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

(11) **EP 3 104 106 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.12.2016 Bulletin 2016/50

(51) Int Cl.:
F25D 23/04 *(2006.01)*

(21) Application number: **16170849.0**

(22) Date of filing: **23.05.2016**

(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
Designated Validation States:
MA MD

(30) Priority: **08.06.2015 CN 201510310469**

(71) Applicant: **BSH Hausgeräte GmbH**
81739 München (DE)

(72) Inventors:
- **Cai, Junsheng**
  210000 Nanjing (CN)
- **Huang, Lulu**
  239016 Chuzhou (CN)
- **Wang, Tieniu**
  239016 Chuzhou (CN)
- **Zhou, Zhanhong**
  210046 Nanjing (CN)

(54) **REFRIGERATION DEVICE**

(57) The present invention proposes a refrigeration device, including: a door, having a pair of rails; a door bin, moving along the rails in a vertical direction; and a retaining mechanism, for stopping, in at least one direction, the door shelf at a join-up position on the rail, characterized by further including a synchronization mechanism for making the door shelf move along the rails synchronously in the vertical direction. The synchronization mechanism is disposed, so that during a process in which the door shelf moves in the vertical direction on the rails, left and right sides of the door shelf can move by a same height stably and synchronously in the vertical direction, and a situation in which the door shelf inclines because one side of the left and right sides of the door shelf is high while the other side is low does not occur; moreover, a user easily and conveniently adjusts the door shelf as well, and can move the door shelf stably and synchronously in the vertical direction by means of one-hand adjustment.

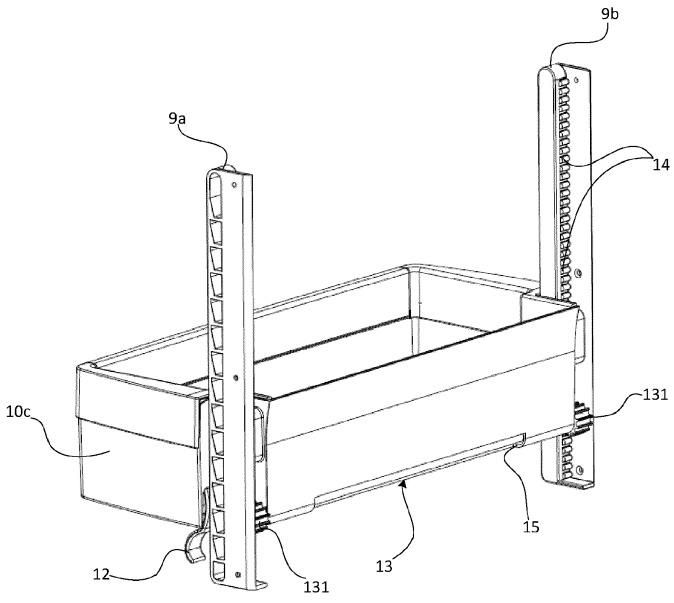


FIG. 3

EP 3 104 106 A1

Description

[0001] The present invention relates to the technical field of refrigeration devices, and in particular, to a refrigerator with a door shelf of which the height is adjustable.

[0002] Food refrigeration and freshness preservation functions of household refrigerators bring great convenience to life of people. However, storage space of the refrigerator is limited, and for how to flexibly and fully use of the limited storage space thereof, many resolutions are provided in the prior art. For example, to flexibly change a height of space above or below a door shelf, the door shelf is disposed in a manner that the door shelf is movable on rails of a door in a vertical direction, and for a specific solution, reference may be made to the Chinese patent CN101978233B. Then, in a process in which such an existing adjustable door shelf moves in a vertical direction, the moving heights of the left and right sides of the door shelf are easily inconsistent, which results in out-of-synchronization, and the entire door shelf easily inclines. A user has to readjust the heights of the left and right sides of the door shelf or be very careful in a process of adjusting the door shelf to avoid the foregoing situation in which the door shelf is unstable, which brings great inconvenience to the user. Therefore, it is necessary to further improve the prior art to resolve the foregoing problem.

[0003] A problem to be resolved in the present invention is to make a user adjust a height of a door shelf more easily and stably.

[0004] To resolve the foregoing problem, the present invention proposes a refrigeration device, including: a door, having a pair of rails; a door shelf, moving along the rails in a vertical direction; and a retaining mechanism, for stopping, in at least one direction, the door shelf at a join-up position on the rail, characterized by further including a synchronization mechanism for making the door shelf move along the rails synchronously in the vertical direction.

[0005] The synchronization mechanism refers to a mechanism that may make the left and right sides of the door shelf synchronously move in a vertical direction, which may be specifically a gear-drive structured manner or a belt-drive structured manner, or even other structure manners that can be figured out by other persons skilled in the art.

