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(54) **BUILT-IN REFRIGERATOR**

(57) A built-in assembly comprises a refrigerator or freezer configured for installation in a piece of kitchen furniture (A) having a front panel hinged to a cabinet structure. The front panel is arranged at the refrigerating appliance door (12) and linked thereto by means of at

least one sliding and connecting device which comprises a rail (20) and a cursor (18), wherein at least one of the rail and cursor is fully interposed between the front panel and the refrigerating appliance door so that it is hidden from view in its installed configuration.

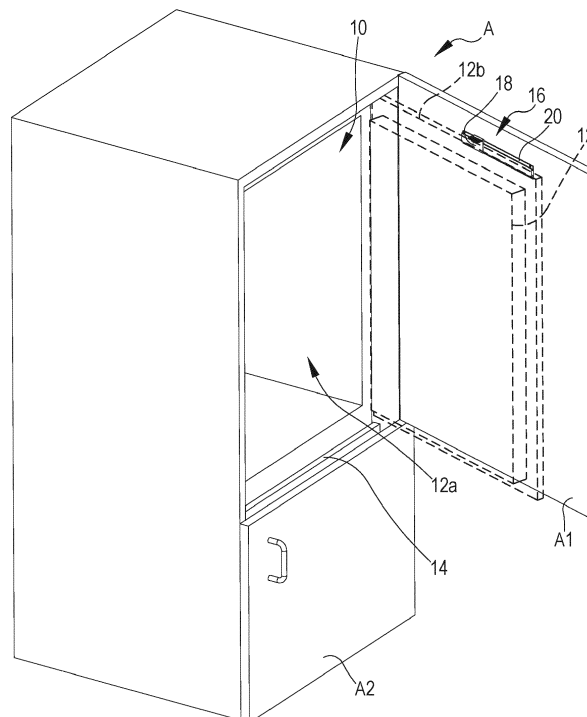


FIG.1

Description

[0001] The present invention relates to a refrigerating built-in appliance configured for installation in a piece of kitchen furniture having a front panel hinged to a cabinet structure. The front panel is typically arranged frontally at a door of the refrigerating appliance and connected thereto by way of at least a sliding and connecting device which comprises a rail element and a sliding element.

[0002] In the above kind of appliances the sliding and connecting device is installed between the door of the appliance and the front panel of a piece of furniture containing the household appliance, such panel being a door of the furniture niche.

[0003] According to such known technique it is possible to use both hinges, i.e. the hinge of the built-in appliance door and the hinge of the furniture front panel, without the need of using expensive special hinges having several axis of rotation.

[0004] For practical and aesthetical reasons, the two "doors", i.e. door of appliance and the panel/door of the piece of furniture, should remain as close to each other as possible during opening and closing, when there is a lateral shift between the two doors due to the two different vertical axis of hinges.

[0005] EP857929 discloses a built-in refrigerator in which a sliding element is installed on the vertical side of an appliance door, and a rail element is installed on a front panel of a piece of furniture configured to accommodate the built-in refrigerator, so that one of its ends protrudes from the sliding element during the entire rotation of the front panel which draws the appliance door. Therefore, for all possible positions of the front panel and door, both components of the sliding and connecting device are at least partially visible by the user when he/she opens the door of the appliance.

[0006] The same considerations apply to the solution shown in DE4200333A1 where a rail element is fastened to an upper side of an appliance door and a sliding element is fastened to a front panel of a piece of furniture configured to accommodate the built-in refrigerator.

[0007] Despite robustness and reliability of known sliding and connecting devices of the type above, they are generally perceived as cheap solutions due to their visibility to users when opening and closing the door of a refrigerator appliance.

[0008] Moreover, rail elements are typically provided with a removable plastic cover that conceals the screws used for fastening such element. During use of the appliance and in view of the position of the rail element near the vertical edges of the doors restrained to each other, such cover can be accidentally detached, increasing the low perceived quality of the device.

[0009] For this reasons, direct connection of furniture panels to refrigerator doors is more and more used by manufactures of kitchen furniture. However, this solution is far more expensive and complex than sliding and connecting devices. Hence, a need exists to improve sliding

and connecting devices for refrigerator built-in appliances.

[0010] To this end, the invention relates to a built-in appliance where at least one of the rail element and slide element is fully interposed between the front panel and the refrigerating appliance door so that it is hidden from view in the installed configuration.

[0011] According to a first aspect of the invention, the sliding element has a first flat portion configured to be fastened to a horizontal side of the refrigerating appliance door and a second portion configured to slide on the rail element fastened to the front panel. In this aspect the rail element is fully hidden by the appliance door in any positions thereof.

[0012] According to a further aspect, the sliding element is L-shaped and one portion is fully interposed between the front panel and the refrigerating appliance door so that it is hidden from view.

[0013] According to a further aspect, the door of the refrigerating appliance presents a seat for the first flat portion of the sliding element so that said flat portion is substantially flush with the door.

[0014] According to a further aspect, both the sliding element and the rail element are fully interposed between the front panel and the refrigerating appliance door so that they are hidden from view in the installed configuration.

[0015] According to a further aspect, one of the sliding element and rail element comprises at least a magnetic portion for its fastening to the refrigerating appliance door.

