



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.02.2015 Bulletin 2015/09

(51) Int Cl.:
F25D 23/10 (2006.01)

(21) Application number: **13181350.3**

(22) Date of filing: **22.08.2013**

(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

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(54) **Built-in kitchen appliance**

(57) A built-in appliance designed for being embedded in a furniture cabinet (110) having a furniture cabinet door (125) swivelling about an axis, the appliance comprising an appliance cabinet (105) and an appliance door (150) swivelling about an axis parallel to the swivelling axis of the furniture cabinet door (125). A coupling member (210) is provided for mechanically coupling the appliance door (150) to the furniture cabinet door (125) such that opening of the furniture cabinet door (125) causes the appliance door (150) to be opened, and closing of the furniture cabinet door (125) causes the appliance door (150) to close, the coupling member comprising a flexible central portion (401) and a first and a second opposite lateral portions (402, 403) and being configured to be attached to the outside of the appliance door (150) along the first lateral portion (402), and to the inside of the furniture cabinet door (150) along the second lateral portion (403).

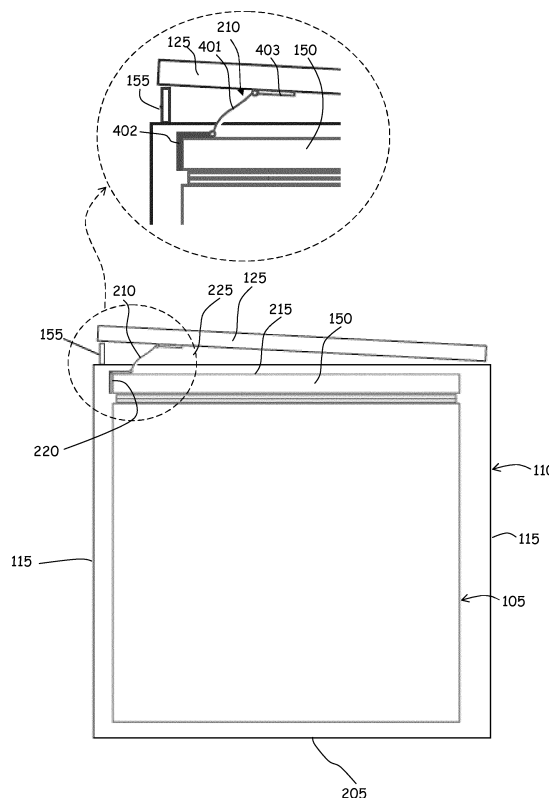


Fig. 3

Description

Background of the invention

Field of the invention

[0001] The present invention generally relates to the field of household appliances, particularly kitchen appliances like food refrigerators.

Discussion of the related art

[0002] Embedded and built-in household appliances for kitchens, i.e. kitchen appliances like refrigerators that are designed for being fitted into furniture bodies, have been known for years. They are appreciated by customers due to the fact that the appliances so designed are perfectly integrated in the kitchen furniture and do not affect the overall appearance thereof.

[0003] Nowadays there is a growing trend in the kitchen furniture industry towards kitchen furniture without handles (handle-less or handle-free kitchen furniture), i.e. kitchen furniture with furniture cabinet doors and drawers that do not have visible or protruding handles to be gripped by the users to open the doors.

Summary of the invention

[0004] The Applicant has tackled the problem of providing a kitchen appliance like a food refrigerator that is suitable for built-in installation in a handle-less kitchen piece of furniture.

[0005] According to an embodiment of the present invention, a

[0006] A built-in appliance is provided designed for being embedded in a furniture cabinet having a furniture cabinet door swivelling about an axis. The appliance comprises an appliance cabinet and an appliance door swivelling about an axis parallel to the swivelling axis of the furniture cabinet door. A coupling member is provided for mechanically coupling the appliance door to the furniture cabinet door such that opening of the furniture cabinet door causes the appliance door to be opened, and closing of the furniture cabinet door causes the appliance door to close. The coupling member comprises a flexible central portion and a first and a second opposite lateral portions and is configured to be attached to the outside of the appliance door along the first lateral portion, and to the inside of the furniture cabinet door along the second lateral portion.

[0007] The flexible central portion of the coupling member may be made of silicon, rubber or felt.

[0008] The first and a second opposite lateral portions of the coupling member are preferably more rigid than the flexible central portion.

[0009] The flexible central portion may be formed by a flexible body and the first and second opposite lateral portions may be totally formed by rigid members, at-

tached or fixed to lateral sides of the flexible body.

[0010] The rigid members may extend along the two opposite longer sides of the flexible body.

[0011] In embodiments of the present invention, both the central portion and the first and second lateral portions of the coupling member may be formed by a flexible body, and the first and second lateral portions may have rigid members embedded in the flexible body, such embedded rigid members defining reinforcing parts for locally reinforcing the coupling member.

[0012] Preferably, the rigid members extend along two opposite longer sides of the coupling member.

[0013] In embodiments of the present invention, the coupling member may be fabricated by moulding of material, preferably injection moulding, over-moulded on the rigid members.

[0014] In embodiments of the present invention, both the central portion and the first and second lateral portions may be formed by a flexible body, and the first and second lateral portions may further comprise U-shaped rigid members enclosing the first and second lateral portions of the flexible body.

[0015] Edges of the first and second lateral portions may fit by interference into the U-shaped rigid members.

[0016] In embodiments of the present invention, the coupling member may be made of a single flexible body and the central portion thereof may be loaded with a substance adapted to provide more flexibility to the material of the flexible body, thereby the first and second lateral portions are more rigid than the central portion of the coupling member.