[0006] The synchronization mechanism is disposed, so that during a process in which the door shelf moves on the rails in the vertical direction, the left and right sides of the door shelf can move by a same height stably and synchronously in the vertical direction, and a situation in which the door shelf inclines because one side of the left and right sides of the door shelf is high while the other side is low does not occur. Moreover, a user easily and conveniently adjusts the door shelf as well, and can move the door shelf stably and synchronously in the vertical direction by means of one-hand adjustment.

[0007] Preferably, the synchronization mechanism includes a gear shaft disposed on the door shelf and a rack disposed on the rail, and a gear of the gear shaft is in meshing cooperation with the rack.

[0008] A pair of racks are provided on the pair of rails on the door, and the left and right gears of the gear shaft are respectively in meshing cooperation with the pair of racks. During the process in which the door shelf moves in the vertical direction, by means of synchronization meshing movement of the left and right gears on the pair of racks, the left and right sides of the gear shaft are ensured to move synchronously in the vertical direction as the left and right gears synchronously moves on the racks, so that the door shelf can remain stable during the movement of the door shelf in the vertical direction.

[0009] Moreover, the gears are in meshing cooperation with the racks, so that the user adjusts, more conveniently, a height by which the door shelf moves in the vertical direction, and does not need an excessively strong adjustment force.

[0010] Preferably, when the door shelf is stopped at the join-up position by the retaining mechanism, the door shelf is supported on the rails by using the gear shaft and the retaining mechanism.

[0011] In this way, the retaining mechanism needs to be disposed on only one single side of the left and right sides of the door shelf to implement that the door shelf is stopped at a join-up position on the rail. The gear shaft and the retaining mechanism simultaneously support the door shelf, especially that the gear shaft overcomes downward rotation torque to remain motionless, thereby supporting the entire door shelf.

[0012] Preferably, the gear shaft is made of metal.

[0013] The gear shaft made of metal has greater strength, and can overcome greater downward rotation torque, thereby supporting a heavier door shelf, that is, heavier articles can be placed on the door shelf.

[0014] Preferably, a hollow through hole is provided at a bottom end of a rear portion of the door shelf, and the gear shaft is disposed on the door shelf through the through hole.

[0015] Preferably, the join-up position is disposed in the front of the rail, and the rack is disposed at the back of the rail.

[0016] Preferably, the retaining mechanism is disposed on at least one of the left and right sides at the rear portion of the door shelf, and the join-up position in cooperation with the retaining mechanism is disposed on at least one of the pair of rails.

[0017] The retaining mechanism may be disposed on each of the left and right sides of the door shelf, or may be disposed on only one single side of the left and right sides of the door shelf. Correspondingly, the join-up position in cooperation with the retaining mechanism may also be disposed on each of the pair of rails, or is disposed on only one single rail corresponding to the retaining mechanism.

[0018] Preferably, the refrigeration device further includes an unblocking mechanism, for releasing the door

shelf from a current join-up position.

[0019] Preferably, the retaining mechanism is designed in a manner that the door shelf can be adjusted upwards when the unblocking mechanism is not actuated.

[0020] Preferably, the retaining mechanism is designed in a manner that the retaining mechanism can pivotally move between a locking position and an unblocking position when the unblocking mechanism is actuated.

[0021] Preferably, the retaining mechanism and the unblocking mechanism are integrally formed and are elastic.

[0022] In this way, when the unblocking mechanism is actuated, the retaining mechanism can link with the unblocking mechanism together, to implement movement between the locking position and the unblocking position. The retaining mechanism and the unblocking mechanism are elastic, so that the retaining mechanism and the unblocking mechanism can restore the initial position and states of the retaining mechanism and the unblocking mechanism when an external force is revocated, for example, the retaining mechanism can automatically reach a join-up position on the rail, to automatically implement a locking function and retain the door shelf.

FIG. 1 is a schematic structural view of a household refrigeration device according to the present invention;

FIG. 2 is an enlarged view of a door shelf on an inner side surface of a door and at a locking position;

FIG. 3 is a schematic view of an entire structure from a perspective of the back of the door shelf when the door shelf is fixed between rails;

FIG. 4 is a longitudinal cross-section view from a perspective of a side of FIG. 3;

FIG. 5 is an enlarged schematic view of FIG. 4 about that a retaining mechanism is locked into a join-up position and a gear meshes with a rack; and

FIG. 6 is a schematic view of an entire structure after a gear shaft is detached from the door shelf.