[0016] According to a further aspect, one of the sliding element and rail element has magnetic inserts.

[0017] Further technical features and advantages of the invention will be clear in the following description, which is provided as a non-limiting example, with reference to the accompanying drawings in which:

- Figure 1 is a perspective view of a built-in appliance according to a first embodiment of the invention, with a door in an open configuration;
- Figure 2 is an enlarged view of a detail of figure 1;
- Figure 3 is a section along line III-III of figure 2;
- Figure 4 is a perspective view of a built-in appliance according to a second embodiment of the invention, with a door in an open configuration;
- Figure 5 is an enlarged view of a detail of figure 4;
- Figure 6 is a section along line VI-VI of figure 5;
- Figure 7 is a perspective view of the sliding element according to the first embodiment; and
- Figure 8 is a perspective view of the sliding element according to the second embodiment of the invention.

[0018] The indications "upper", "lower", "top", "front", "bottom", "floor", "horizontal", "vertical" and the like refer to the positions and orientations of the household appliance in its intended use position with respect to an ob-

server located in front of the household appliance.

[0019] With reference to the drawings, A indicates a kitchen piece of furniture having an upper front panel A1 and a lower front panel A2 (for instance wooden panels or the like), both hinged to the piece of furniture A along a vertical axis and acting as doors of the piece of furniture A. Inside the piece of furniture A a built-in refrigerating appliance 10 (shown only schematically in the drawings) having an upper door 12 for closing a refrigeration compartment 12a and a lower door 14 for closing a freezer compartment is inserted.

[0020] Between each panel A1 and A2 of the piece of furniture A and each door 12 and 14 of the appliance 10 a sliding and connecting device 16, comprising a sliding element, or cursor, 18 and a rail 20, is interposed. Reference will be made in the following to door 12 and panel A1. It goes without saying that the same considerations apply, *mutatis mutandis*, to door 14 and panel A2.

[0021] According to a first embodiment shown in figures 1-3 and 7, the sliding element 18 is L shaped and has a first flat portion 18a fastened to an upper horizontal edge 12b of the appliance door 12 and a second flat orthogonal portion 18b on which a hollow profile 18c having a C-shaped cross section is formed. The rail 20 is fastened on a rear surface of the front panel A1 and features a H-shaped cross section configured to match and engage the C-shaped cross section of the hollow profile 18c. The sliding element 18 is fastened to the door 12 at a predetermined position, for instance in a seat (not shown) provided in the upper edge of the door so that the first flat portion 18a may be substantially flush with such upper edge 12b. Fastening screws (not shown) are inserted in openings 18d of the first flat portion 18. Moreover, the first flat portion 18a has a seat 19 where a flat plug (not shown) can be mounted e.g. by snap-fitting in order to hide the screw heads and the openings 18d. The rail element 20 is fastened to the panel A1 or A2 by means of screws, and for its correct initial positioning a self-adhesive tape (not shown) may be used during the assembly of the built-in appliance.

[0022] The sliding element 18 may be fastened to the door 12 also by using its second vertical portion 18b which, in this case, will be provided with holes (not shown) for fastening screws.

[0023] The shape and dimensions of the sliding element 18 (as indicated in figure 3) are such that the rail 20 on which it slides is completely interposed between the panel A1 and the door 12 of the appliance, so that in any position of such door 12 during its opening and closing movement, it is totally invisible to the user. What the user can see is only the first flat horizontal portion 18a of the sliding element 18, which is small and placed in a seat of the upper edge of the door, so that its visibility is very low.

[0024] The same kind of sliding connection between the panel and the door of the appliance can be used for the lower panel A2 (freezer) as well. Of course some variants of this system can be adopted, for instance the

sliding and connecting device 16 can be positioned at the lower edge of the door 12, or two sliding devices 16 can be used for both horizontal edges of the door 12. Also the shape of the sliding element 18 and of the rail element 20 can be different from what shown in the drawings, and the cross section of the rail 20 can be different from the H shape shown in the drawings, for instance it could have a simple T-shaped cross section. Also the fastening means of the rail element 20 to the panels A1 and A2 could be different from screws. Alternatively, the rail element 20 could be glued to the panel.

[0025] With reference to figures 4-6 and 8, a second embodiment of the sliding and connecting device 16 is shown wherein this comprises a rail element 20 that is substantially identical to the one used in the first embodiment. Instead of the L-shaped sliding element 18, a sliding element 22 having a quadrangular flat shape, with a first surface 22a having lowered seats 24 and a second surface 22b having a C-shaped hollow profile 22c configured (as in the first embodiment) to engage the rail element 20. In the seats 24 of the sliding element 22 elongated magnetic inserts 26 are fastened (for instance by glue), such inserts 26 being designed for cooperating with the metal door 12 of the appliance 10 for fastening the sliding element 22 thereto. The seats 24 are placed adjacent to parallel opposite edges of the sliding element 22 and the C-shaped hollow profile 22c is placed, on the other side 22b of the sliding element 22, in a central position between the seats 24 so that the seats 24 and the C-shaped hollow profile 22c exploit the thickness of the sliding element 22. The depth of the seats 24 and the thickness of the magnetic inserts 26 are such that the first surface 22a of the sliding element 22 is at the same level of the inserts 26, as clearly shown in figure 6, so that the magnetic fastening is robust, with no deflection of the sliding element 22. By choosing a proper length and surface of the magnetic inserts 26, the sliding element 22 can be reliably fastened to the front flat surface of the metal door 12 of the appliance 20.