[0017] advantageously, both the central portion and the lateral portions of the coupling member have a height in the range from 10 cm to 60 cm, preferably 15 - 30 cm, a length in the range from 50 cm to 70 cm and a thickness in the range from 0.5 to 5 mm.

[0018] Preferably, one of the first and second lateral portions of the coupling member is attached on or close to a lateral free edge of the refrigerator door, preferably around the edge between a front surface of the refrigerator door and a side of the refrigerator door, and the opposite lateral portion of the coupling member is attached to an inner side of the furniture cabinet door in a position where it does not overlap with the lateral portion attached to the refrigerator door when the two doors are closed.

[0019] Alternatively, one of the first and second lateral portions of the coupling member is attached to an inner side of the furniture cabinet door in a position close to a lateral free edge of the furniture cabinet door, where it partially or totally overlaps with the opposite lateral portion of the coupling member when the two doors are closed.

Brief description of the drawings

[0020] These and other features and advantages of the present invention will be better understood by reading the following detailed description of an embodiment

thereof, provided merely by way of non-limitative example, description that, for its better intelligibility, should be read in conjunction with the attached drawings, wherein:

Figure 1 schematically shows in isometric view a built-in kitchen household appliance embedded in a kitchen piece of furniture, with the appliance door partially open;

Figures 2 and 3 schematically show in cross-section along a horizontal plane II-II the built-in kitchen appliance of **Figure 1**, with the door closed and open, respectively;

Figure 4 shows, developed in a plane and from the front, a coupling member for coupling the door of the kitchen appliance with the door of the piece of furniture wherein the appliance is embedded;

Figures 5a, 5b, 5c and 5d show, in lateral view, the coupling member according to embodiments of the present invention, and

Figures 6 and 7 show, in views similar to those of **Figures 2 and 3**, an alternative mounting of the coupling member to the doors of the kitchen appliance and the piece of furniture.

Detailed description of embodiments of the invention

[0021] With reference to the drawings, **Figure 1** schematically shows in isometric view a built-in household appliance, particularly a built-in kitchen appliance, embedded in a piece of furniture.

[0022] The appliance is for example a food refrigerator **105**, designed for being installed embedded in a piece of furniture, for example a furniture cabinet **110** part of a kitchen furniture, in such a way as to be completely hidden within the furniture cabinet **110**.

[0023] The furniture cabinet **110** comprises cabinet panels, e.g. made of wood or other material commonly used in the furniture industry, the panels being assembled to form a parallelepiped. The panels of the furniture cabinet **110** comprise for example two lateral, vertically-extending panels **115**, a top panel **120**, a bottom panel **123** and (possibly) a rear panel **205** (not visible in the view of **Figure 1**, but visible in **Figures 2 and 3**). A furniture cabinet door **125** is hinged to, e.g., a front edge of one of the two lateral panels **115**, e.g. the right-hand lateral panel **115** in the drawing, so as to be swivable along a vertical axis.

[0024] The refrigerator **105** comprises a refrigerator cabinet **130** which in use is fitted within the furniture cabinet **110**. The refrigerator cabinet **130** defines inside it a food storage compartment **135**, which may be provided with shelves **140** and/or drawers **145** for containing food. A refrigerator door **150** is hinged to a front vertical edge

of the refrigerator cabinet **130** so as to be swivable along a vertical axis parallel to the swiveling axis of the furniture cabinet door **125**.

[0025] The refrigerator door **150** is advantageously coupled, in a way described in detail in the following, with the furniture cabinet door **125**, so that when the user opens the furniture cabinet door **125**, also the refrigerator door **150** is open, and vice versa when the user closes the furniture cabinet door **125**, also the refrigerator door **125** is closed.

[0026] The furniture cabinet door **125** is preferably handle-free, i.e. no handle or other protruding grip means are provided, so that the external side of the furniture cabinet door **125** is essentially flat, smooth.

[0027] To assist the user in the operation of opening the furniture cabinet door **125**, a "push-to-open" mechanism is preferably provided. The push-to-open mechanism may be of a known type, for example model TIP-ON produced by Julius Blum GmbH, and preferably comprises a spring-loaded piston **155** mounted in a cylinder provided on the furniture cabinet **110**, advantageously on a front edge thereof, e.g. along the front edge of the lateral panel **115** opposite to the lateral panel to which the furniture cabinet door **125** is hinged (the left-hand lateral panel **115** in the drawing). The push-to-open mechanism works as follows: when the furniture cabinet door **125** is brought to the closed position, at a certain time the furniture cabinet door **125** abuts the piston **155** and pushes the piston **155** (against the spring force) back into its seat, until the piston reaches a retracted position in which it is retained by a retaining mechanism. In this operation, the spring-loaded piston **155** performs a damping action. A magnet is advantageously provided in the piston **155** (e.g. on the head thereof) that cooperates with a magneto-responsive member, e.g. a metal plate attached to the inner side of the furniture cabinet door **125**, to keep the latter in the closed position by magnetic force. To open the furniture cabinet door **125**, the user slightly pushes it and the piston **155** is thus released from the retaining mechanism and the spring that biases the piston causes the piston **155** to move to the extracted position, thereby exerting a force on the furniture cabinet door **125** that causes the latter to slightly open of a certain angle, sufficient for the user to grip the furniture cabinet door **125** edge and continue the opening.

[0028] The retaining mechanism may be realized in different ways. One possible solution is to provide the bottom of the cylinder hosting the piston **155** with a hook member and the piston **155**, in its longitudinal portion opposite the head, with a guide for the hook member, which guide is branched into a first and a second path almost parallel to each other. When the piston is pushed into the cylinder, the hook member slides into a first branch of the guide up to an end section where an edge wall deviates it laterally into a seat. When the piston is then released the hook member, loaded by the spring, abuts against the wall of the seat, thus impeding the piston extraction. If the piston is further pushed (as a result

of a pressure on the furniture cabinet door **125**), another edge wall positioned in front of the seat further deviates laterally the hook member (in the same direction as above) so as to lead it into the second path of the guide, where the hook member is then forced to slide by the spring action on the piston. As the piston is extracted, it opens the furniture cabinet door **125**.

