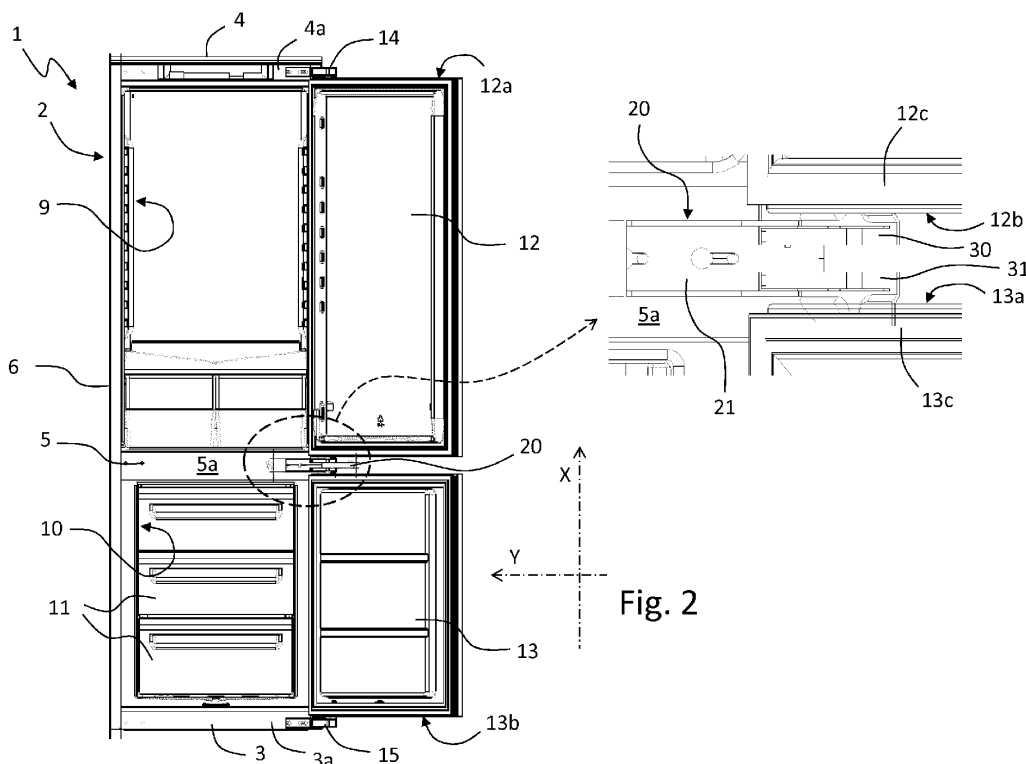


Fig. 2

Description

[0001] The present invention relates to a cold appliance, such as a refrigerating appliance, of the combined type provided with a refrigerator and a freezing compartment realized in the same body, with at least two vertically aligned doors arranged to close respectively the refrigerating compartment and the freezing compartment.

[0002] Figure 1 shows a refrigerating appliance 1 of a known type. Appliance 1 includes a frame or cabinet 2 in which a first refrigerating compartment 9 and a second freezing compartment 10 are defined.

[0003] The above two compartments are usually vertically aligned, mutually separated by a horizontal divider or partition frame element 5 and thermally insulated from the environment.

[0004] Different temperature ranges may be obtained in the refrigerating and freezing compartment: in the refrigerating compartment items to be refrigerated are stored at a temperature usually comprised between 0°C and 4°C, whilst in the freezing compartment items to be frozen are stored at a temperature usually comprised between -6°C and -18°C.

[0005] This type of refrigerating appliance is provided with a first (upper) and second (lower) door 12, 13 for respectively opening/closing the refrigerating and the freezing compartment 9, 10, the two doors being also vertically aligned.

[0006] The upper door 12 is hinged to the upper portion of the frame 2 of the refrigerating appliance 1 by means of an upper hinge 14 and to the divider frame element 5 by means of a first intermediate hinge 16. The lower door 13 is hinged to the lower portion of the frame 2 by means of a lower hinge 15 and to the divider frame element 5 by means of a second intermediate hinge 17 that is positioned below the first intermediate hinge 16. The two separate intermediate hinges 16 and 17 are better visible in the enlarged view of Figure 1.

[0007] The upper and lower doors 12, 13 are rotatable around the respective hinges for respectively opening/closing the refrigerating and the freezing compartment.

[0008] One problem arising from known refrigerating appliances is that the divider frame element must be sufficiently wide to house both the first and second intermediate hinges.

[0009] Moreover, there should be a minimum predefined distance between the two intermediate hinges in order to allow the upper and/or lower door to be correctly positioned both in the open and closed position and to be correctly rotated around the relevant hinges without hindering or impeding the positioning of the same.

[0010] Usually, the intermediate hinges of the refrigerating appliances of the known art are mutually spaced of at least 10 mm or more and the divider frame element is more than 125 mm high. Clearly, the higher the divider frame element, the lower the useful volume for refrigeration or freezing defined by the freezing and refrigerating

compartment.

[0011] The Applicant has therefore tackled the problem to maximize the volume of the refrigerating and freezing compartments keeping constant the external volume of the refrigerating cabinet.

