(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 594 878 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.05.2013 Bulletin 2013/21

(51) Int Cl.:
F25D 25/02 *(2006.01)*

(21) Application number: **12007425.7**

(22) Date of filing: **30.10.2012**

(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

(30) Priority: **18.11.2011 KR 20110120778**

(71) Applicant: **LG ELECTRONICS INC.**
Yeongdeungpo-gu
Seoul 150-721 (KR)

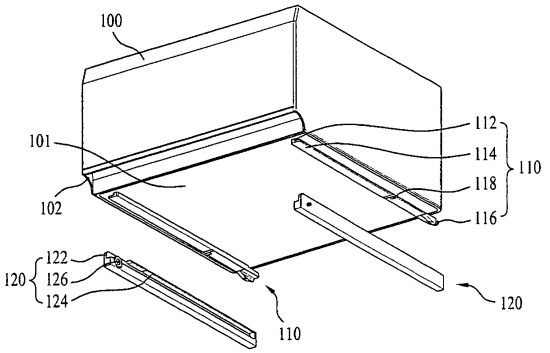
(72) Inventors:
- **Seo, Woonkyu**
  642-711 Changwon-si, Gyeongnam (KR)
- **Kim, Seonkyu**
  642-711 Changwon-si, Gyeongnam (KR)
- **Yoon, Seungjin**
  642-711 Changwon-si, Gyeongnam (KR)
- **Hwang, Jungyeon**
  642-711 Changwon-si, Gyeongnam (KR)
- **Lee, Daesung**
  642-711 Changwon-si, Gyeongnam (KR)

(74) Representative: **Urner, Peter**
Ter Meer Steinmeister & Partner
Mauerkircherstrasse 45
81679 München (DE)

(54) Refrigerator

(57) A refrigerator (10) is provided. The refrigerator (10) may include at least one first rail (120) installed on a bottom surface of a storage compartment, and at least one corresponding second rail (110) installed on a bottom of a drawer (100) and engaged with the at least one first rail (120) to slide the drawer (100) into and out of the storage compartment. The at least one first rail (120) may include a first roller (126) for slidably supporting the at least one second rail (110), and the at least one second rail (110) may include at least one second roller (116) for slidably supporting the at least one first rail (120).

FIG. 5



EP 2 594 878 A2

Description

[0001] This application claims priority based on the Korean Application No. 10-2011-0120778 filed on November 18, 2011, whose entire disclosure is hereby incorporated by reference.

BACKGROUND

1. Field

[0002] This relates to a refrigerator, and more particularly, to a refrigerator efficiently using the space of a refrigerating compartment and/or freezing compartment.

2. Background

[0003] Generally, a refrigerator stores items in a frozen or refrigerated state by lowering an internal temperature of a compartment thereof through discharge of cold air generated by a refrigeration cycle including a compressor, a condenser, an expansion valve, and an evaporator. Such a refrigerator may include a freezing compartment for storing items in a frozen state, and a refrigerating compartment for storing items at low temperature. A Kimchi refrigerator may store items such as Kimchi or vegetables in a fresh state. A refrigerator may include a plurality of doors, at least one of the plurality of doors being connected to a refrigerator body by hinges to open or close a front side of the refrigerator body. In addition to the hinged door, the refrigerator may include a drawer type door mounted to a front wall of a drawer slidably installed in the refrigerator. Items of various sizes and shapes may be stored in the freezing and refrigerating compartments, which may include a plurality of shelves or racks to vertically partition the storage compartment to receive such items.

[0004] The drawer described above may include mounting structures at opposite lateral sides thereof which may reduce storage space of the drawer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

[0006] FIG. 1 is a front view of an exemplary refrigerator according to an embodiment as broadly described herein;

[0007] FIG. 2 is a front view of the refrigerator shown in FIG. 1 with its doors open;

[0008] FIG. 3 is a perspective view of a drawer of the refrigerator, according to an embodiment as broadly described herein;

[0009] FIG. 4 is a side view of the drawer shown in FIG. 3;

[0010] FIG. 5 is an exploded perspective view of the drawer shown in FIG. 3;

[0011] FIG. 6 is a detail view of a coupled state of first and second rails of the drawer shown in FIGs. 3-5; and

[0012] FIGs. 7 and 8 illustrate moved states of the drawer shown in FIGs. 3-6.

DETAILED DESCRIPTION

[0013] Reference will now be made in detail to the various embodiments, examples of which are illustrated in the accompanying drawings.