[0029] The push-to-open mechanism can thus move to one condition to the other simply by a push action on the head of the piston, i.e. by a push action on the furniture cabinet door **125**.

[0030] A coupling member **210** is provided for coupling the refrigerator door **150** with the furniture cabinet door **125**. The coupling member **210** is shown developed in a plane from the front in **Figure 4** and laterally in **Figure 5a**. **Figures 5b, 5c** and **5d** show, still in lateral view, other possible embodiments of the coupling member.

[0031] As visible in **Figures 4**, the coupling member **210** may be a substantially rectangular body having two opposite longer sides **405** and two opposite shorter sides **410**. The coupling member **210** comprises a flexible central portion **401** and a first and a second opposite lateral portions **402, 403** along the longer sides **405**. The central portion **401** is substantially flat and is formed by a flexible body **434** of a material like silicon, rubber or felt. Preferably this material has also a certain degree of elasticity. The first and second opposite lateral portions **402, 403** shall be suitable for fixing the coupling member **210** to the refrigerator door **150** and to furniture cabinet door **125**, respectively, and therefore should have a sufficient robustness. Advantageously, the first and second opposite lateral portions **402, 403** may be more rigid than the central portion **401**. Moreover, the first and second opposite lateral portions **402, 403** may be formed, totally or in part, by rigid members **435**, such as metal stripes or plates.

[0032] In the embodiment of **Figure 5a**, the central portion **401** is formed by the flexible body **434** and the first and second opposite lateral portions **402, 403** are totally formed by rigid members **435**, attached or fixed to the lateral sides of the flexible body **434**. Advantageously, the rigid members **435** extend along the two opposite longer sides **405** of the flexible body **434**.

[0033] In the embodiment of **Figure 5b**, both the central portion **401** and the first and second opposite lateral portions **402, 403** are formed by the flexible body **434**, but the lateral portions **402, 403** in addition have rigid members **435**, such as metal plates, embedded in the flexible body, which define reinforcing parts for locally reinforcing the coupling member **210**. Again, the rigid members **435** advantageously extend along the two opposite longer sides **405** of the rectangular piece of flexible sheet material. For example, the coupling member **210** is fabricated by moulding of material, e.g. injection moulding, and the reinforcing parts **435** are inserted in the mould where the material to be moulded is then injected.

[0034] In the embodiment of **Figure 5c**, both the central portion **401** and the first and second opposite lateral

portions **402, 403** are formed by the flexible body **434**, but the lateral portions **402, 403** further comprise U-shaped rigid members **435** enclosing (in particular encapsulating) the lateral portions of the flexible body **434**. In this case, the edges of the lateral portions **402, 403** may fit by interference into the U-shaped rigid members **435**.

[0035] In the embodiment of **Figure 5d**, the coupling member **210** is made of a single flexible body **434** and the central portion **401** is loaded with some substances, for example foam, providing more flexibility to the material. Therefore, the first and second opposite lateral portions **402, 403** are more rigid than the central portion **401**.

[0036] The coupling member **210** may comprise through holes **440**, for example six, three distributed along one of the two longer sides **405**, and the other three distributed along the other longer side **405**, for the fixation to the refrigerator door **150** and furniture cabinet door **125**.

[0037] Possible dimensions of the coupling member **210** may be the following: both the central portion **401** and the lateral portions **402, 403** may have a height (i.e. a width) in the range from 10 cm to 60 cm, preferably 15 - 30 cm, a length in the range from 50 cm to 70 cm and a thickness in the range from 0.5 to 5 mm. The optimum height clearly depends on the type of materials chosen.

[0038] As an example, in the embodiment of **Figure 5a** the central portion **401** and lateral portions **402, 403** may have a height of 10 cm and a length of 60 cm, while the thickness of the central portion **401** may be 1 mm and that of the lateral portions **402, 403** 3 mm. In the same embodiment, the metal stripes forming the lateral portions **402, 403** may have a height of 2 cm.

[0039] In the embodiment of **Figure 5b**, the central portion **401** and lateral portions **402, 403** may have a height of 20 cm and a length of 60 cm, while the thickness of the central portion **401** may be 2 mm and that of the lateral portions **402, 403** 6 mm. In the same embodiment, the metal stripes embedded in the lateral portions **402, 403** may have a height of 2 cm and a thickness of 2 mm.

[0040] In the embodiment of **Figure 5c**, the central portion **401** and lateral portions **402, 403** may have a height of 10 cm and a length of 60 cm, while the thickness of both the central portion **401** and the lateral portions **402, 403** may be 3 mm. In the same embodiment, the metal stripes embedded in the lateral portions **402, 403** may have a height of 2 cm.

[0041] The coupling member **210**, folded along a folding axis **F** shown in **Figure 4**, is then affixed to the refrigerator door **150** and to the furniture cabinet door **125**, as shown in **Figures 2** and **3**, e.g. by means of screws: the coupling member **210** is affixed to the refrigerator door **150** in correspondence of one of the two longer sides **405**, and to the furniture cabinet door **125** in correspondence of the opposite longer side **405**. Preferably, the lateral portion **402** of the coupling member **210** is attached on or close to the lateral free edge of the refrigerator door **150**. In the embodiment of **Figures 2** and **3**, the lateral

portion **402** is attached around the edge between the front surface **215** of the refrigerator door **150** and the side **220** of the refrigerator door **150**. Still in this embodiment, the lateral portion **403** is attached to the inner side of the furniture cabinet door **125** in a position where it does not overlap with the lateral portion **402** when the two doors are closed. In particular, the lateral portion **403** is a few centimetres distant from the lateral free edge of the furniture cabinet door **125**. With such a construction, when the furniture cabinet door **125** is slightly open and the refrigerator door **150** still closed, the free edge of the furniture cabinet door **125** is free and can be easily grasped by the user's hand.