[0026] During installation of the built-in appliance, it is sufficient to fasten the rail 20 to the panel A1, to slide on it the sliding element 22 in a proper position and then to close the panel A1 on the appliance door 12, so that the magnetic inserts 26 can exert their effect. By pulling out the panel A1 for opening the appliance door, the rail 20 will draw the door 12 by means of the sliding element 22 attached magnetically to the metal door 12. In order to remove the panel A1 or A2 from the door 12 or 14 (for instance for maintenance purposes), the user can lever with a tool between the panel and the door.

[0027] In this second embodiment both the sliding element 22 and the rail element 20 are fully interposed between the panel A1 or A2 and the door 12 or 14 so that the sliding and connecting device 16 is not visible by the user.

[0028] Several variants can be implemented to the solutions described above without departing from the subject-matter of the invention. For instance, in the first em-

bodiment the rail element 20 may be fastened to the door 12 of the appliance, by changing the shape of the second portion of the sliding element 18 so that such element is flat and can be fastened to the panel A1.

[0029] Similarly, in the second embodiment a rail element 20 may be provided with magnetic inserts in order to be magnetically fastened to the door 12 of the appliance, while the sliding element 22 may be fastened by way of screws or the like to the panel A1 of the kitchen furniture A. Moreover, in the second embodiment the whole sliding element 22 can be made of magnetic material instead of using magnetic inserts.

[0030] A combination between the first embodiment and the second embodiment may also be envisaged to further increase the reliability and the invisibility of the sliding connection between the door and the front panel. For instance a solution according to the first embodiment can be used on the lower edge of the door (so that the first portion of the sliding element is hidden from view by the door itself) while a "magnetic" solution according to the second embodiment can be used in combination with the upper half of the door of the appliance.

[0031] In all the above embodiments and possible variants the sliding and connecting device 16 will be totally or almost totally hidden to the view of the user, without any decrease in its functionality, reliability and ease of installation.

Claims

1. Built-in assembly comprising a refrigerating appliance (10) and a piece of furniture (A, A1, A2) having a cabinet structure and a front panel (A1, A2) hinged to said cabinet structure, wherein said cabinet structure is configured to receive said refrigerating appliance (10), and wherein said front panel (A1, A2) is arranged at a door (12, 14) of the refrigerating appliance (10) and is connected thereto by means of at least one sliding and connecting device (16) which comprises a rail element (20) and a sliding element (18, 22), **characterized in that** at least one of the rail element (20) and sliding element (18, 22) is fully interposed between the front panel (A1, A2) and the refrigerating appliance door (12, 14) so that it is hidden from view in the installed configuration.
2. Built-in assembly according to claim 1, wherein one of the sliding element (18) and the rail element (20) has a first flat portion (18a) configured to be fastened to a horizontal edge (12b) of the refrigerating appliance door (12) and a second portion (18b) configured to mate a front surface of the refrigerating appliance door (12, 14) and to slidably engage the rail element (20).
3. Built-in assembly according to claim 2, wherein said second portion (18b) of the sliding element (18) has a C-shaped cross section hollow profile (18c) configured to engage and slide along a matching H-shaped cross section profile formed on the rail element (20) fastened to the front panel (A1).
4. Built-in assembly according to claim 3, wherein the slide element (18) is L-shaped and the second portion (18b) thereof is fully interposed between the front panel (A1, A2) and the refrigerating appliance door (12) so that it is hidden from view.
5. Built-in assembly according to any of claims 3-4, wherein the horizontal edge (12b) of the door (12) of the refrigerating appliance (10) presents a seat configured to receive the first flat portion (18a) of the sliding element (18), so that said flat portion (18a) is substantially flush with the door (12).
6. Built-in assembly according to any of claims 3-5, wherein the first flat portion (18a) of the sliding element (18) presents a seat (19) for a flat plug in order to hide fastening means.
7. Built-in assembly according to claim 1, wherein both the sliding element (22) and the rail element (20) are fully interposed between the front panel (A1, A2) and the refrigerating appliance door (12, 14) so that they are fully hidden from view in the installed configuration.
8. Built-in assembly according to claim 7, wherein one of the sliding element (22) and rail element (20) comprises at least a magnetic portion for its fastening to the refrigerating appliance door (12, 14).
9. Built-in assembly according to claim 8, wherein said magnetic portion comprises magnetic inserts (26) and wherein one of the sliding element (22) and rail element (20) comprises seats (24) to accommodate said magnetic inserts (26).
10. Built-in assembly according to claim 8 or 9, wherein the sliding element (22) has a flat quadrangular shape and presents a first surface (22a) with the seats (24) for the magnetic inserts (26) placed adjacent opposite and parallel sides and a second surface (22b) with a C-shaped hollow cross section profile (22c) placed centrally and parallel to the seats (24) for cooperating with a matching T-shaped cross section profile of the rail element (20).
11. Built-in assembly according to claim 10, wherein a top surface of the magnetic inserts (26) is flush with the first surface (22a) of the sliding element (22).
12. Built-in assembly comprising a refrigerating appliance (10) and a piece of furniture (A, A1, A2) having a cabinet structure and a front panel (A1, A2) hinged