[0014] In accordance with the refrigerator illustrated in the embodiment shown in FIGs. 1 and 2, the refrigerator, which is designated by reference numeral "10", is applicable not only to a top mount type refrigerator in which the inner space of the refrigerator is vertically partitioned to define a freezing compartment and a refrigerating compartment such that the freezing compartment is arranged above the refrigerating compartment, but also to a side-by-side type refrigerator in which the inner space of the refrigerator is laterally partitioned to define a freezing compartment and a refrigerating compartment such that the freezing compartment and refrigerating compartment are laterally arranged. Simply for ease of discussion and illustration, exemplary embodiments will be described in conjunction with a bottom freezer type refrigerator. That is, the inner space of the exemplary refrigerator 10 is vertically partitioned to define a freezing compartment 32 positioned below a refrigerating compartment 22.

[0015] Generally, the freezing compartment 32 may be maintained at a sub-zero temperature, and the refrigerating compartment 22 may be maintained at a temperature relatively higher than that of the freezing compartment 32.

[0016] The refrigerator 10 may include a body which defines an outer appearance of the refrigerator 10 while also protecting mechanical devices received therein. The body of the refrigerator 10 may include an outer case 12 which defines an outer appearance of the refrigerator 10, and an inner case 14 which defines storage compartments therein, namely, the freezing compartment 32 and the refrigerating compartment 22. A certain space may be defined between the outer case 12 and the inner case 14. A passage for circulation of cold air may be formed in the space.

[0017] A machinery chamber may be formed in the space between the outer case 12 and the inner case 14 to accommodate a refrigerant cycle device for generating cold air through circulation of a refrigerant. Using the refrigerant cycle device, the interior of the refrigerator 10 may be maintained at low temperature to maintain a desired freshness level of items stored in the refrigerator 10. The refrigerant cycle device may include, for example, a compressor for compressing a refrigerant, and an evaporator for changing the phase of the refrigerant from liquid to gas, to cause the refrigerant to exchange heat with the outside of the refrigerant cycle device.

[0018] The refrigerator 10 may include a freezing compartment door 30 for opening or closing the freezing com-

partment 32, and a refrigerating compartment door 20 for opening or closing the refrigerating compartment 22. Each of the freezing compartment door 30 and refrigerating compartment door 20 may be pivotally mounted to the body of the refrigerator 10 at one end thereof by hinges. Each of the freezing compartment door 30 and refrigerating compartment door 20 may include a plurality of doors. That is, as shown in FIG. 2, each of the freezing compartment door 30 and refrigerating compartment door 20 may be configured such that it opens forward while being pivotally moved about opposite lateral edges of the refrigerator 10.

[0019] A barrier 16 may be positioned between the freezing compartment 32 and the refrigerating compartment 22, to partition the freezing compartment 32 and refrigerating compartment 22. The barrier 16 may be formed at the inner case 14 such that it has a certain thickness. The barrier 16 may extend horizontally to vertically partition the freezing compartment 32 and refrigerating compartment 22 such that the freezing compartment 32 and refrigerating compartment 22 are disposed below and above the barrier 16, respectively.

[0020] A partition wall 18 may be positioned in the freezing compartment 32, for example, at a central portion thereof, to partition the freezing compartment 32 into two separate spaces. The partition wall 18 may be vertically installed at the inner case 14 such that the freezing compartment 32 is divided into two laterally arranged compartments. In this case, the freezing compartment door 30 may include two doors for opening or closing respective freezing compartments 32.

[0021] In the embodiment shown in FIGs. 1 and 2, there is no partition wall installed in the refrigerating compartment 22 to laterally partition the refrigerating compartment 22. However, a partition wall may be installed in the refrigerating compartment 22, as in the freezing compartment 32.

[0022] Racks, drawers, baskets, and the like may be disposed in each of the freezing compartment 32 and refrigerating compartment 22, to store various items.

[0023] A drawer 40 may be mounted in the freezing compartment and slidably extracted or retracted. Food and other such items may be stored in the drawer 40. A vertically-extending cover may be mounted to a front wall of the drawer 40 to preserve cold air in the freezing compartment 32 even when the freezing compartment door 30 is opened.

[0024] A plurality of drawers 40 may be provided in the freezing compartment 32. In this case, the drawers 40 may be arranged at opposite sides of the partition wall 18, and stacked vertically.