[0042] The coupling member **210** is mounted as described above at a height such that the coupling member **210** vertically extends through an area where it is expected that the user will apply his/her hand for opening the refrigerator door **150**.

[0043] Preferably, the lateral portion **402** is fixed to the furniture cabinet door **125** first, in a position suitable to control an angle of opening of the door itself, and then the lateral portion **403** is fixed to the refrigerator door **150**.

[0044] The two lateral portions **402**, **403**, possibly reinforced with the reinforcing parts **435**, ensure a strong, close stable and straight connection of the coupling member **210** to the refrigerator door **155** and the furniture cabinet door **150**.

[0045] Other means for affixing the coupling member **210** to the doors **125** and **150** can be used, e.g. the coupling member **210** can be glued, along the two longer sides **405**, to the doors **125** and **150**, or snap-fit means provided on the two doors **125** and **150** can be provided for snap-fit coupling the member **210**.

[0046] When the furniture cabinet door **125** and the refrigerator door **150** are closed, as in **Figure 2**, the coupling member **210**, being of flexible material (in at least the central portion **401**), is compressed and stays in a gap **225** between the inner side of the furniture cabinet door **125** and the outer side of the refrigerator door **150**. The coupling member **210** is not visible from the outside.

[0047] When the user wishes to open the refrigerator door **150** to access the food storage compartment **135**, the user slightly pushes the furniture cabinet door **150**, and, as described in the foregoing, the piston **155** is released from the retaining mechanism, so that the piston biasing spring causes the piston **155** to extend, thereby exerting a force on the furniture cabinet door **125** that causes the latter to slightly open of a certain angle (while the refrigerator door **150** is still closed), sufficient for the user to put the fingers of his/her hand in the gap that forms between the furniture cabinet door **125** and the front edge of the lateral panel **115**. The fingers of the user grip the coupling member **210**, and the pulling action of the user on the furniture cabinet door **125** is transmitted by the coupling member **210** to the refrigerator door **150**, that is caused to open. The width of the central flexible portion **401** and the fixing position of the lateral portions **402**, **403** to the furniture cabinet door **125**, together with

the length of the released piston **155**, determine and limit the angle of opening of the furniture cabinet door **125** with respect to the refrigerator door **150**. Even when the furniture cabinet door **125** is open, the coupling member **210** hides the gap between the furniture cabinet door **125** and the refrigerator door **150**.

[0048] To close the refrigerator door **150**, the user pushes the furniture cabinet door **125**. The coupling member **210** is thus compressed, and the pushing action of the user on the furniture cabinet door **125** is transmitted to the refrigerator door **150**. The flexibility of the material forming the coupling member **210** has a damping function that avoids the furniture cabinet door **125** unpleasantly beating against the refrigerator door **150**.

[0049] Moreover, the particular coupling between the refrigerator door **150** and the furniture cabinet door **125** according to the present invention allows, if wished by the user, to close only the refrigerator door **150** while keeping the furniture cabinet door **125** slightly open so as to be easily grasped when needed. To do so, it can be sufficient to apply a smooth / gently push on the furniture cabinet door **125**, sufficient to close the refrigerator door **150** but insufficient to close the furniture cabinet door **125** due to the action of the piston **155**. Differently, when the user wishes to close both doors, he has to apply a pressure on the door sufficient to push in the piston **155**.

[0050] According to a less preferred embodiment shown in **Figures 6** and **7**, the lateral portion **403** is attached to the inner side of the furniture cabinet door **125** in a position close to the lateral free edge of the furniture cabinet door **125**, where it partially or totally overlaps with the lateral portion **402** when the two doors are closed. In this case, when the two doors are closed, the flexible body is folded around the folding axis **F** shown in **Figure 4**, extending parallel to the longer sides **405**. The drawback of this solution is that when doors **125**, **150** are opened, the central portion **401** may hit the user's hand.

Claims

1. A built-in appliance designed for being embedded in a furniture cabinet (**110**) having a furniture cabinet door (**125**) swivelling about an axis, the appliance comprising an appliance cabinet (**105**) and an appliance door (**150**) swivelling about an axis parallel to the swivelling axis of the furniture cabinet door (**125**), **characterized by** comprising a coupling member (**210**) for mechanically coupling the appliance door (**150**) to the furniture cabinet door (**125**) such that opening of the furniture cabinet door (**125**) causes the appliance door (**150**) to be opened, and closing of the furniture cabinet door (**125**) causes the appliance door (**150**) to close, the coupling member comprising a flexible central portion (**401**) and a first and a second opposite lateral portions (**402**, **403**) and being configured to be attached to the outside of the appliance door (**150**) along the first lateral portion