to said cabinet structure, wherein said refrigerating appliance (10) is configured for installation in said cabinet structure, and wherein said front panel (A1, A2) is arranged at a door (12, 14) of the refrigerating appliance and connected thereto by means of at least one sliding and connecting device (16) which comprises a rail element (20) and a sliding element (18, 22), **characterized in that** one of the sliding element (18) and the rail element (20) has a first flat portion (18a) configured to be fastened to a horizontal edge (12b) of the refrigerating appliance door (12, 14) and a second portion (18b) configured to cooperate with the rail element (20), said second portion (18b) being fully interposed between the door (12, 14) and the front panel (A1, A2) so that it is hidden from view in the installed configuration.

13. Built-in assembly comprising a refrigerating appliance (10) and a piece of furniture (A, A1, A2) having a cabinet structure and a front panel (A1, A2) hinged to said cabinet structure, wherein said refrigerating appliance (10) is configured for installation in said cabinet structure, and wherein said front panel (A1, A2) is arranged at a door (12, 14) of the refrigerating appliance and connected thereto by means of at least one sliding and connecting device (16) which comprises a rail element (20) and a sliding element (18, 22), **characterized in that** one of the sliding element (22) and rail element (20) comprises at least a magnetic portion for its fastening to the refrigerating appliance door (12) so that both said sliding element (22) and rail element (20) are fully interposed between the door (12, 14) and the panel (A1, A2) and are hidden from view in an installed configuration.

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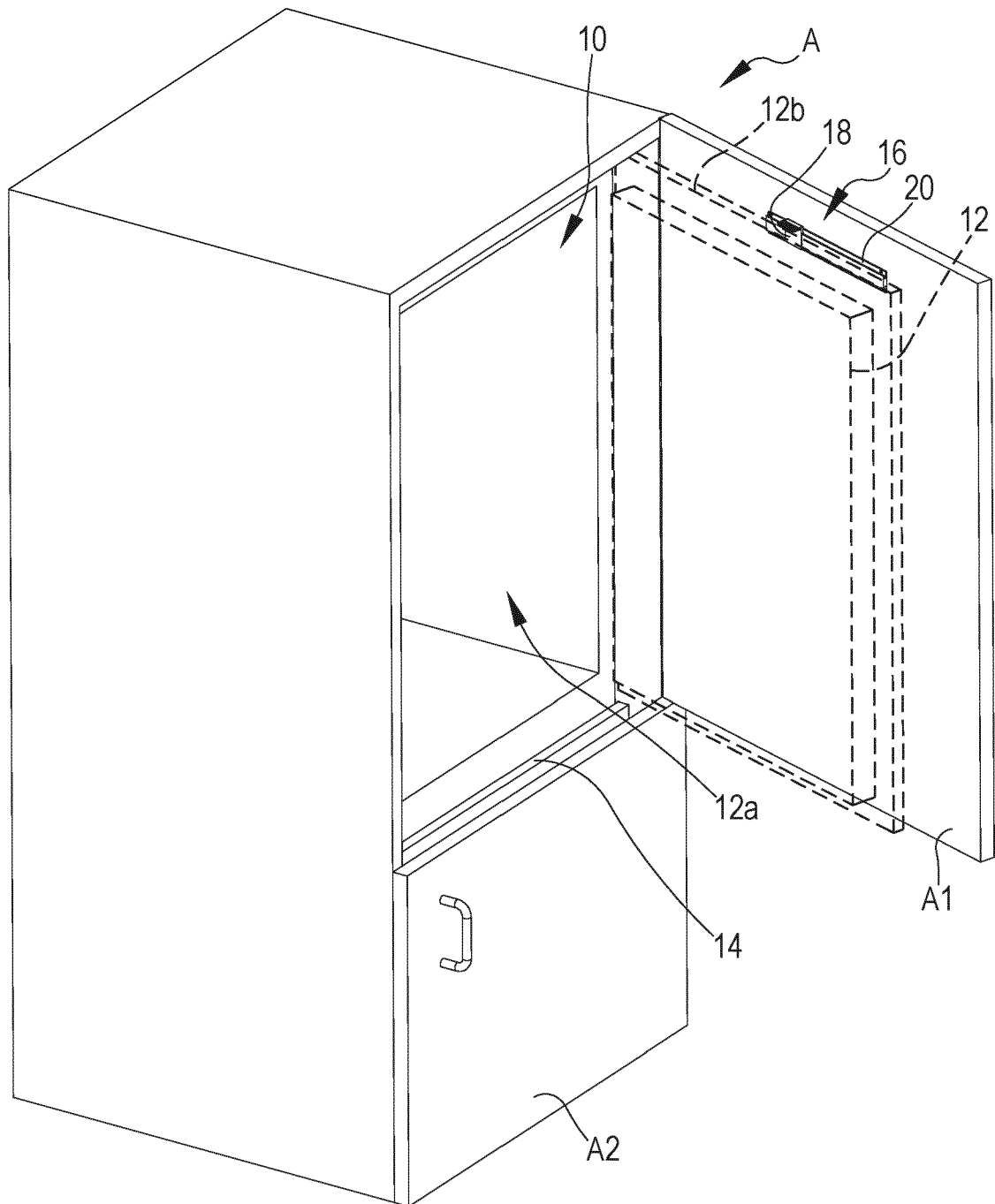