[0023] The following clearly and completely describes the technical solutions in the embodiments of the present invention with reference to a household refrigeration device shown in the accompanying drawings of the present invention. Apparently, the described embodiments are merely some but not all of the embodiments of the present invention. All other embodiments obtained by persons of ordinary skill in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

[0024] As shown in FIG. 1, a household refrigeration device 1 includes a cabinet-type case body 2, and a wall 3 of the case body defines an interior 4 of the refrigeration device 1. A front opening 5 of the case body 2 may be enclosed by a door 6. The door 6 is pivotally installed to the case body 2 around a vertical axis by using a hinged apparatus 7. The door 6 includes a door lining 8, and the door lining 8 faces the interior 4 when the door is at a closed position. Two rails 9a and 9b are disposed on parts opposite to a traversal edge and on the door lining 8 of the door 6. The rails 9a and 9b may be used to fasten door shelves 10a, 10b and 10c. For example, the door shelf 10c includes a rectangular groove-shaped box part and a cover side portion whose top is open. A product (for example, especially a bottled or packaged drink) may be put in by using the open cover side portion. Each of the door shelves 10a, 10b and 10c can be detachably installed on the rails 9a and 9b.

[0025] FIG. 2 is an enlarged view of the door shelf 10c on an inner side surface of the door 6 and at a locking position. The door shelf 10c is installed between the two rails 9a and 9b gradually or step by step in a manner that the door shelf 10c is vertically adjustable. The door shelf 10c is locked into a step-shaped join-up position 11 by using a retaining mechanism (not shown in the figure), so as to be locked and fixed between the rails 9a and 9b. If an unblocking mechanism 12 is poked in a direction away from the inner side surface of the door 6, the retaining mechanism may leave the join-up position 11 and unlocking is implemented. In this case, a user may randomly adjust the door shelf 10c to move in a vertical direction and stop at different join-up positions 11 of the rail.

[0026] FIG. 3 is a schematic view of a structure from a perspective of the back of the door shelf 10c when the door shelf 10c is fixed between the rails 9a and 9b. In a process in which the door shelf 10c moves along the rails 9a and 9b in the vertical direction, the left and right sides of the door shelf 10c may synchronously move in the vertical direction along the rails 9a and 9b by using a synchronization mechanism formed by means of meshing cooperation of a gear shaft 13 and a rack 14. The gear shaft 13 is disposed at a bottom end of a rear portion of the door shelf 10c, and is rotatably and movably disposed on the door shelf 10c through a through hole 15 that is at the bottom end of the rear portion of the door shelf 10c. For details, refer to FIG. 6. By using gears 131 at the head and tail ends of the gear shaft 13, the gear shaft 13 is separately in meshing cooperation with the racks 14 respectively disposed at the rear portions of the rails 9a and 9b. During the process in which the door shelf 10c moves along the rails 9a and 9b in the vertical direction, by means of synchronization meshing movement of the head and tail gears 131 of the gear shaft 13 separately on the left and right racks 14, the left and right sides of the gear shaft 10c are ensured to move synchronously in the vertical direction as the left and right gears 131 synchronously moves on the racks 14, so that the door shelf 10c can remain stable during the movement of the door shelf 10c in the vertical direction, and a situ-

ation in which the door shelf 10c inclines because one side of the left and right sides of the door shelf 10c is high while the other side is low does not occur. Moreover, the user easily and conveniently adjusts the door shelf 10c as well, and can move the door shelf 10c stably and synchronously in the vertical direction by means of one-hand adjustment. In addition, the gears 131 are in meshing cooperation with the racks 14, so that the user adjusts, more conveniently, a height by which door shelf 10c moves in the vertical direction, and does not need an excessively strong adjustment force.

[0027] FIG. 4 is a longitudinal cross-section view from a perspective of a side of FIG. 3. FIG. 5 is an enlarged schematic view of FIG. 4 about that the retaining mechanism 16 is locked into the join-up position 11 and the gear 131 meshes with the rack 14. As shown in the figure, when the door shelf 10c is stopped at the join-up position 11 by the retaining mechanism 16, a wedge portion of the retaining mechanism 16 is locked into a wedge groove of the join-up position 11 and locking is implemented. At the same time, the gear shaft 13 stops moving, and the gear 131 of the gear shaft 13 rests on and meshes with the rack 14. Because the retaining mechanism 16 is disposed on only one side of the rear portion of the door shelf 10c, the entire door shelf 10c in a stopped state is supported on the rails 9a and 9b by using the gear shaft 13and the retaining mechanism 16. With reference to FIG. 3, the gear shaft 13 and the retaining mechanism 16 simultaneously support the door shelf 10c, especially that the gear shaft 13 overcomes downward rotation torque to remain motionless, thereby supporting the entire door shelf 10c. The gear shaft is preferably made of metal, so that the gear shaft has greater strength, and can overcome greater downward rotation torque, thereby supporting a heavier door shelf 10c, that is, heavier articles can be placed on the door shelf 10c.

[0028] When the door shelf 10c needs to be adjusted upwards, the user may directly push up the door shelf 10c.