- (402), and to the inside of the furniture cabinet door (150) along the second lateral portion (403).
2. The built-in appliance of claim 1, wherein the flexible central portion (401) of the coupling member (210) is made of silicon, rubber or felt. 5
 3. The built-in appliance of any one of the preceding claims, wherein the first and a second opposite lateral portions (402,403) of the coupling member (210) are more rigid than the flexible central portion (401). 10
 4. The built-in appliance of claim 3, wherein the flexible central portion (401) is formed by a flexible body (434) and the first and second opposite lateral portions (402,403) are totally formed by rigid members (435), attached or fixed to lateral sides of the flexible body (434). 15
 5. The built-in appliance of claim 4, wherein the rigid members (435) extend along the two opposite longer sides (405) of the flexible body (434). 20
 6. The built-in appliance of claim 3, wherein both the central portion (401) and the first and second lateral portions (402,403) of the coupling member (210) are formed by a flexible body (434), and wherein the first and second lateral portions (402,403) have rigid members (435) embedded in the flexible body (434), such embedded rigid members (435) defining reinforcing parts for locally reinforcing the coupling member (210). 25
 7. The built-in appliance of claim 6, wherein the rigid members (435) extend along two opposite longer sides (405) of the coupling member (210). 30
 8. The built-in appliance of claim 6 or 7, wherein the coupling member (210) is fabricated by moulding of material, preferably injection moulding, over-moulded on the rigid members (435). 35
 9. The built-in appliance of claim 3, wherein both the central portion (401) and the first and second lateral portions (402,403) are formed by a flexible body (434), and wherein the first and second lateral portions (402,403) further comprise U-shaped rigid members (435) enclosing the first and second lateral portions of the flexible body (434). 40
 10. The built-in appliance of claim 9, wherein edges of the first and second lateral portions (402,403) fit by interference into the U-shaped rigid members (435). 45
 11. The built-in appliance of claim 3, wherein the coupling member (210) is made of a single flexible body (434) and wherein the central portion (401) thereof is loaded with a substance adapted to provide more flexibility to the material of the flexible body, thereby the first and second lateral portions (402,403) are more rigid than the central portion (401) of the coupling member (210). 50
 12. The built-in appliance of any one of the preceding claims, wherein both the central portion (401) and the lateral portions (402,403) of the coupling member (210) have a height in the range from 10 cm to 60 cm, preferably 15 - 30 cm, a length in the range from 50 cm to 70 cm and a thickness in the range from 0.5 to 5 mm. 55
 13. The built-in appliance of any one of the preceding claims, wherein one of the first and second lateral portions (402,403) of the coupling member (210) is attached on or close to a lateral free edge of the refrigerator door (150), preferably around the edge between a front surface (215) of the refrigerator door (150) and a side (220) of the refrigerator door (150), and the opposite lateral portion (403) of the coupling member (210) is attached to an inner side of the furniture cabinet door (125) in a position where it does not overlap with the lateral portion (402) attached to the refrigerator door when the two doors are closed.
 14. The built-in appliance of any one of claims 1 to 12, wherein one of the first and second lateral portions (402,403) of the coupling member (210) is attached to an inner side of the furniture cabinet door (125) in a position close to a lateral free edge of the furniture cabinet door (125), where it partially or totally overlaps with the opposite lateral portion (402,403) of the coupling member (210) when the two doors are closed.