FIG.1

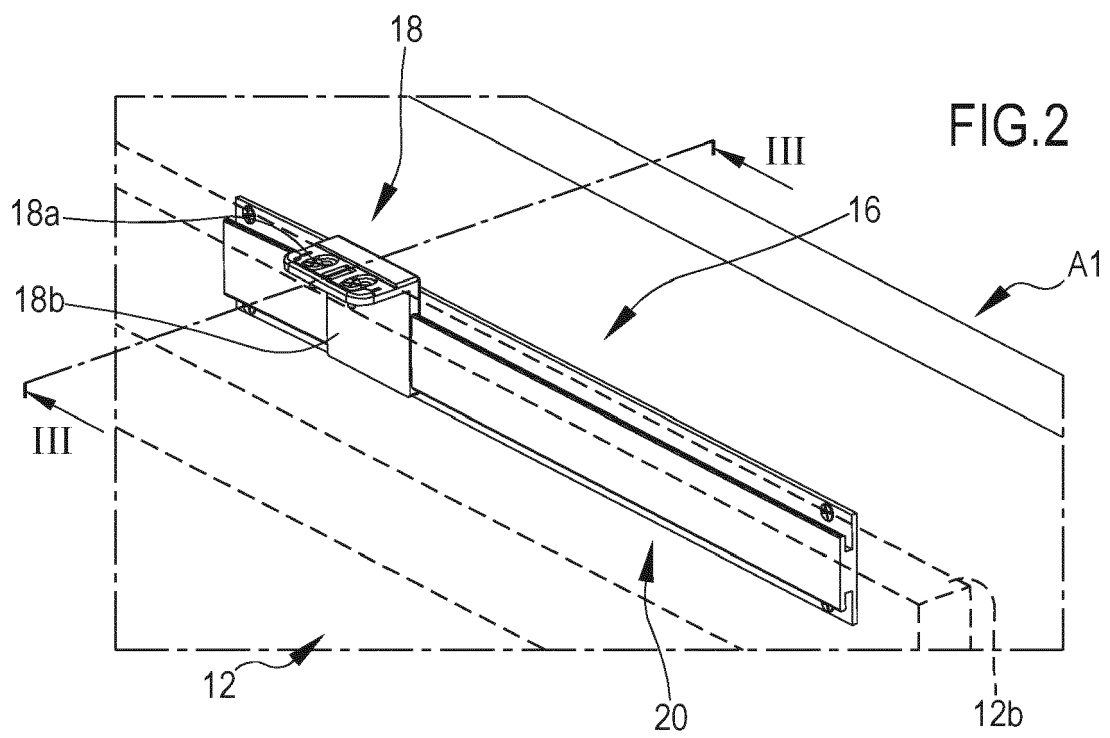
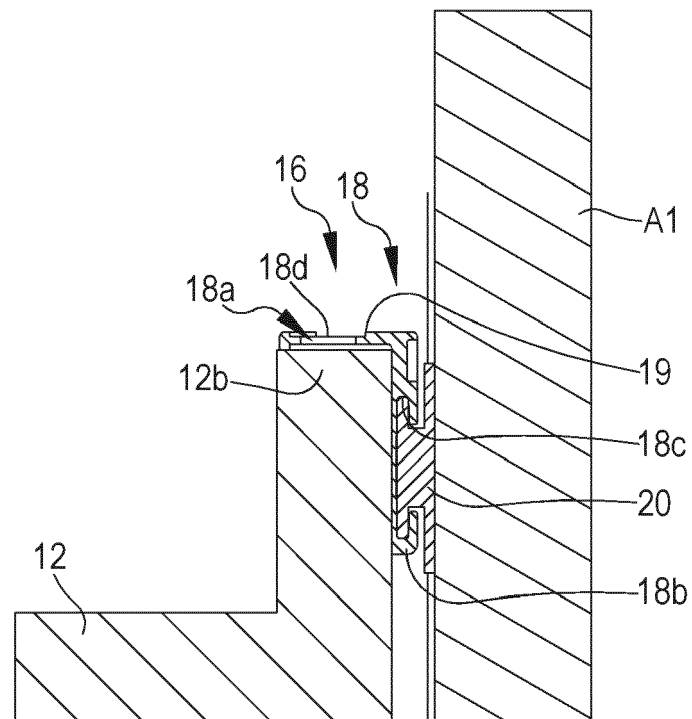