[0012] The above object is preferably realized without losing any functionality of the refrigerating appliance, in particular when it comes to the easy opening and closing of both doors.

[0013] This problem is in particular felt in connection to the built-in appliances, such as the door-on-door refrigerating appliances, where panels are attached to the door(s) of the refrigerator. The refrigerator itself is also housed in a piece of furniture which surrounds the same. In order to avoid any interference between the door and the furniture, especially "bulky" hinges have typically to be used allowing both a rotation and translation of the door with respect to the frame.

[0014] According to the present invention, a refrigerating appliance, which is for example a built-in door-on-door refrigerating appliance, comprises:

- a cabinet defining a first and a second compartment located one on top of the other and separated by a horizontal divider;
- a first and a second door apt to open and close said first and second compartment, respectively, said first and second door being pivotally mounted on the cabinet by means of at least a common hinge, the common hinge comprising a mounting base fixed to a front surface of the horizontal divider and two independent articulated joints movably coupling the first and the second door to the mounting base.

[0015] Preferably, each articulated joint defines an articulated parallelogram, in particular comprises a four-bar linkage mechanism; moreover, each articulated joint is apt to move on a respective horizontal plane.

[0016] Each of said articulated joints may comprise a base plate fixed to the respective door, a hinging arm hinged to the mounting base, and a couple of connecting bars coupling the base plate with the hinging arm.

[0017] In particular, the connecting bars are coupled to the base plate and to the hinging arm so as to allow a roto-translation movement of the base plate with respect to the hinging arm. In case of built-in appliances, it is preferred that the door moves in a roto-translatory manner, so that relative movements of the door and the external cabinet are not impeded.

[0018] The base plate may be fixed to a front surface of the respective door, or alternatively be located (and fixed) in correspondence of an edge of the respective door.

[0019] Preferably, the mounting base comprises a top and a bottom wall and each hinging arm is hinged to the top or to the bottom wall.

[0020] When in a retracted position, each of the articulated joints is at least partially housed between the top

and the bottom wall.

[0021] Preferably, in addition to the common hinge, each door includes a further hinge.

[0022] In particular, there can be a first hinge to pivotally connect the first door to the cabinet in addition to the common hinge and a second hinge to pivotally connect the second door to the cabinet in addition to the common hinge. Two hinges per door allow a good stability of the same.

[0023] The cabinet has a top wall and a bottom wall and preferably the first hinge is connected to the top wall and the second hinge is connected to the bottom wall.

[0024] The height of the horizontal divider is advantageously lower than 120 mm. In particular, thanks to the present invention, refrigerators with a height of the divider as low as 100 mm may be realized.

[0025] The refrigerating appliance of the present invention can be a built-in door-on-door refrigerating appliance.

[0026] The refrigerating appliance of the invention, comprising a common hinge including two independent hinging arms and a single common mounting base, allows the reduction of the height of the divider with respect to the height of the divider of known refrigerating appliances, because no spacing between separate hinges is required, but at the same time the independent functionality of both doors is kept.

[0027] Consequently, the dimensions, i.e. the useful volume, of the compartments of the refrigerating appliances of the invention are increased in relation to the dimensions of the compartments of known refrigerating appliances, without increasing at the same time the overall dimensions of the refrigerating appliance.

[0028] Moreover, by providing a common hinge having a single mounting base on the frame for hinging both doors of the two adjacent compartments allows a reduction of the time spent for assembling the refrigerating appliance of the invention.

[0029] Moreover, as previously stated, the possibility of moving the upper and lower door independently one to another is kept.

[0030] In case of a refrigerating appliance having more than two different superimposed compartments the aforementioned advantages are further increased, since a greater saving of space is accomplished and a grater reduction of the assembling times is obtained.

[0031] According to a preferred embodiment of the invention, the refrigerating appliance includes a built-in refrigerating appliance designed to be housed in a furniture cabinet of a kitchen. More preferably, it includes a door-on-door refrigerating appliance.

[0032] The invention will be better described below in a non limiting example on the basis of the appended drawings. The figures show:

- Figure 1 is a front view of a refrigerating apparatus of a known type with the two superimposed doors opened;

- Figure 2 is a front view of a refrigerating apparatus according to the invention with the two superimposed doors opened;
- Figures 3 and 4 are perspective views of a hinge according to the invention in a first operative position;
- Figures 5 and 6 are perspective views of the hinge according to the invention in a second operative position;
- Figures 7 and 8 are perspective views of the hinge according to the invention in a third operative position; and
- Figure 9 is a bottom view of the hinge according to the invention in a fourth operative position.

[0033] In the Figures 2-9 related to the present invention, elements that are identical or that fulfill the same function as the elements of the appliance of Figure 1 (known art) bear the same reference numeral. In addition, the Figures are in some cases oversimplified and elements are removed in order to enhance clarity of the same to better show and describe the present invention.

[0034] With initial reference to Figure 2, it is shown a refrigerating appliance 1 comprising a body (or cabinet) 2 having a parallelepiped shape, in which at least first (upper) and second (lower) compartment 9, 10 are defined, for example a refrigerating compartment and a freezing compartment, mutually separated so that different temperature ranges may be obtained in each compartment.