[0025] A light source 150 to emit light may be installed in the freezing compartment 32 and/or refrigerating compartment 22. The light source 150 may operate when the user opens the freezing compartment door 30 or refrigerating compartment door 20. The light source 150 may emit light toward the interior of the freezing compartment 32 and/or refrigerating compartment 22.

[0026] FIG. 3 is a perspective view of a coupled state of various elements of a drawer of a refrigerator, in accordance with an embodiment as broadly described herein, and FIG. 4 is a side view of the drawer shown in FIG. 3.

[0027] In the following description, the term "storage compartment" apply to both the freezing compartment 32 and the refrigerating compartment 22. That is, the drawer as embodied and broadly described herein may apply not only to the freezing compartment 32, but also to the refrigerating compartment 22.

[0028] The refrigerator as embodied and broadly described herein may include a drawer 100 slidably installed on a bottom surface 14a of the compartment in which it is received. In accordance with features of this embodiment, mounting of the drawer 100 is not achieved using lateral side mounting structures, but is achieved using a mounting structure installed on the bottom, or installation, surface 14a of the compartment. Accordingly, downward sagging of the drawer 100 may be avoided even when relatively heavy items are stored in the drawer 100.

[0029] The bottom, or installation surface 14a may be, for example, the barrier 16 which partitions the freezing compartment 32 and refrigerating compartment 22. The barrier 16 may be a horizontal partition wall which partitions the freezing compartment 32 and refrigerating compartment 22 such that the refrigerating compartment 22 is disposed above the freezing compartment 32. Alternatively, the barrier 16 may be a horizontal partition wall, which partitions the freezing compartment 32 and refrigerating compartment 22 such that the freezing compartment 32 is disposed above the refrigerating compartment 22. In this embodiment, space efficiency may be enhanced by installation of the mounting structure of the drawer 100 at the barrier 16, which otherwise forms a dead space.

[0030] In alterative embodiments, the bottom/installation surface 14a may instead be a lowermost wall of the freezing compartment 32 or refrigerating compartment 22. In other words, when the refrigerating compartment 22 is disposed above the freezing compartment 32, the barrier 16 disposed between the refrigerating compartment 22 and the freezing compartment 32 does not serve as the bottom/installation surface 14a. In this case, the bottom/installation surface 14a may be a wall defining the bottom of the freezing compartment 32.

[0031] That is, in accordance with this embodiment, there is no drawer mounting structure at side walls of the drawer 100 and corresponding side walls of the compartment. Instead, for components movably supporting the drawer 100 are received at the bottom/installation surface 14a to increase storage space.

[0032] FIG. 5 is an exploded perspective view of the drawer and its movement structure according to an embodiment as broadly described herein. Although the bottom/installation surface is not shown in FIG. 5, simply for ease of illustration, it may be well understood, referring

to FIGs. 3 and 4, that the bottom/installation surface is disposed below the first rails.

[0033] As shown in FIG. 5 a pair of first rails 120 may be installed on the bottom 14a, or installation surface 14a, and a pair of second rails 110 may be installed on the drawer 100. The first rails 120 and second rails 110 may be slidably coupled to each other to allow the drawer 100 to be slidably extracted from or retracted into the storage compartment.

[0034] Each first rail 120 may include a first vertical member 122 extending vertically from the bottom 14a, and a first horizontal member 124 extending horizontally from an end of the first vertical member 122. The first horizontal member 124 may extend horizontally from the first vertical member 122 such that the first horizontal member 124 faces the bottom 14a while defining a certain space between the bottom 14a and the first horizontal member 124.

[0035] Each first rail 120 may also include a first roller 126 for slidably supporting a corresponding second rail 110. The first roller 126 may be mounted on the first vertical member 122 and rotatable as it contacts the corresponding second rail 110.

[0036] The first roller 126 may be mounted at a horizontal end of the first vertical member 122. The first roller 126 may be mounted at a horizontal end of the first vertical member 122 that is near the front side of the storage compartment so that the drawer 100 may be continuously supported by the first roller 126 during extraction thereof from the storage compartment. This may eliminate the need to install a plurality of rollers, which function as the first roller 126, for stable support of the drawer 100.

[0037] Each second rail 110 may include a second vertical member 112 extending vertically from a bottom 101 of the drawer 100, and a second horizontal member 114 extending horizontally from an end of the second vertical member 112. The second horizontal member 114 may extend horizontally from the second vertical member 112 such that the second horizontal member 114 faces the bottom 101 of the drawer 100 while defining a certain space between the bottom 101 of the drawer 100 and the second horizontal member 114.