[0029] In the vertical and up direction, traversal widths of the wedge portion of the retaining structure 16 and the wedge groove of the join-up position 11 become increasingly smaller. In a process in which the door shelf 10c is forced to move upwards, the wedge portion of the retaining structure 16 and the wedge groove of the join-up position 11 press each other, the wedge portion of the retaining mechanism 16 is gradually pressed out of the wedge groove of the join-up position 11, and at the same time, elastic deformation occurs to the retaining mechanism 16. When the door shelf 10c is raised and fixed at a next join-up position 11, the retaining mechanism 16 automatically restores its initial state because of elasticity, so that the wedge portion of the retaining structure 16 is automatically locked into a wedge groove of the join-up position 11 and locking is implemented; therefore, the door shelf 10c is adjusted upwards and is stopped at the join-up position 11.

[0030] When the door shelf 10c needs to be adjusted downwards, first, the unblocking portion 12 is poked to pivotally move towards a direction away from the rail, the unblocking portion 12 drives the retaining mechanism 16 to pivotally move towards a direction detaching from the join-up position 11, and finally, the retaining mechanism 16 completely detaches from the join-up position 11 and unblocking is implemented. In this case, elastic deformation occurs to the unblocking portion 12 and the retaining mechanism 16 because of external forces. After the door shelf 10c is adjusted downwards to reach a join-up position 11, the unblocking portion 12 may be released, and the unblocking portion 12 restores its initial state because of elasticity of the unblocking portion 12, and pivotally moves towards a direction approaching the rail. The retaining mechanism 16 also pivotally moves towards the direction approaching the rail because of elasticity of the retaining mechanism 16 and linkage driving of the unblocking portion 12, and is finally automatically locked into the join-up position 11 and unlocking is implemented, so that the door shelf 10c is adjusted downwards and is stopped at the join-up position 11. The unblocking portion 12 and the retaining mechanism 16 may be integrally formed, so that linkage movement between the unblocking portion 12 and the retaining mechanism 16 is more reliable and effective.

[0031] In a process in which the door shelf 10c is adjusted downwards, the left and right sides of the door shelf 10c always synchronously move in the vertical direction by means of meshing cooperation of the gear shaft 13 and the rack 14, and a situation in which the door shelf 10c inclines to one side does not occur, so that articles that are placed on the door shelf 10c do not tilt or detach from the door shelf 10c because the door shelf 10c inclines, and damage to the articles is avoided.

[0032] Based on the description of the disclosed embodiments, persons skilled in the art can implement or apply the present invention. Multiples modifications made to these embodiments are obvious to the persons skilled in the art, and general principles defined in this specification may be implemented, without departing from the spirit and scope of the present utility model, in other embodiments. Therefore, the present invention is not limited to the embodiments in the specification, but intends to cover the most extensive scope consistent with the principle and the novel features disclosed in the specification. Reference numerals: 1. household refrigeration device; 2. cabinet-type case body; 3. wall; 4. interior; 5. front opening; 6. door; 7. hinged apparatus; 8. door lining; 9a\9b. rail; 10a\10b\10c. door bin; 11. join-up position; 12. unblocking mechanism; 13. gear shaft; 131. gear; 14. rack; 15. through hole; 16. retaining mechanism

Claims

1. A refrigeration device, comprising:

a door (6), having a pair of rails (9a, 9b);

a door shelf (10c), moving along the rails (9a, 9b) in a vertical direction; and
a retaining mechanism (16), for stopping, in at least one direction, the door shelf (10c) at a join-up position (11) on the rail (9a, 9b), **characterized by** further comprising a synchronization mechanism for making the door shelf (10c) move along the rails (9a, 9b) synchronously in the vertical direction.

2. The refrigeration device according to claim 1, **characterized in that** the synchronization mechanism comprises a gear shaft (13) disposed on the door shelf (10c) and a rack (14) disposed on the rail (9a, 9b), and a gear (131) of the gear shaft (13) is in meshing cooperation with the rack (14).

3. The refrigeration device according to claim 2, **characterized in that** when the door shelf (10c) is stopped at the join-up position (11) by the retaining mechanism (16), the door shelf (10c) is supported on the rails (9a, 9b) by the gear shaft (13) and the retaining mechanism (16).

4. The refrigeration device according to claim 3, **characterized in that** the gear shaft (13) is made of metal.

5. The refrigeration device according to claim 2 or 3, **characterized in that** a hollow through hole (15) is provided at a bottom end of a rear portion of the door shelf (10c), and the gear shaft (13) is disposed on the door shelf (10c) through the through hole (15).

6. The refrigeration device according to claim 2 or 3, **characterized in that** the join-up position (11) is disposed in the front of the rail (9a, 9b), and the rack (14) is disposed at the back of the rail (9a, 9b).

7. The refrigeration device according to claim 1 or 2, **characterized in that** the retaining mechanism (16) is disposed on at least one of the left and right sides of the rear portion of the door shelf (10c), and the join-up position (11) in cooperation with the retaining mechanism (16) is disposed on at least one of the pair of rails (9a, 9b).