[0035] It is to be understood that the appliance 1 of the invention can include further compartments in addition to the two which will be herein described.

[0036] The refrigerating appliance 1 can be either a stand-alone or a built-in refrigerator. In the latter case, the refrigerating appliance may be a door-on-door appliance, in which a cabinet encloses the appliance itself and the front part of the each of the refrigerator's doors, described below, is covered by an additional door panel in order to give to the appliance the same aesthetical appearance of the kitchen furniture where it is located.

[0037] In the following, with the terms "vertical" and "horizontal", "upper" and "lower", reference is made to the standard positioning of a refrigerating appliance during use.

[0038] The body 2 comprises two opposite vertical walls 6 (only the left one being visible in Figure 1), a bottom wall 3 and a top wall 4.

[0039] A horizontal divider element 5 (called simply divider in the following), preferably integral to the body 2, vertically delimits and separates two internal volumes of the body 2 forming the first and second compartments 9, 10 in the refrigerating appliance 1. The two compartments 9, 10 are thus located one on top of the other. Preferably, bottom wall 3, top wall 4 and divider 5 are substantially parallel one to the other and substantially perpendicular to a vertical direction X of extension of the body 2.

[0040] In the embodiment here illustrated, the upper

compartment 9 is delimited by the top wall 4, the divider 5 and an upper portion of the two opposite vertical walls 6, while the lower compartment 10 is delimited by the bottom wall 3, the divider 5 and a lower portion of the two opposite vertical walls 6.

[0041] The upper compartment 9 and the lower compartment 10 are accessible to the user via rotating doors, which can be open and closed. More specifically, the upper compartment 9 is associated to a first (upper) door 12 and the second (lower) compartment 10 is associated to a second (lower) door 13. Both first and second doors 12, 13 are pivotally mounted to the body 2 via hinging devices.

[0042] Within the two compartments 9, 10, shelves, drawers and/or other accessories standard in the field of refrigerating appliances are preferably located. For example, in Figure 1 a plurality of drawers 11 in the lower compartment 10 are depicted.

[0043] In the refrigerating appliance 1, a front side is defined, which is the side of the body 2 to which the doors 12, 13 are hinged. In the following, with the term "front" all surfaces of the body 2 included in this front side are indicated.

[0044] Although in the preferred shown embodiment both doors 9, 10 are hinged to the body 2 by means of two hinges (an upper one and a lower one), more than two hinges for each door 12, 13 can be used as well. Moreover, the number of hinges used to hinge the first door 12 can be different from the number of hinges used to hinge the second door 13.

[0045] According to the present invention, the two doors 12, 13 have a common hinge 20, defining the lower hinge of the upper door 12 and the upper hinge of the lower door 13. Therefore, the upper door 12 is hinged to the cabinet 2 by means of an upper hinge 14 and of the common hinge 20, and lower door 13 is hinged to the cabinet 2 by means of a lower hinge 15 and of the common hinge 20. The hinges are designed to allow rotation of the doors about a vertical axis, when closed/opened by a user.

[0046] Preferably, the upper hinge 14 is fastened to the upper door 12 in correspondence of an upper edge 12a of the same and the common hinge 20 is attached in correspondence of a lower edge 12b opposite to the upper edge 12a of door 12. The upper hinge 14 is then also fixed to the body 2 preferably in correspondence of the top wall 4, more specifically in correspondence of a front surface 4a of the same.

[0047] Similarly, the lower hinge 15 is preferably fastened to the lower door 13 in correspondence of a lower edge 13b of the same and the common hinge 20 is attached in correspondence of an upper edge 13a opposite to the lower edge 13b and facing the lower edge 12b of the upper door 12. The lower hinge 15 is then also fixed to the cabinet 2 preferably in correspondence of the bottom wall 3, more specifically in correspondence of a front surface 3a of the same.

[0048] The upper hinge 14 and the lower hinge 15 are

preferably of the conventional type used in this technical field and thus not described in detail.

[0049] When both doors 12, 13 are closed on the respective compartments 9, 10, in the front side of the body 2 a gap there between is visible, leaving a portion of a front surface 5a of the divider 5 not covered by any of the two doors.

[0050] The common hinge 20, better shown in figures 3-9, comprises a mounting base 21 fixed to the divider 5, in particular to the front surface 5a of the divider 5, for example by means of screws, or any other suitable fixing means. More in detail, the mounting base 21 is fastened to the portion of the front surface 5a which is not covered by any of the two doors 12, 13 when the latter are closed. Further, the common hinge 20 includes a first and a second independent articulated joint or hinging element 30, 31, connecting the mounting base 21 to the first 12 and the second door 13 respectively, for independently moving the doors with respect to the body 2 according to a roto-translation movement. In particular, the hinging elements 30, 31 are configured to move between a collapsed position, where the corresponding door is closed, and a completely extracted position, where the corresponding door is completely open.

[0051] The mounting base 21, as shown in Figures 3 and 4, comprises a main wall 21 a extending on a vertical plane and fixed on the front surface 5a of the divider 5, a top and a bottom wall 21 b, 21 c, and a lateral wall 21 d for fastening to the furniture housing the appliance, in case of a built-in arrangement. The height of the main wall 21 a, i.e. the distance between the top and a bottom wall 21 b, 21 c, is higher than the sum of the heights of the two hinging elements 30, 31, so that it can at least partially host them (between the top and the bottom wall 21 b, 21c) when in a collapsed position.