[0038] Each second rail 110 may also include a second roller 116 that is rotatable while contacting the corresponding first rail 120. The second roller 116 may be mounted at an end of the second horizontal member 112.

[0039] The second roller 116 be mounted at a portion of the second horizontal member 112 opposite the mounting position of the first roller 126, namely, at a horizontal end of the second horizontal member 112, which is disposed far from the front end of the storage compartment in a retracted state of the drawer 100. Thus, the drawer 100 may be supported at two points, namely, the first and second rollers 126 and 116, at front and rear ends of the drawer 100 and, as such, the drawer 100 may be more stably supported, without being inclined, when the support points provided by the first and second rollers 126 and 116 are spaced away from each other in this manner.

[0040] A stopper 118 may be provided at each second rail 110 to limit the movement range of the corresponding first roller 126. When the first roller 126 reaches the stopper 118, the drawer 100 may be stopped and restricted from being further forwardly extracted.

[0041] The stopper 118 may have the form of, for example, a protrusion vertically extending from the corresponding second horizontal member 114. The stopper 118 may have a gently curved structure extending toward a highest central portion thereof without forming a sharp step. In this case, the drawer 100 may be slowly stopped without being abruptly stopped when the first roller 126 comes into contact with the stopper 118.

[0042] The drawer 100 may also include a handle 102 mounted on a front wall of the drawer 100. The handle 102 may be formed with a groove to allow the user to grasp the handle 102, or other arrangement as appropriate.

[0043] The pairs of first and second rails 120 and 110 may be respectively symmetrically arranged at opposite sides of the bottom 101 of the drawer 100. This symmetrical arrangement may stably support the drawer 100 at opposite sides of the bottom 101 of the drawer 100.

[0044] FIG. 6 illustrates a coupled state of the first and second rails 120 and 110 a region where the first roller 126 is disposed. For ease of description, the following description will be provided for the rails arranged at one side of the drawer 100.

[0045] The first vertical member 122 and first horizontal member 124 may form a substantially right angle having, for example, an " " shape, and the second vertical member 112 and second horizontal member 114 may form a substantially right angle having, for example, an " " shape. This may allow for engagement between and overlap the first horizontal member 124 and second horizontal member 114 so that, the drawer 100 may be prevented from being upwardly raised.

[0046] The first roller 126 may contact a lower end of the second horizontal member 114, to reduce friction generated when the second horizontal member 114 slides. The first roller 126 may also sustain the weight of items stored in the drawer 100 while supporting the drawer 100.

[0047] The installation of the second roller 116 may be similar to that of the first roller 126, except that the second roller 116 is installed at the second horizontal member 114. Thus, the second roller 116 may be arranged between the first horizontal member 124 and the first vertical member 122. The second roller 116 may move along a space defined between the first horizontal member 124 and the first vertical member 122.

[0048] Since the second roller 116 is disposed beneath the first horizontal member 124, the drawer 100 may be slidably extracted from the storage compartment without being raised at a rear portion thereof. Also, the second vertical member 112 may be disposed beneath the first roller 126 and, as such, the rear portion of the drawer

110 may be supported by the second vertical member 112.

[0049] In certain embodiments, the first roller 126 may partially received in the bottom 14a, or installation surface 14a. In this regard, a part of the structure for moving the drawer 100 may also be received in the bottom 14a. Thus, the storage space of the drawer 100 may be increased and, as such, the utility of the storage space may be enhanced.

[0050] FIGs. 7 and 8 illustrate moved states of the drawer. In FIG. 7, the drawer 100 has been completely retracted into the storage compartment, and the first roller 126 and second roller 116 are spaced apart from each other by a maximum distance such that they support front and rear portions of the drawer 100, respectively. In this state, the user may pull the drawer forward to extract the drawer 100 from the storage compartment after grasping the handle 102.

[0051] During extraction of the drawer 100, the second horizontal member 114 may move forward while contacting the first roller 126 at the front end of the storage compartment. Since the first roller 126 rotates, friction generated between the first roller 126 and the second horizontal member 114 may be reduced during movement of the second horizontal member 114. At the rear end of the drawer 100, friction generated between the second roller 116 and the first horizontal member 124 may be reduced while rotating during extraction of the drawer 100.