FIG.3



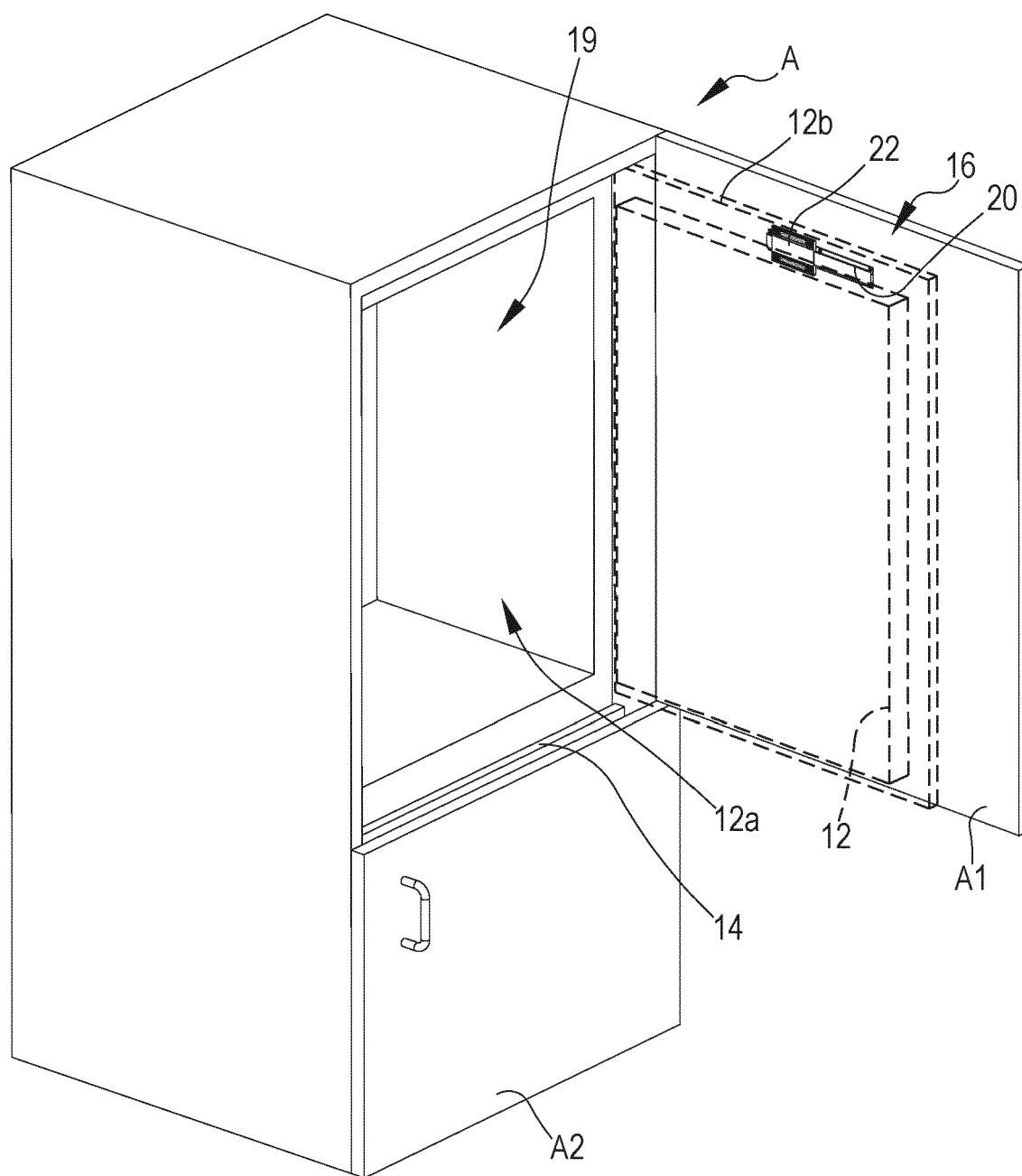


FIG.4

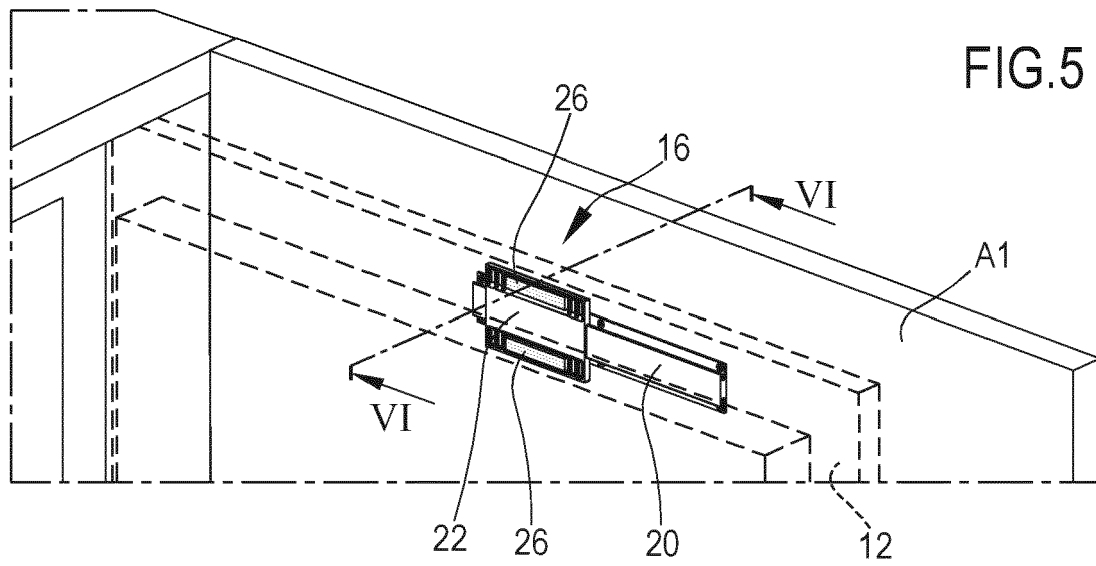


FIG.6

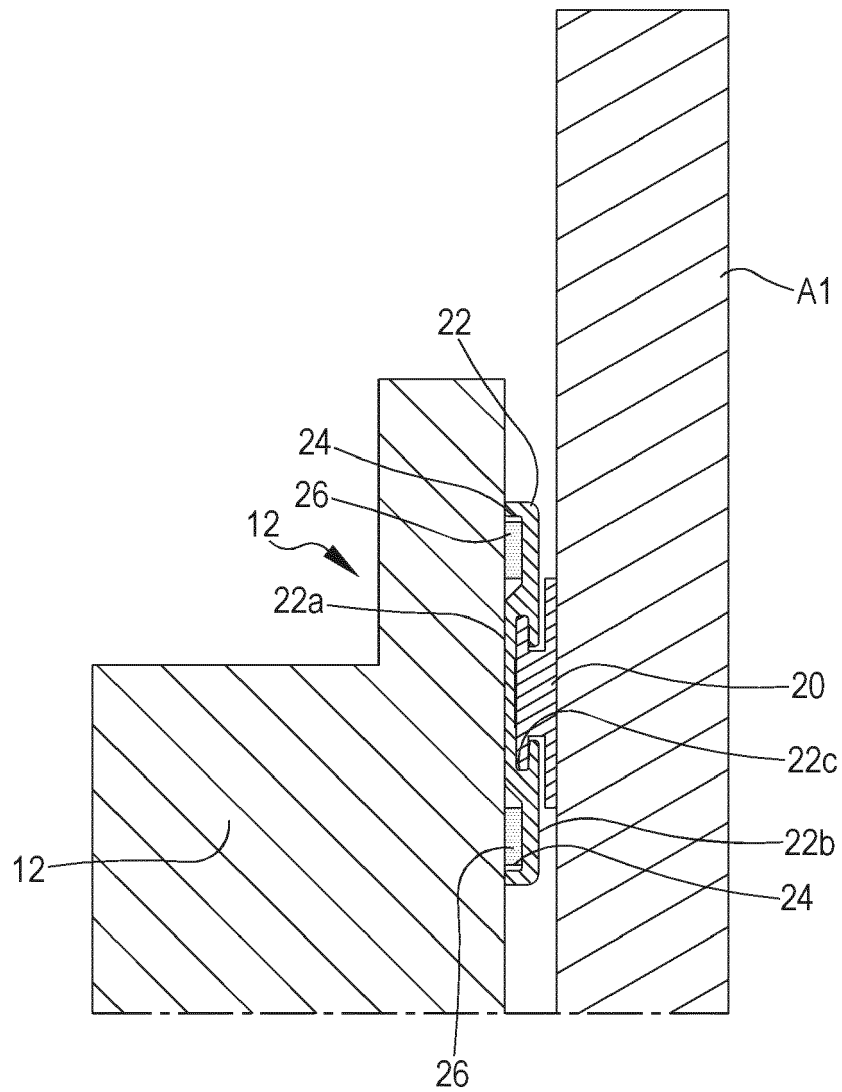


FIG.7

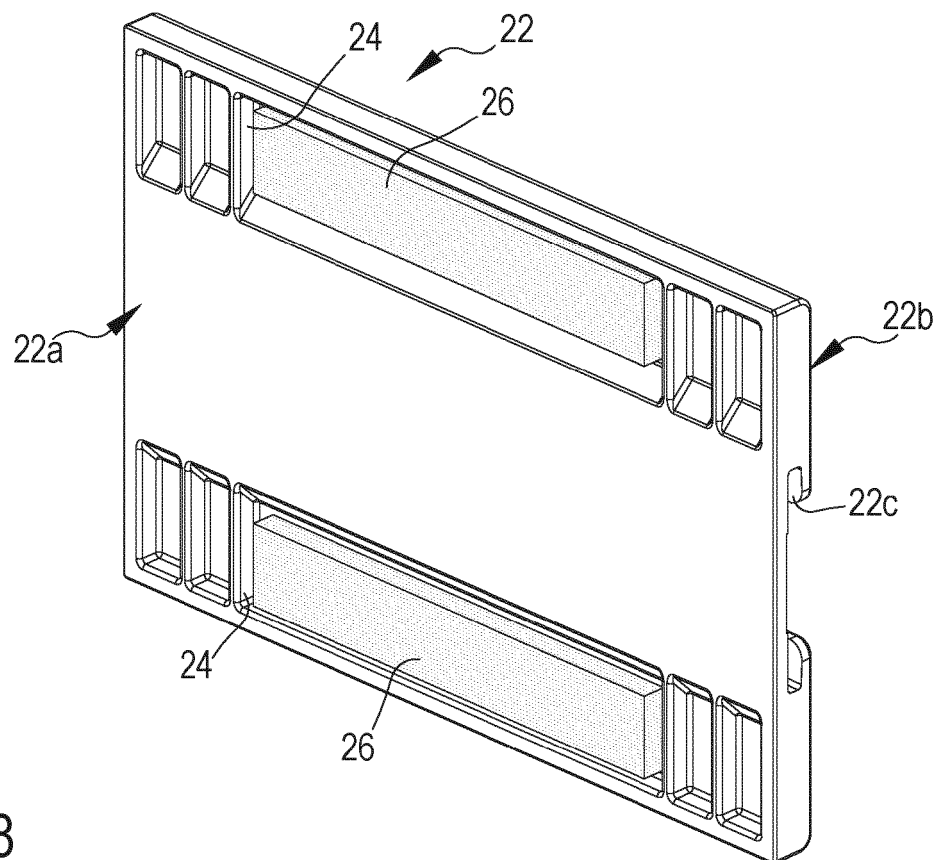
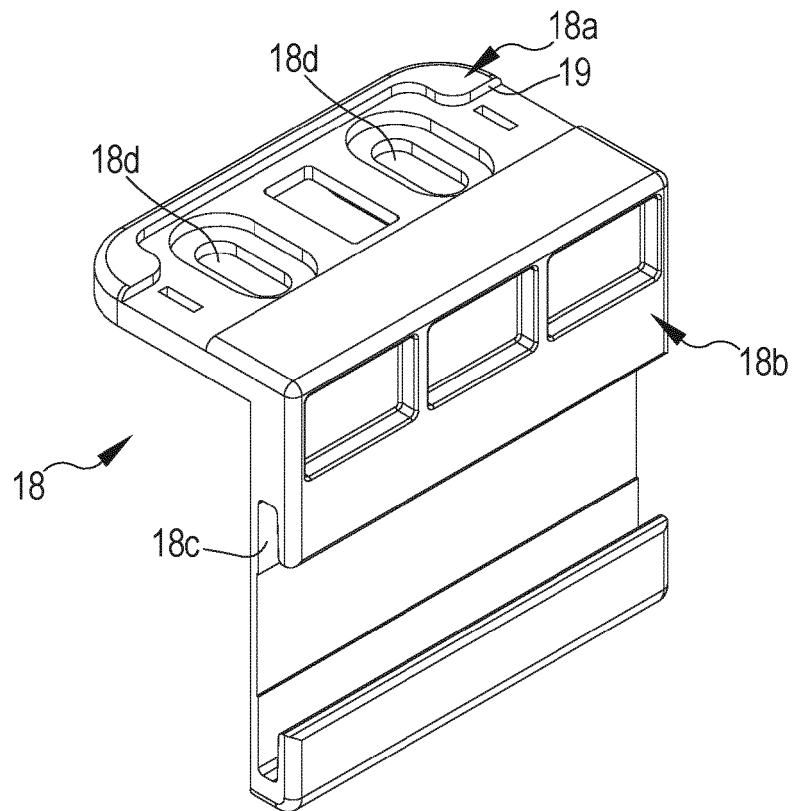


FIG.8

**PARTIAL EUROPEAN SEARCH REPORT**

Application Number

under Rule 62a and/or 63 of the European Patent Convention.
This report shall be considered, for the purposes of
subsequent proceedings, as the European search report

EP 20 16 7545

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	DE 10 2010 038371 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 26 January 2012 (2012-01-26) * figure 7 *	1-6	
X	DE 75 20 916 U (LICENTIA PATENT-VERWALTUNG GMBH) 6 November 1975 (1975-11-06) * figure 1 *	1-6	