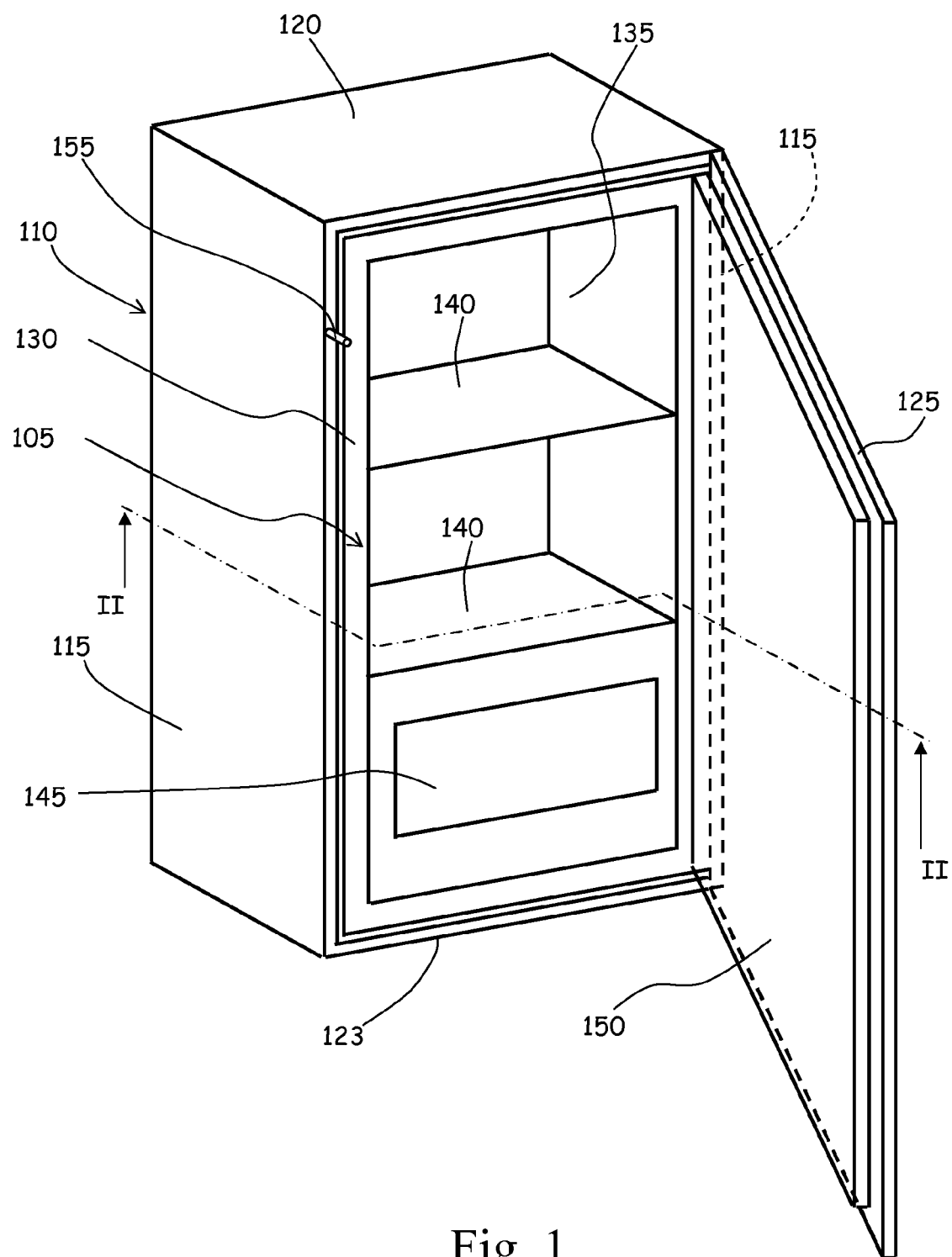


Fig. 1

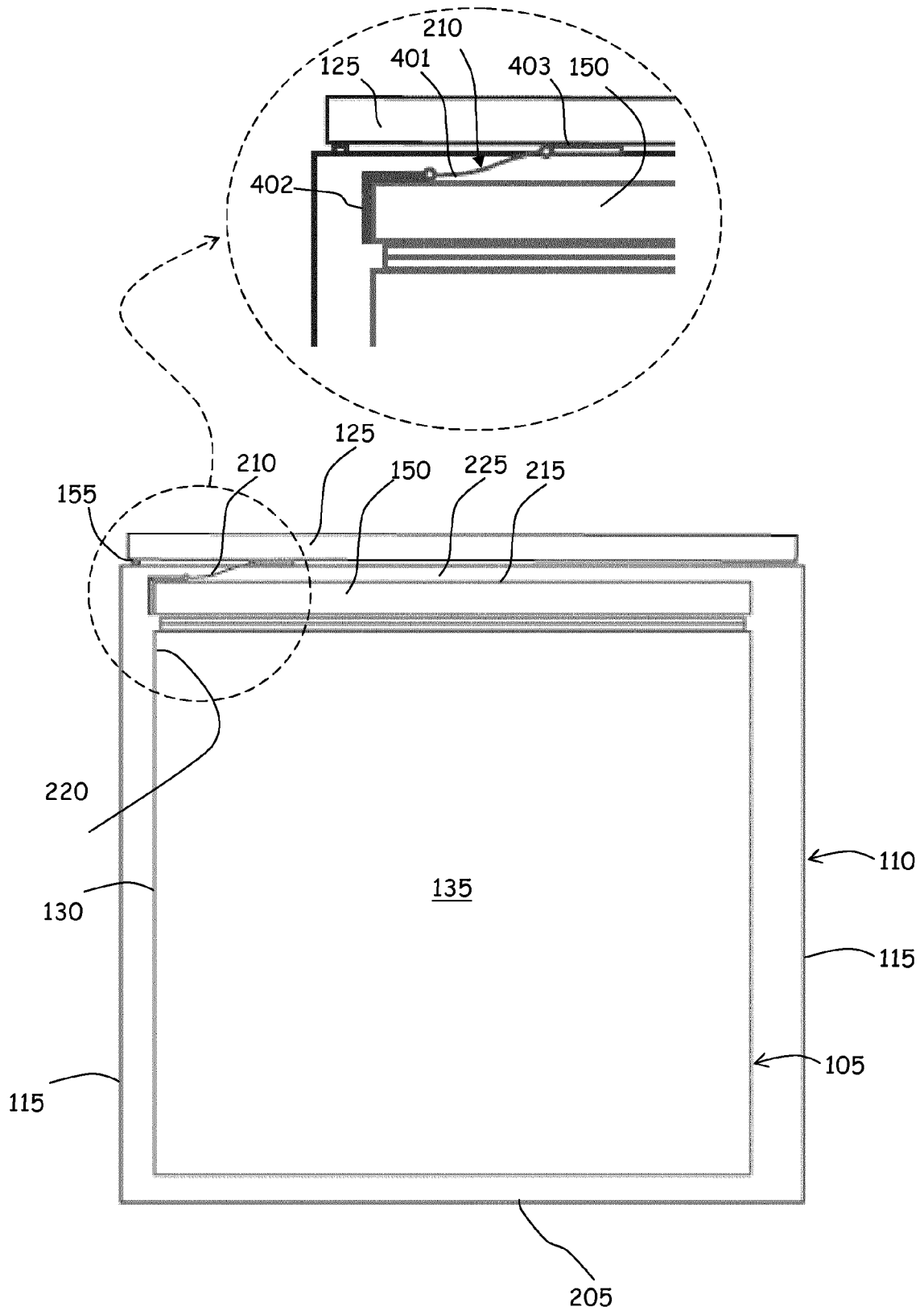


Fig. 2

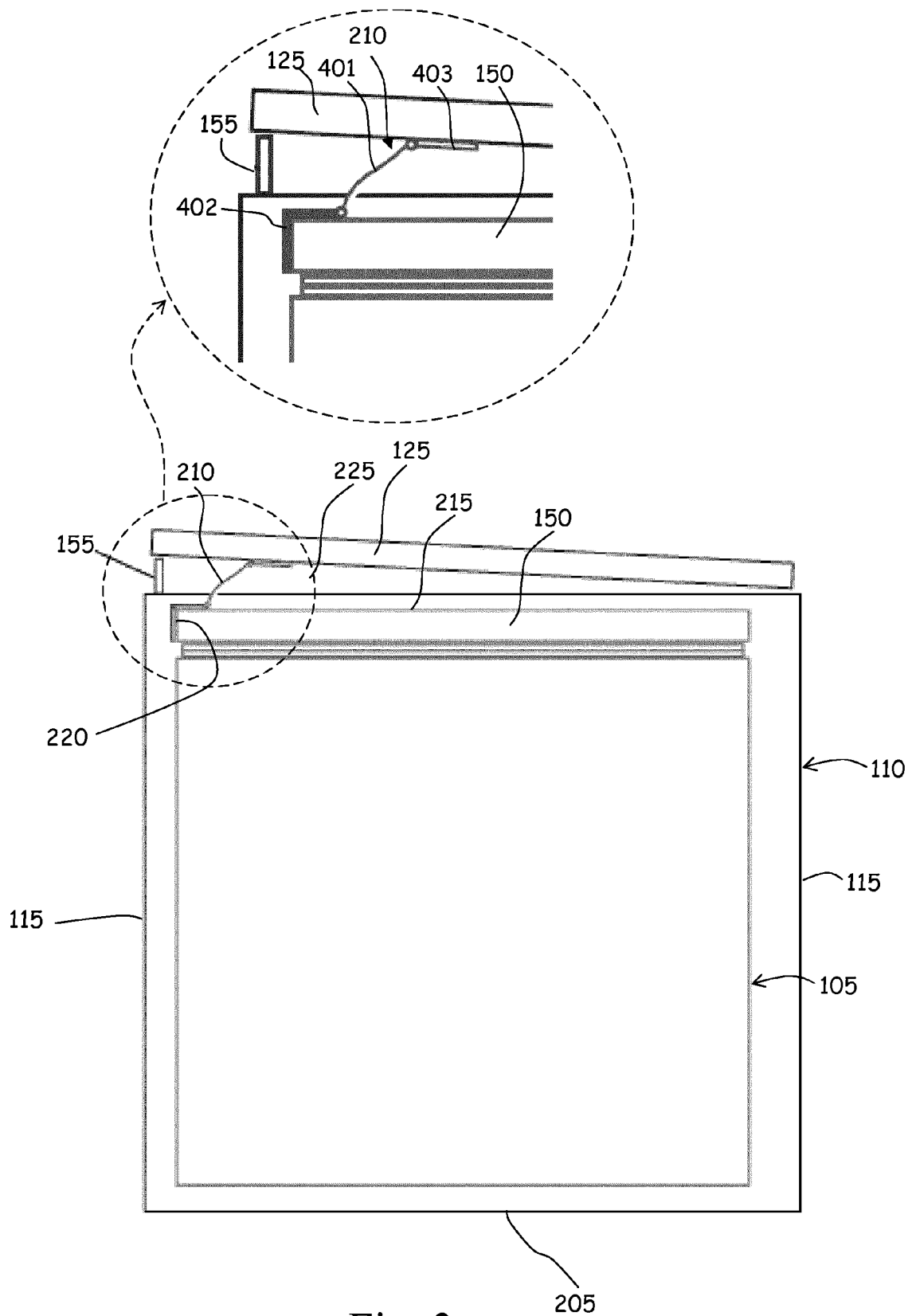


Fig. 3

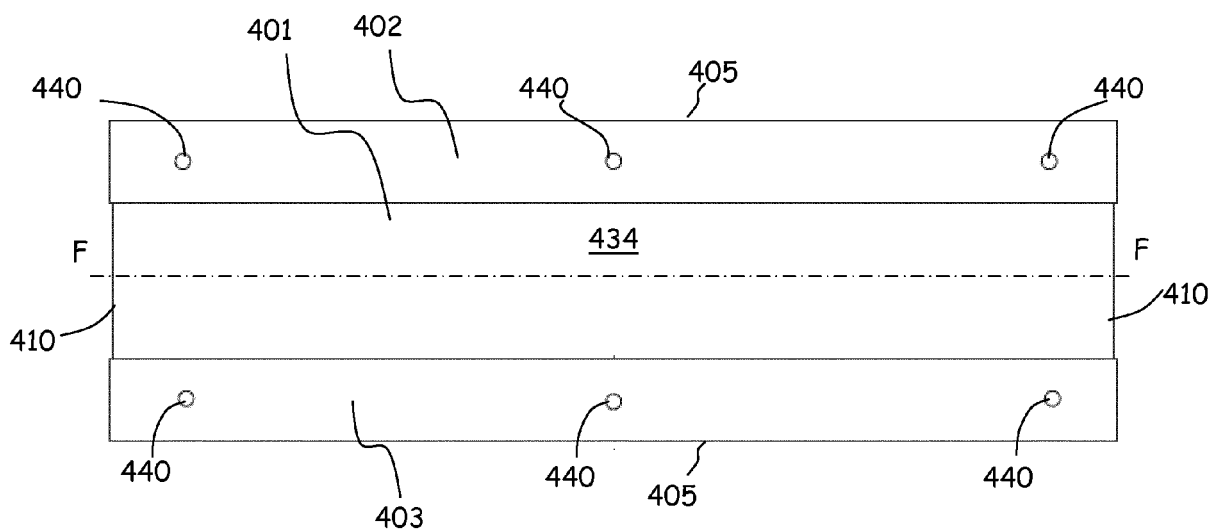


Fig. 4

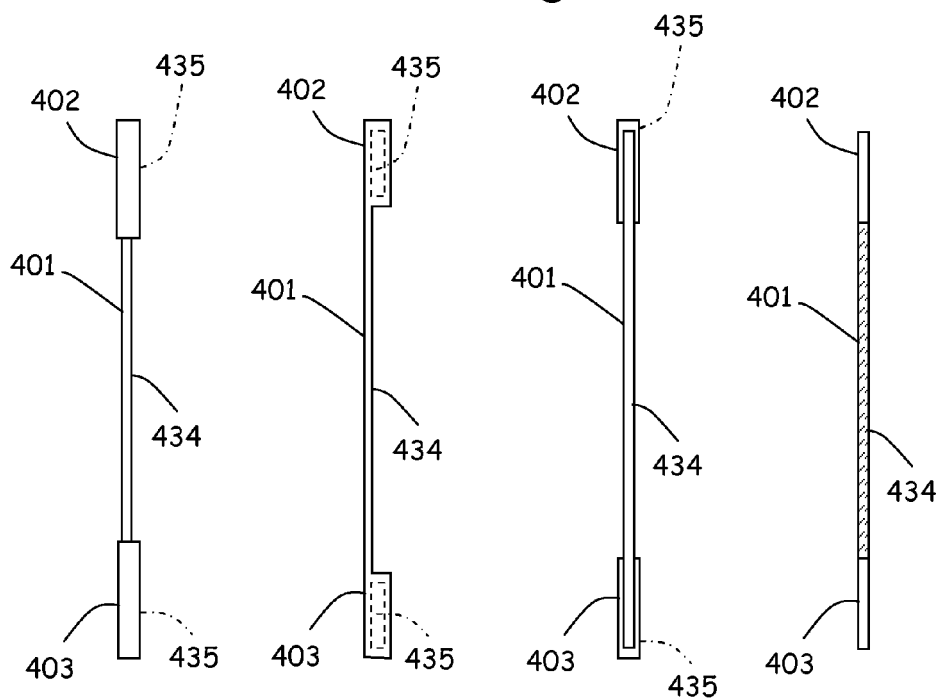


Fig. 5a

Fig. 5b

Fig. 5c

Fig. 5d

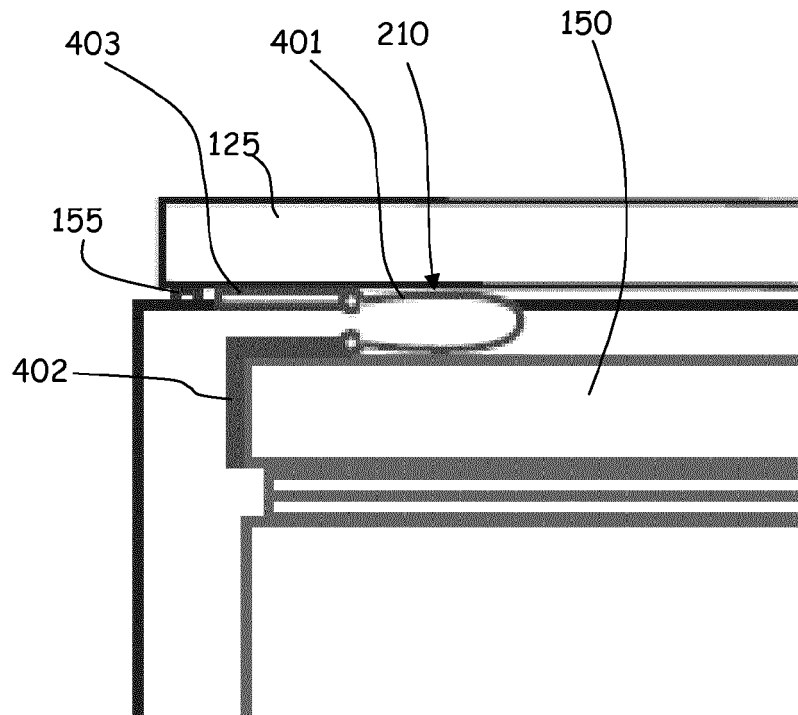


Fig. 6