[0052] That is, the first roller 126, which is installed at the front end of the storage compartment corresponding to the front end of the drawer 100 in a retracted state of the drawer 100, and the second roller 116, which is installed at the rear end of the drawer 100, may achieve a reduction in the friction generated at the front and rear ends of the drawer 100. Thus, the drawer 100 may be smoothly extracted. At the left and right sides of the drawer 100, movements of the first and second rollers 126 and 116 may be carried out in the same manner.

[0053] As shown in FIG. 8, as the drawer 100 is extracted from the storage compartment, the distance between the first roller 126 and the second roller 116 may be gradually reduced, because the first roller 126 is fixed to the bottom 14a, or installation surface 14a, whereas the second roller 116 moves along with the drawer 100.

[0054] When the first roller 126 comes into contact with the stopper 118 during forward movement of the second horizontal member 114, the drawer 100 may be stopped, as the second horizontal member 114 cannot pass beyond the first roller 126 due to the stopper 118. The stopper 118 may be arranged at a position allowing the user to extract the drawer 100 by a sufficient distance.

[0055] In accordance with embodiments as broadly described herein, the drawer, which is installed in the interior of the refrigerator, is not mounted at opposite lateral sides thereof, but is mounted at a bottom side thereof. Accordingly, it is possible to use the dead space typically occupied by installation of mounting structures at opposite sides of the drawer as storage space. In this regard, space efficiency may be enhanced.

[0056] Also, since the drawer is supported by a structure installed at the bottom of the drawer, it may be possible to stably support the drawer without downward sinking or sagging thereof even when heavy items are stored in the drawer.

[0057] A refrigerator is provided that is capable of more efficiently using the inner space thereof.

[0058] A refrigerator is provided that is capable of stably supporting a drawer even when heavy articles are stored in the drawer.

[0059] A refrigerator as embodied and broadly described herein, may include a first rail installed at a bottom of the storage compartment such that a portion of the first rail is received in the bottom of the storage compartment, and a drawer extractable from and retractable into the storage compartment, wherein the drawer includes a second rail provided at a bottom of the drawer such that the second rail is slidably coupled to the first rail, wherein the first rail includes a first roller for slidably supporting the second rail, and wherein the first roller is partially received in the bottom of the storage compartment.

[0060] The first rail may also include a first vertical member extending vertically from the bottom of the storage compartment, and a first horizontal member extending horizontally from a vertical end of the first vertical member.

[0061] The first roller may be provided at a horizontal end of the first vertical member.

[0062] The second rail may include a stopper for limiting a movement range of the second rail.

[0063] The second rail may include a second vertical member extending vertically from the bottom of the drawer, and a second horizontal member extending horizontally from a vertical end of the second vertical member.

[0064] The second rail may also include a second roller rotatable while contacting the first rail.

[0065] The second roller may be provided at a horizontal end of the second horizontal member.

[0066] The drawer may also include a handle.

[0067] The bottom of the storage compartment may be a barrier for partitioning an interior of the refrigerator into a freezing compartment and a refrigerating compartment.

[0068] Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

[0069] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Claims

1. A refrigerator, comprising:

a cabinet having a storage compartment formed therein; and
a drawer slidably received in the storage compartment;
characterized in that
the refrigerator further comprises:

at least one recess formed in a bottom surface of the storage compartment;
at least one first rail at least partially received in the at least one recess;
at least one second rail provided on a bottom of the drawer such that the at least one second rail is slidably coupled to the at least one first rail; and
a first roller provided in the at least one first rail and slidably supporting the at least one second rail, wherein the first roller is at least partially received in the at least one recess formed in the bottom surface of the storage compartment.

2. The refrigerator of claim 1, wherein the at least one first rail comprises a first vertical leg extending vertically upward from the at least one recess, and a first horizontal leg extending horizontally from a top end of the first vertical leg.

3. The refrigerator of claim 2, wherein the first roller is provided at a bottom end of the first vertical leg.

4. The refrigerator of claim 1, wherein the at least one second rail comprises a stopper for limiting a movement range of the at least one second rail.

5. The refrigerator of claim 1, wherein the at least one second rail comprises a second vertical leg extending vertically downward from the bottom of the drawer, and a second horizontal leg extending horizontally from a bottom end of the second vertical leg.

6. The refrigerator of claim 5, wherein the at least one second rail further comprises a second roller that maintains rolling contact with the at least one first rail.