[0052] The first and second hinging elements 30, 31 are jointed elements movable on respective horizontal planes; the distance between the two elements 30, 31 is preferably between 10 and 15 mm. Preferably, the elements 30, 31 comprise a number of jointed parts forming an articulated parallelogram, in particular a four-bar linkage mechanism.

[0053] Preferably, the first hinging element 30 connecting the mounting base 21 to the upper door 12 comprises a first base plate 22 fixed to the upper door 12, a first hinging arm 24, and a first and a second link member (or connecting bar) 26a, 26b connecting the first base plate 22 to the first hinging arm 24. The first hinging arm 24 is preferably hinged at opposite ends thereof 24a, 24b respectively to the mounting base 21 and to the first link members 26a. In the illustrated embodiment, from the first base plate 22 a flap 22a extends, on which the first link member 26a is pivotally connected.

[0054] Similarly, the second hinging element 31 connecting the mounting base 21 to the lower door 13 comprises a second base plate 23 fixed to the lower door 13, a second hinging arm 25 and a first and a second link member (or connecting bar) 27a, 27b connecting the sec-

ond base plate 23 to the second hinging arm 25. The second hinging arm 25 is preferably hinged at opposite ends thereof 25a, 25b respectively to the mounting base 21 and to the first link member 27a, which in turn is fixed to the second base element 23 via for example a flap 23a.

[0055] First and second hinging elements 30, 31 are pivotally coupled to the mounting base 21 by means of a first and a second pivotal pin 33, 34. First and second pin 33, 34 are aligned along a common vertical axis defining a rotation axis for the first and second hinging arm. When one of the doors 12, 13 is closed, the hinging arm 24, 25 of the corresponding hinging element 30, 31 is in a retracted (or closed) position where it is at least partially housed in the mounting base 21 (in particular between the two walls 21 b and 21c thereof).

[0056] In the following, only one of the two hinging elements 30, 31, in particular the first hinging element 30, will be described in detail, the construction of the other hinging element being preferably the same.

[0057] As described above, the first hinging arm 24 and the first base plate 22 are connected together by means of the two connecting bars 26a, 26b so as to form an articulated parallelogram having four sides. Thanks to this articulation, both a translation and a rotation of the first door 12 with respect to the body 2 is performed, allowing a correct opening of the door 12 even in case of built-in appliances. In other words, the axis of rotation of the first hinging element 30 is an axis of rotation which changes location in time during opening/closing of the door 12, although it always remains parallel to itself (and to the vertical axis X). In particular, the use of this articulated parallelogram is preferred in case of door-on-door appliances where otherwise the door opening is hindered by the presence of the cabinet of outside furniture surrounding the body 2.

[0058] In addition, the first base plate 22 is preferably mounted on a front surface 12c of the door 12. Alternatively, the base plate 22 can be mounted on a lower edge 12b of the upper door 12 facing the lower door.

[0059] Similarly, in the second hinging element 31, the second base plate 23 is preferably mounted on a front surface 13c of the lower door 13. Alternatively, the second base plate 23 can be mounted on an upper edge 13a of the lower door 13 facing the upper door 12.

[0060] Preferably also the upper and the lower hinge 14, 15 define articulated parallelograms in order to achieve the same type of articulation on the whole door.

[0061] From the above construction, it is clear that the first hinging element 30 and the second hinging element 31 of the common hinge 20 can be moved independently one to the other so that the upper door 12 and the lower door 13 respectively can be open/closed independently one to the other.

[0062] With reference now to Figures 3 and 4, a first operative position of the common hinge 20 is shown, in which the first and second hinging arms 24, 25 have the same displacement from the mounting base 21, i.e. a same angle is formed between the arms 24, 25 and the

mounting base 21. This first operative position corresponds to a configuration of the refrigerating appliance 1 where both doors 12, 13 are opened at least partially of a same angle.

[0063] In Figures 5 and 6, a second operative position is shown, where first and second hinging arms 24, 25 have different displacements from the mounting base 21, in particular the first hinging arm is more rotated than the second one with respect to the mounting base 21. This second operative position corresponds to a configuration of the refrigerating appliance 1 where the lower door 13 is more open than the upper door 12.

[0064] In Figures 7 and 8, a third operative position is shown, where the first hinging arms 24 is completely retracted inside the mounting base 21 and substantially in contact with the same (i.e. in a collapsed position) while the second hinging arm 25 is displaced from the mounting base 21 (i.e. in an extracted position). This third operative position corresponds to a configuration of the refrigerating appliance 1 where the lower door 13 is open and the upper door 12 is closed.

[0065] In Figure 9, a fourth operative position is shown, where the second hinging arms 25 is completely retracted inside the mounting base 21 and substantially in contact with the same (i.e. in a collapsed position) while the first hinging arm 24 is displaced from the mounting base 21 (i.e. in an extracted position). This fourth operative position corresponds to a configuration of the refrigerating appliance 1 where the upper door 12 is open and the lower door 13 is closed.