A	WO 2018/133210 A1 (HEFEI HUALING CO LTD [CN]; HEFEI MIDEA REFRIGERATOR CO [CN] ET AL.) 26 July 2018 (2018-07-26) * figures 12,14 *	7-10	TECHNICAL FIELDS SEARCHED (IPC) F25D E06B A47L
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INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

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EPO FORM 1503 03.82 (P04E07)

Place of search	Date of completion of the search	Examiner
The Hague	6 October 2020	Kuljis, Bruno
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		

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	WO 2013/182428 A1 (ARCELIK AS [TR]; OZYUKSEL FAIK EMRE [TR] ET AL.) 12 December 2013 (2013-12-12) * figure 2 * -----	1-6	TECHNICAL FIELDS SEARCHED (IPC)

**INCOMPLETE SEARCH
SHEET C**

Application Number

EP 20 16 7545

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Claim(s) completely searchable:
1-10

Claim(s) not searched:
11-13

Reason for the limitation of the search:

The search division has identified multiple independent claims in the same category. In accordance with Rule 62a(1) EPC, the applicant was invited to indicate the claims complying with Rule 43(2) EPC on the basis of which the search is to be carried out. The applicant indicated, in his letter on 28-09-2020, to carry out the search on the apparatus claims 1 to 10.

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

EP 20 16 7545

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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
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REFERENCES CITED IN THE DESCRIPTION

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