7. The refrigerator of claim 6, wherein the second roller is provided at a distal end of the second horizontal leg.

8. The refrigerator of claim 1, wherein the drawer further comprises a handle.

9. The refrigerator of claim 1, wherein the bottom surface of the storage compartment is formed by a barrier that extends horizontally across the storage compartment to partition the storage compartment into a freezing compartment and a refrigerating compartment.

10. The refrigerator of claim 9, wherein the freezing compartment is disposed below the refrigerating compartment.

11. The refrigerator of claim 9, wherein the freezing compartment is disposed above the refrigerating compartment.

12. The refrigerator of claim 1, wherein the bottom surface of the storage compartment is a lowermost wall of a freezing compartment or a lowermost wall of a refrigerating compartment formed within the storage compartment.

13. The refrigerator of claim 1, wherein the at least one second rail comprises a pair of second rails arranged along opposite end portions of an outer bottom surface of the drawer, and wherein the at least one recess comprises a pair of recesses and the at least one first rail comprises a pair of first rails respectively arranged in the pair of recesses, at positions respectively corresponding to the pair of second rails.

FIG. 1

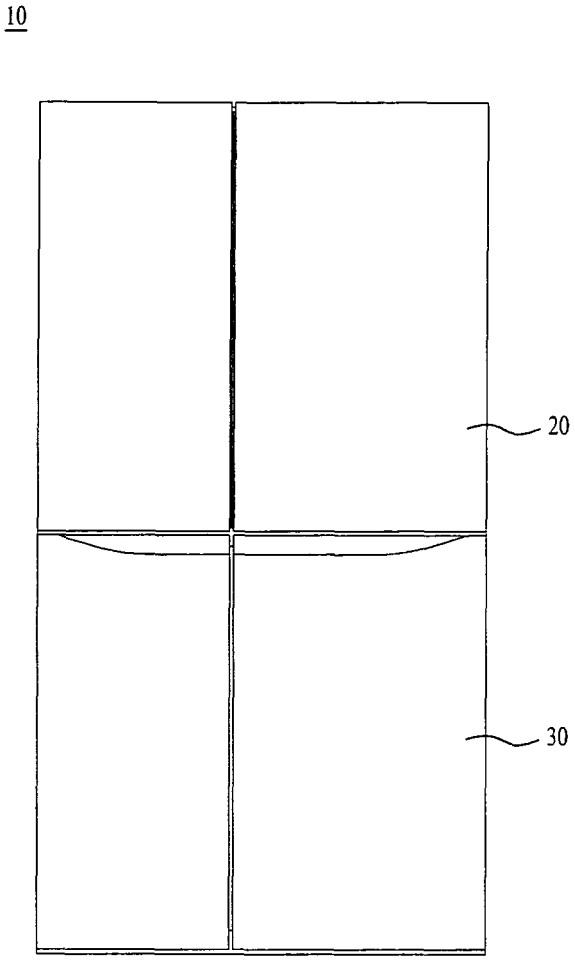


FIG. 2

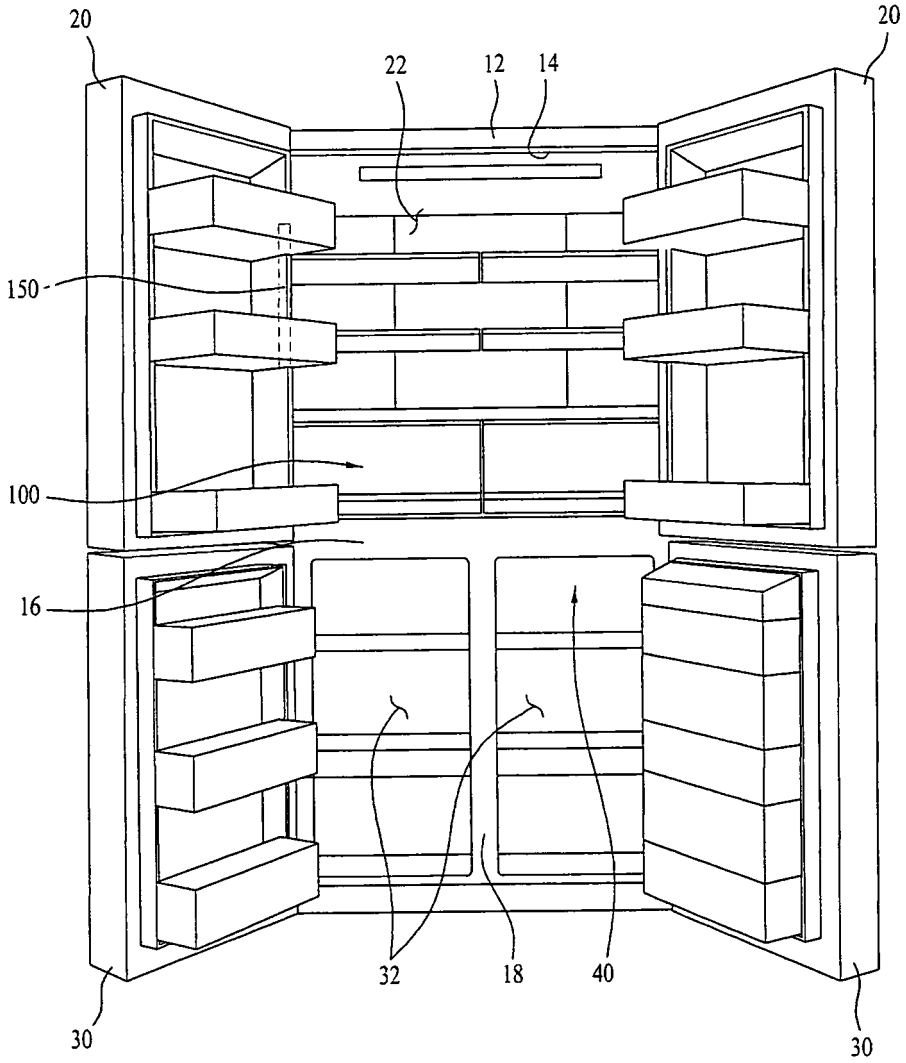


FIG. 3

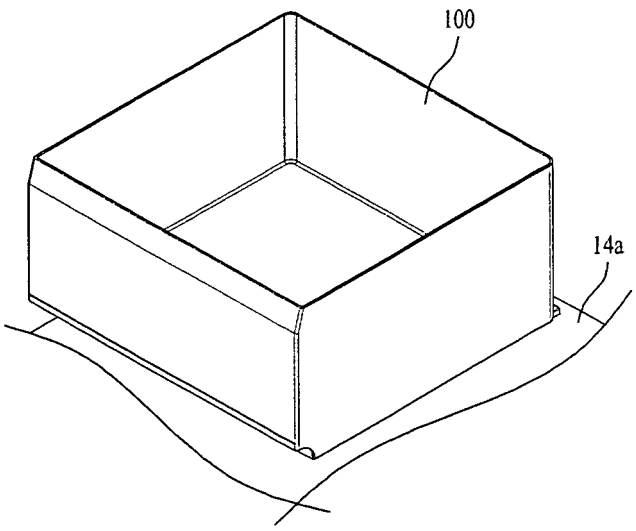


FIG. 4

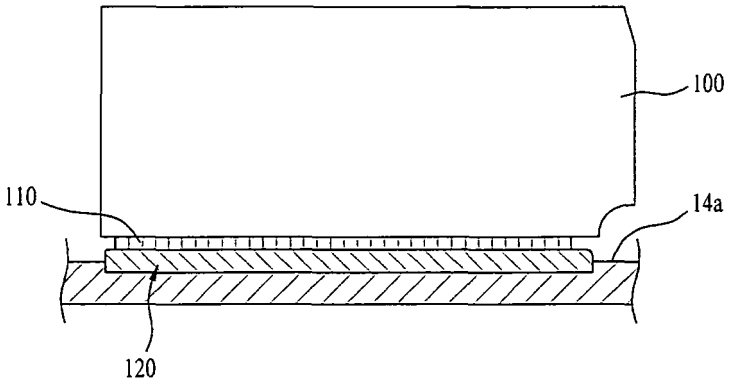


FIG. 5

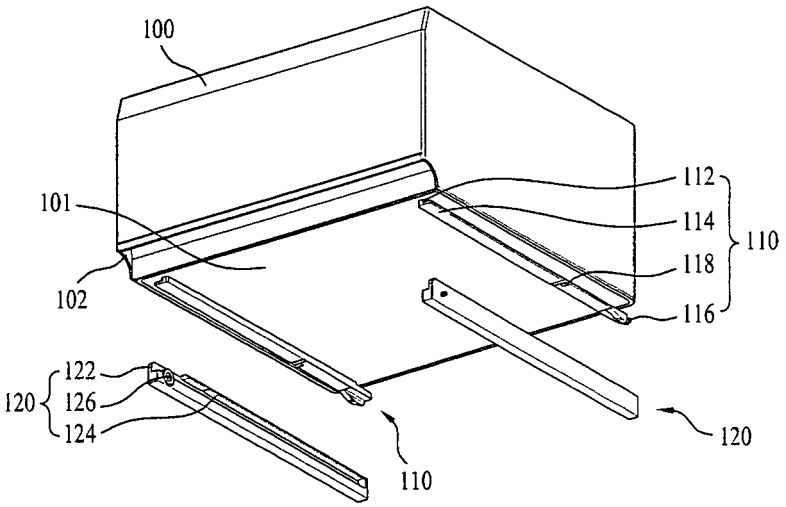


FIG. 6

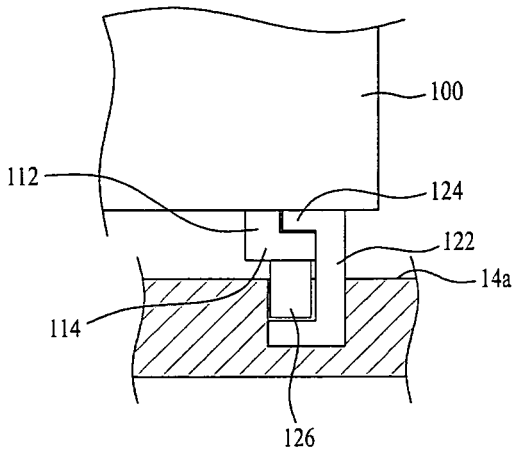


FIG. 7

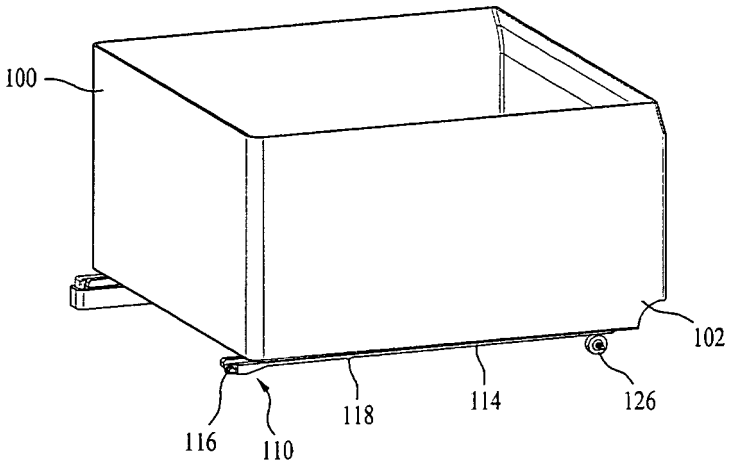
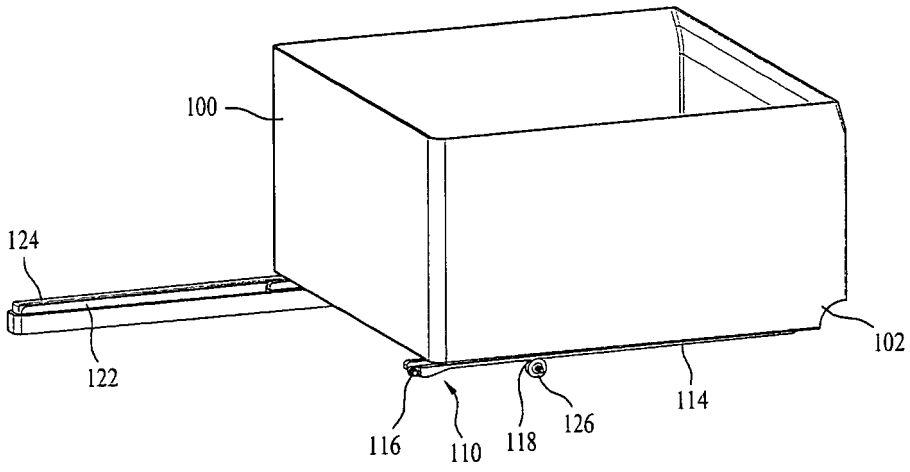


FIG. 8



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 1020110120778 **[0001]**