[0066] As seen, the upper and the lower hinging arm 24, 25 are mutually spaced so that the upper and lower door 12, 13 do not reciprocally interfere either when both doors are closed, or when both are open, or during the opening/closing movement.

[0067] Preferably, the upper and the lower arm 24, 25 of the intermediate hinge 20 are mutually spaced of a distance lower than 25 mm, more preferably comprised in the range 10-15 mm. Moreover, preferably the mounting plate 21 has a width between 30-40 mm.

[0068] Therefore, the overall height of the divider 5 is reduced in relation to the height of the transversal intermediate portion of known refrigerating appliances.

[0069] Preferably, thanks to the solution of the present invention, the divider 5 has a height lower than 120 mm, more preferably between 100 mm and 120 mm.

[0070] In a preferred embodiment, not shown, in which more than two different superimposed compartments are defined in the refrigerating appliance 1, more than one divider is formed in body 2. In this case, at least one of the hinges of each compartment's door is fixed to one of the dividers and its structure corresponds to that of the common hinge 20 before described.

[0071] In other words, at least one of the hinges of the appliance's doors is provided with a common mounting base to be fixed to one of the dividers, and from this mounting base two hinging elements depart and are apt to hinge the two different doors.

Claims

1. A refrigerating appliance (1) comprising:
 - a cabinet (2) defining a first and a second compartment (9, 10) located one on top of the other and separated by a horizontal divider (5);
 - a first and a second door (12, 13) apt to open and close said first and second compartment (9, 10), respectively, said first and second door being pivotally mounted on said cabinet by means of at least a common hinge (20), said common hinge comprising a mounting base (21) fixed to a front surface (5a) of the horizontal divider (5) and two independent articulated joints (30, 31) movably coupling the first and the second door to the mounting base (21).
2. The refrigerating appliance of any one of the preceding claims, wherein the articulated joints comprise respective four-bar linkage mechanisms.
3. The refrigerating appliance of any one of the preceding claims, wherein each of said articulated joints (30, 31) comprises a base plate (22, 23) fixed to the respective door (12, 13), a hinging arm (24, 25) hinged to the mounting base (21), and a couple of connecting bars (26a, 26b, 27a, 27b) coupling the base plate with the hinging arm.
4. The refrigerating appliance of claim 3, wherein the connecting bars (26a, 26b, 27a, 27b) are coupled to the base plate and to the hinging arm so as to allow a roto-translation movement of the base plate with respect to the hinging arm.
5. The refrigerating appliance of claim 3 or 4, wherein the mounting base (21) comprises a couple of vertical delimiting walls (21 b, 21 c) and wherein each hinging arm (24, 25) is hinged to the top or to the bottom wall (21 b, 21c).
6. The refrigerating appliance of any of the preceding claims, wherein the mounting base (21) comprises a couple of vertical delimiting walls (21 b, 21 c) and wherein each of the articulated joints (30, 31) is at least partially housed between the top and the bottom wall when in a retracted position.
7. The refrigerating appliance of any of the preceding claims, wherein the height of said horizontal divider (5) is lower than 120 mm.
8. The refrigerating appliance according to any one of the preceding claims, wherein said articulated joints (30, 31) are apt to move on respective horizontal planes.
9. The refrigerating appliance according to any one of the preceding claims, including a first hinge (14) to pivotally connect said first door (12) to said cabinet (2) in addition to said common hinge (20) and a second hinge (15) to pivotally connect said second door (13) to said cabinet (2) in addition to said common hinge (20).
10. The refrigerating appliance according to claim 9, wherein said cabinet (2) includes a top wall (3) and a bottom wall (4) and wherein said first hinge (14) is connected to said top wall and said second hinge (15) is connected to said bottom wall.
11. The refrigerating appliance according to claim 3, wherein said base plate (22, 23) is fixed to a front surface (12c, 13c) of the respective door (12, 13).
12. The refrigerating appliance (1) according to claim 3, wherein said base plate (22, 23) is located in correspondence of an edge (12b, 13a) of the respective door (12, 13).
13. The refrigerating appliance of any one of the preceding claims, wherein said refrigerating appliance (1) is a built-in door-on-door refrigerating appliance.