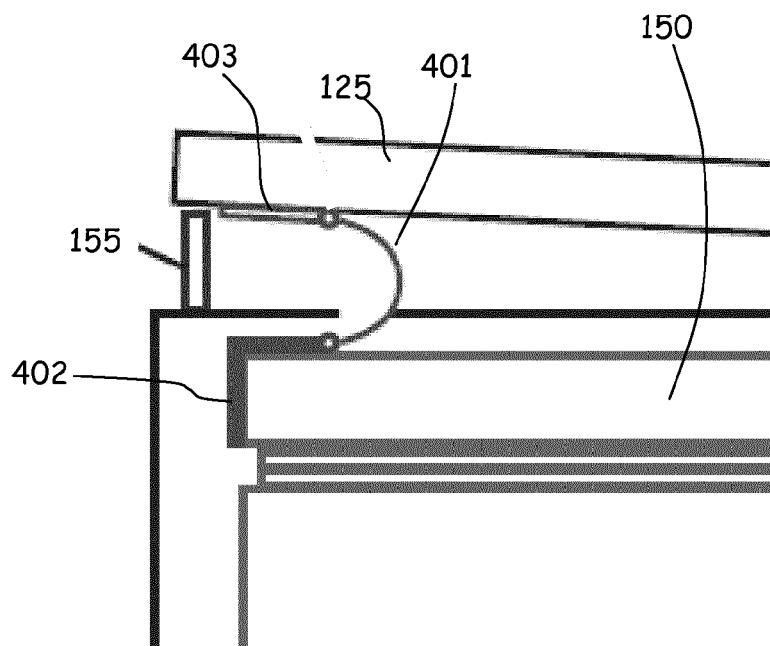


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 13 18 1350

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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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			TECHNICAL FIELDS SEARCHED (IPC)
			F25D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 January 2014	Examiner Dezso, Gabor
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EPO FORM 1503 03.82 (P04001)

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

EP 13 18 1350

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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