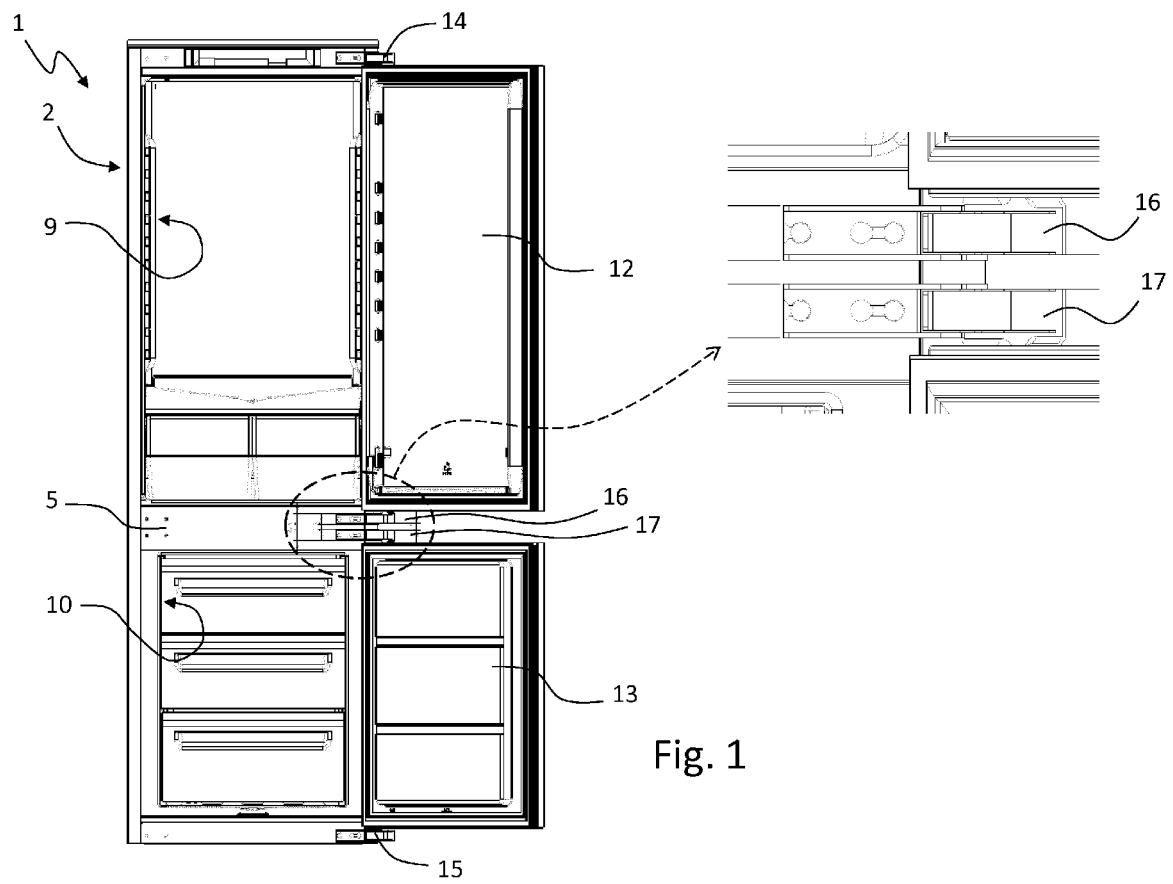
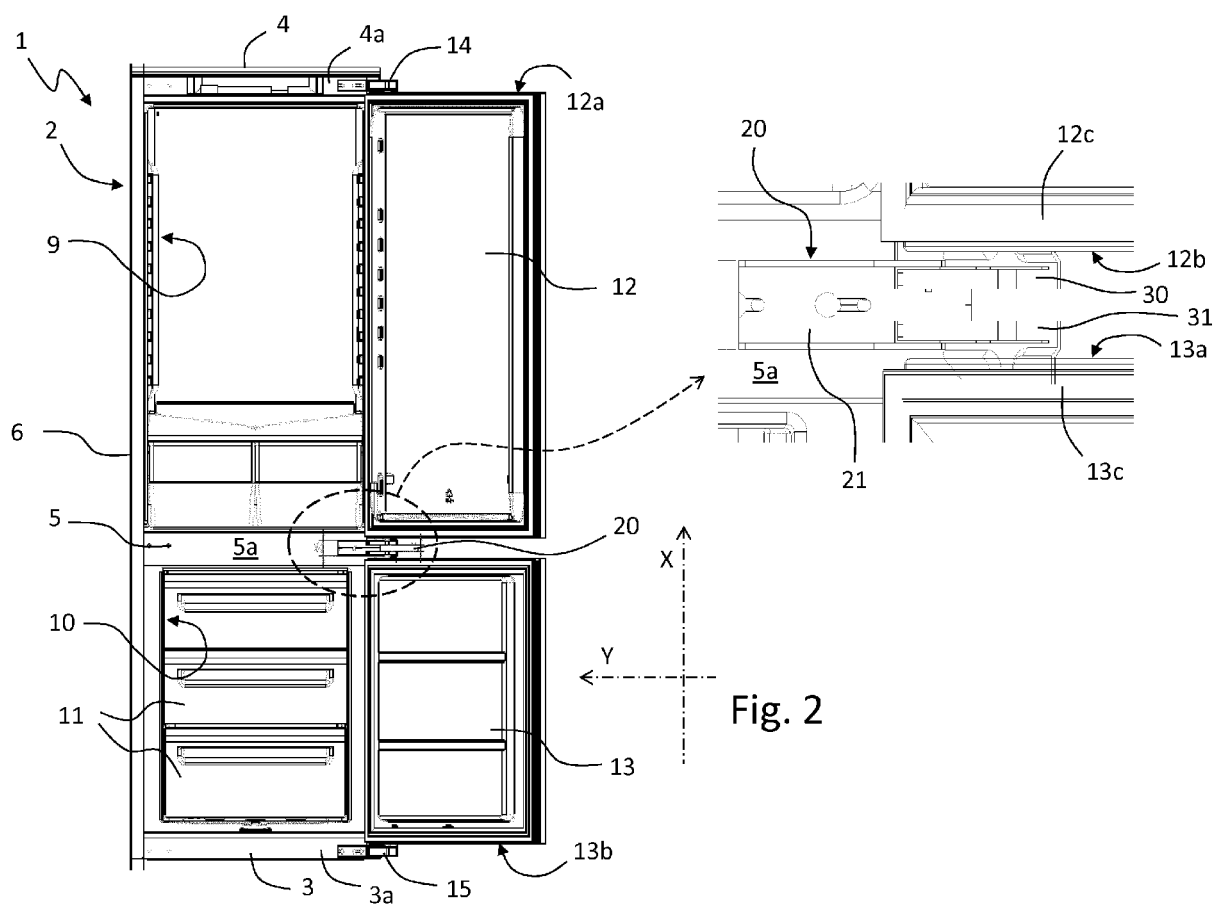
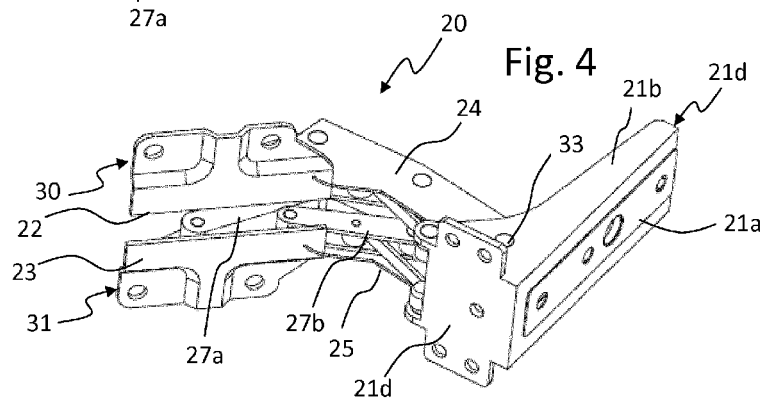
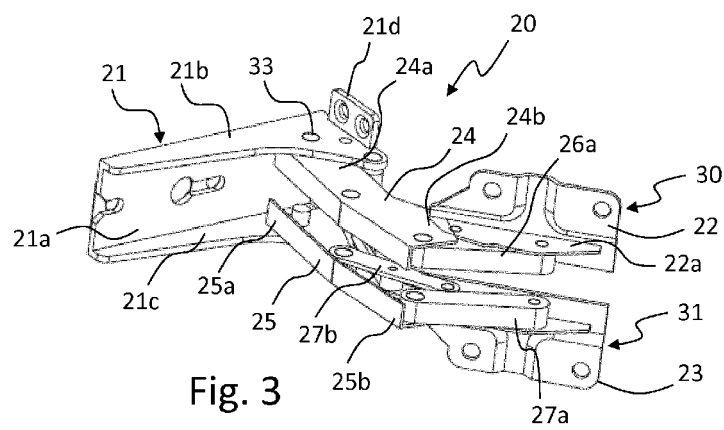
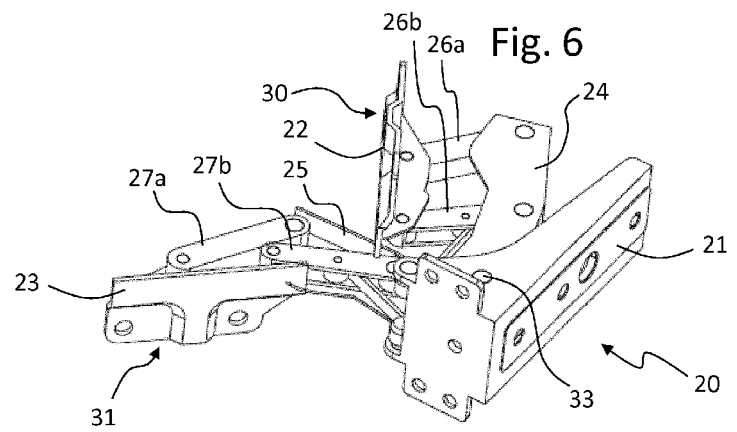
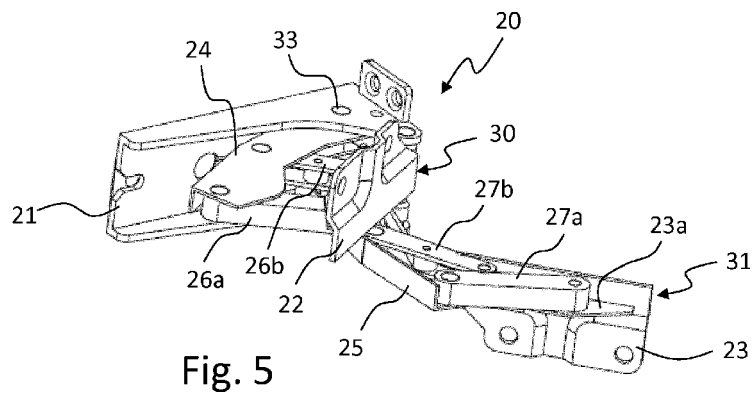
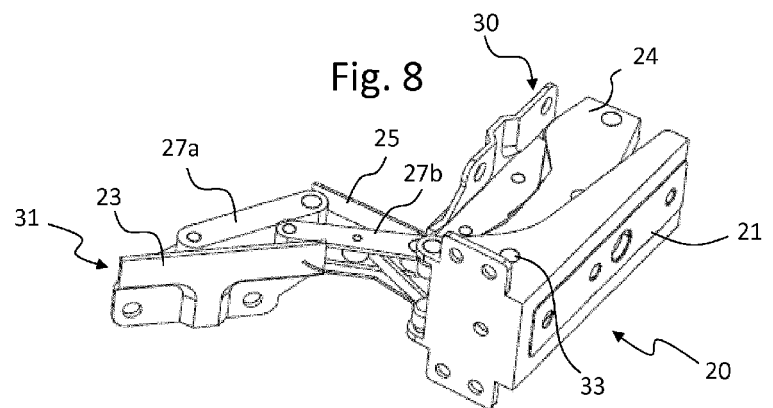
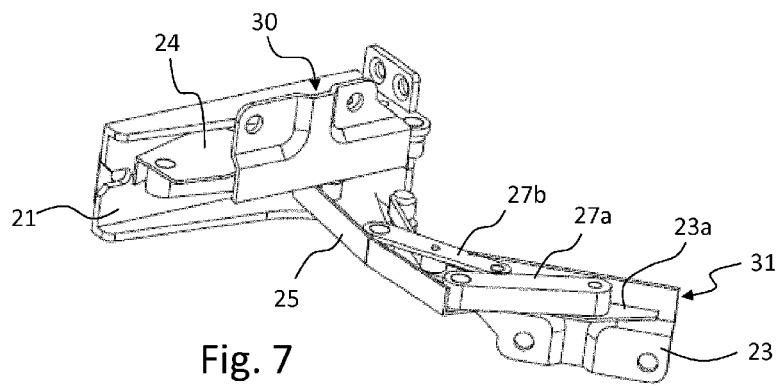


Fig. 1









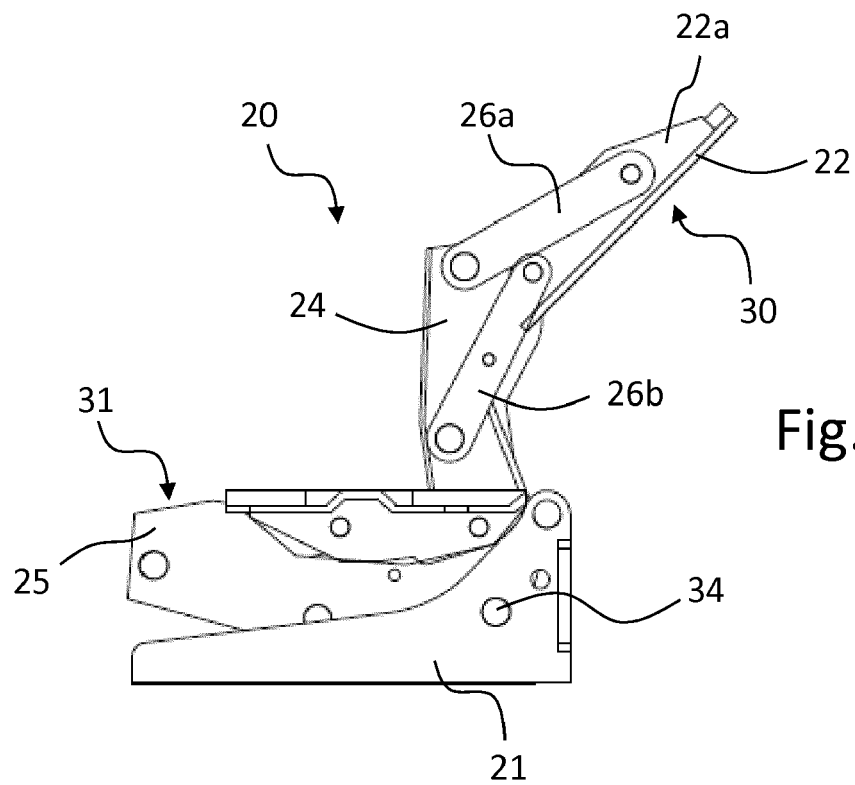


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 13 15 1047

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 864 691 A (GIDSEG EDWARD D [US] ET AL) 12 September 1989 (1989-09-12) * column 7, line 19 - column 9, line 43; figure 3 *	1	INV. F25D23/02 F25D23/10
A	DE 33 19 757 A1 (TOKYO SHIBAURA ELECTRIC CO [JP]) 15 March 1984 (1984-03-15) * page 8, line 26 - page 9, line 1; figures 1-8 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 May 2013	Examiner Jessen, Flemming
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1

EPO FORM 1503 03.82 (PO4C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 15 1047

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-05-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4864691	A	12-09-1989	NONE
DE 3319757	A1	15-03-1984	DE 3319757 A1 15-03-1984
		GB 2128244 A	26-04-1984
		IT 1163412 B	08-04-1987
		JP H0223671 B2	24-05-1990
		JP S5948578 A	19-03-1984
		US 4609234 A	02-09-1986

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82