8. The refrigeration device according to claim 1, **characterized by** further comprising an unblocking mechanism (12), for releasing the door shelf from a current join-up position.

9. The refrigeration device according to claim 8, **characterized in that** the retaining mechanism (16) is designed in a manner that the door shelf (10c) can be adjusted upwards when the unblocking mechanism (12) is not actuated.

10. The refrigeration device according to claim 8 or 9, **characterized in that** the retaining mechanism (16) is designed in a manner that the retaining mechanism (16) can pivotally move between a locking position and an unblocking position when the unblocking mechanism (12) is actuated.

11. The refrigeration device according to claim 8 or 9, **characterized in that** the retaining mechanism (16) and the unblocking mechanism (12) are integrally formed and are elastic.

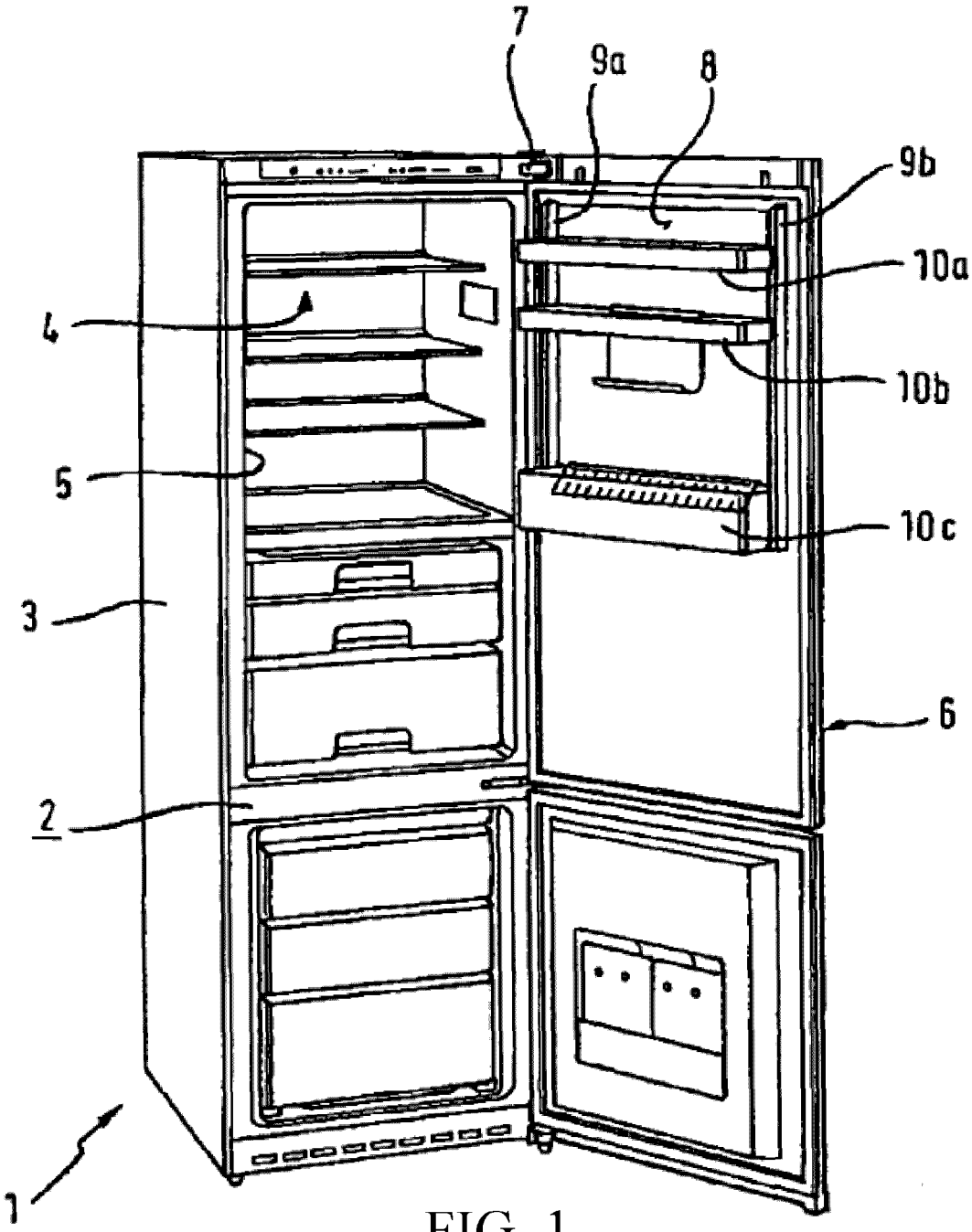


FIG. 1

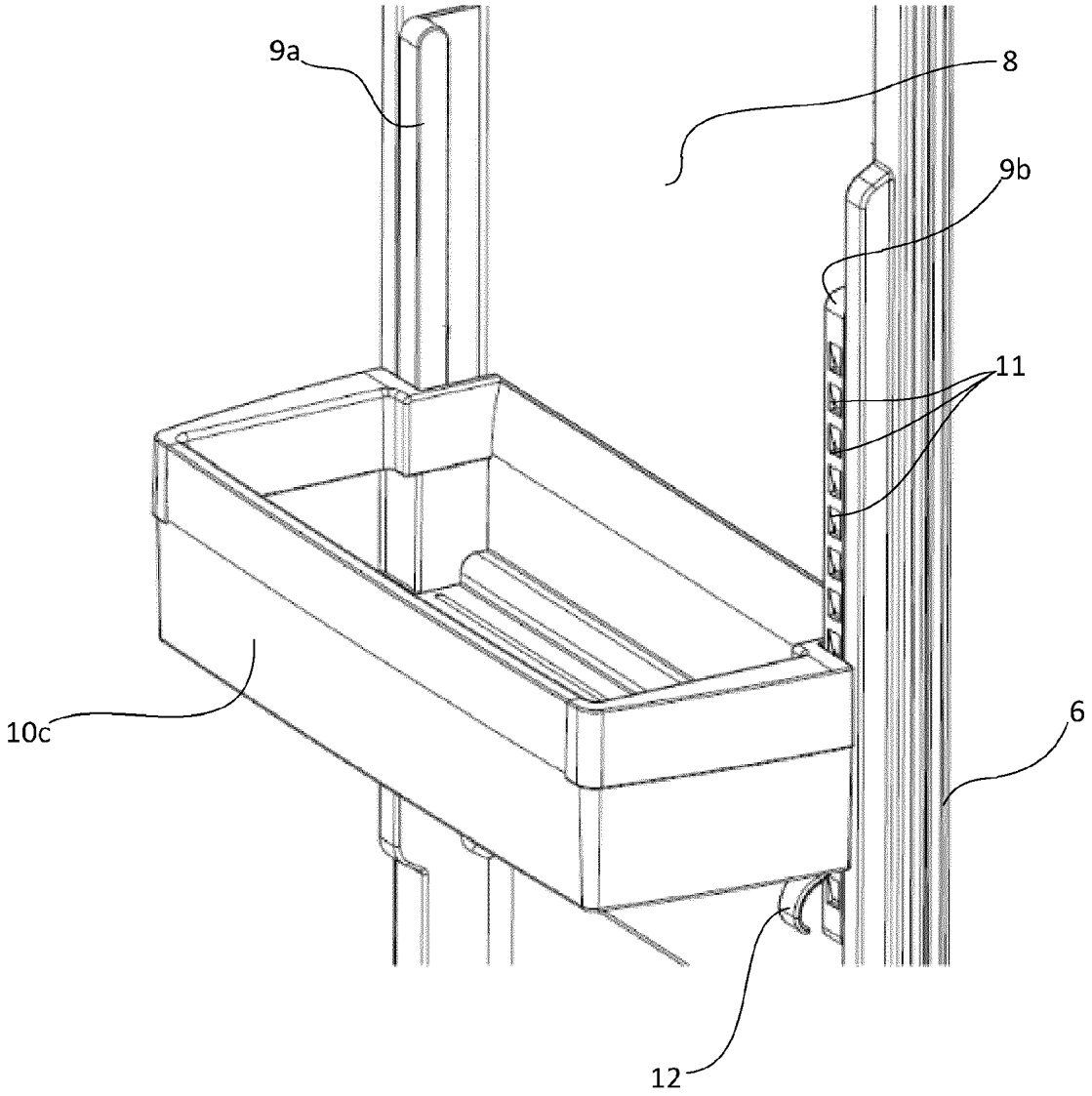


FIG. 2

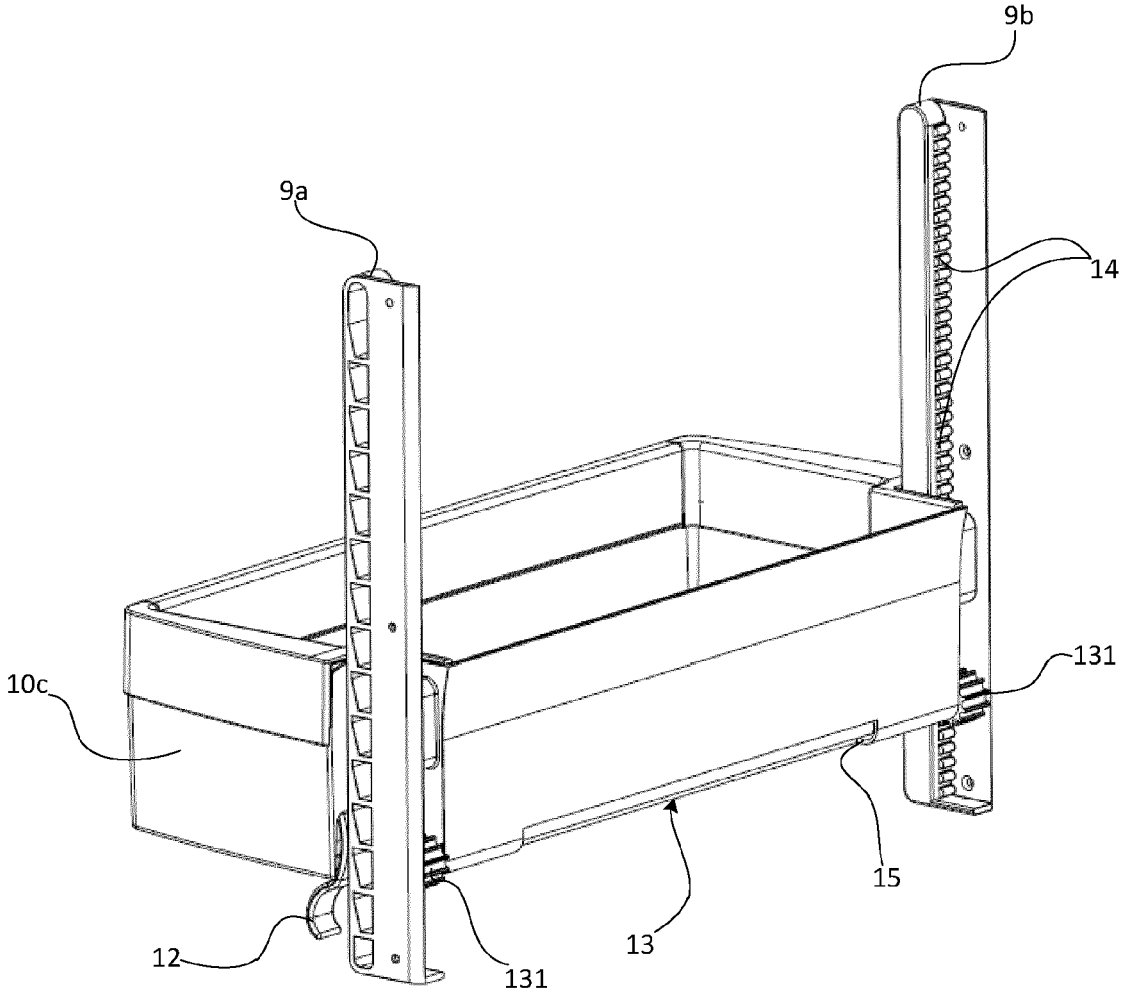


FIG. 3

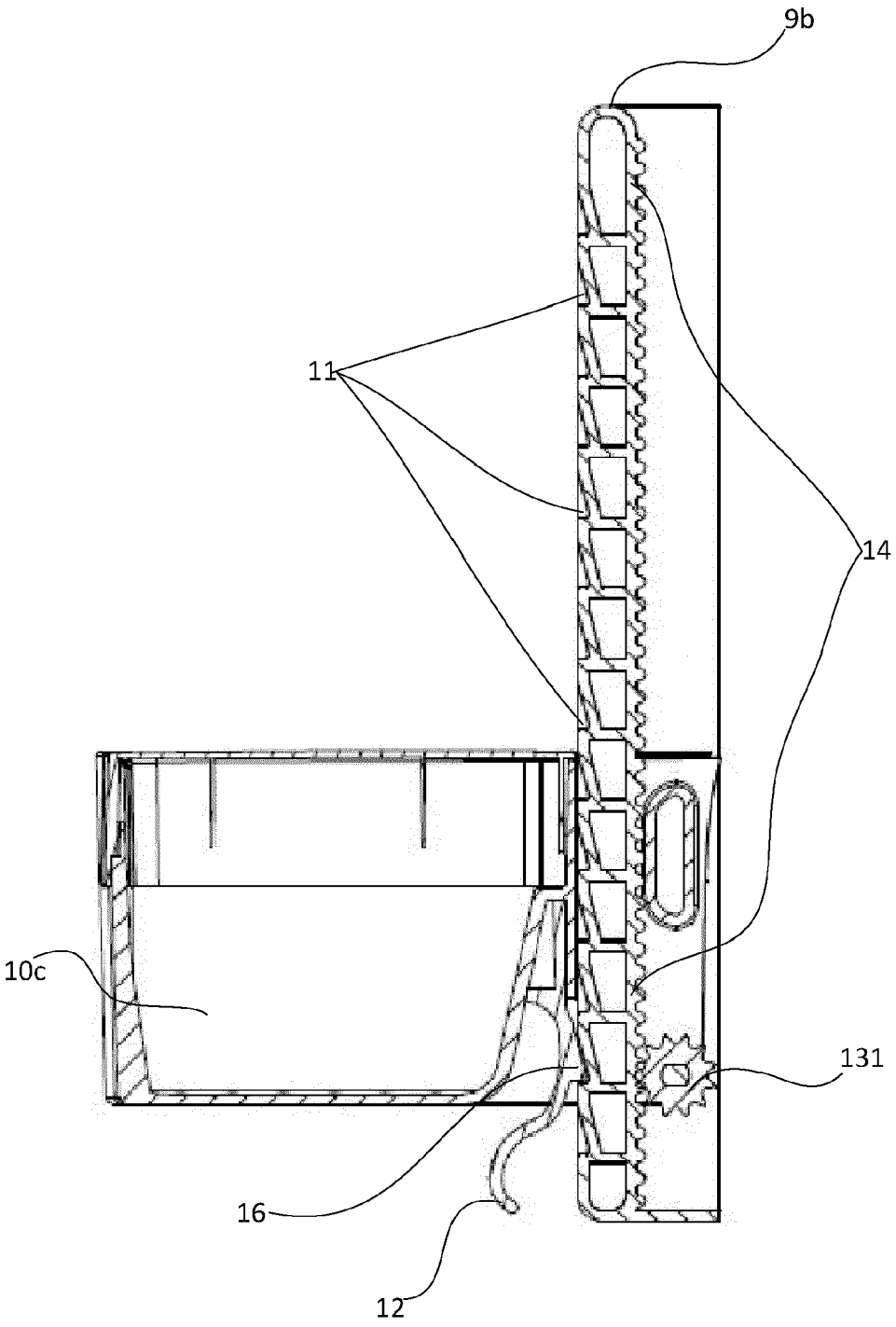


FIG. 4

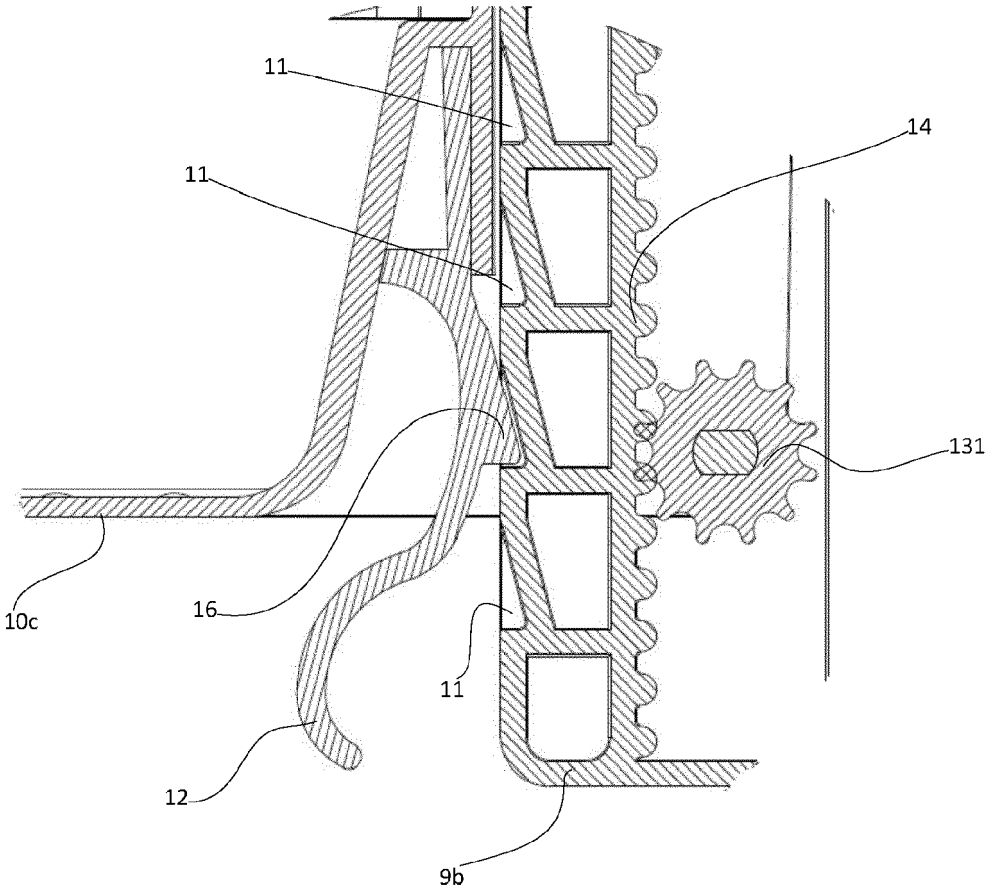


FIG. 5

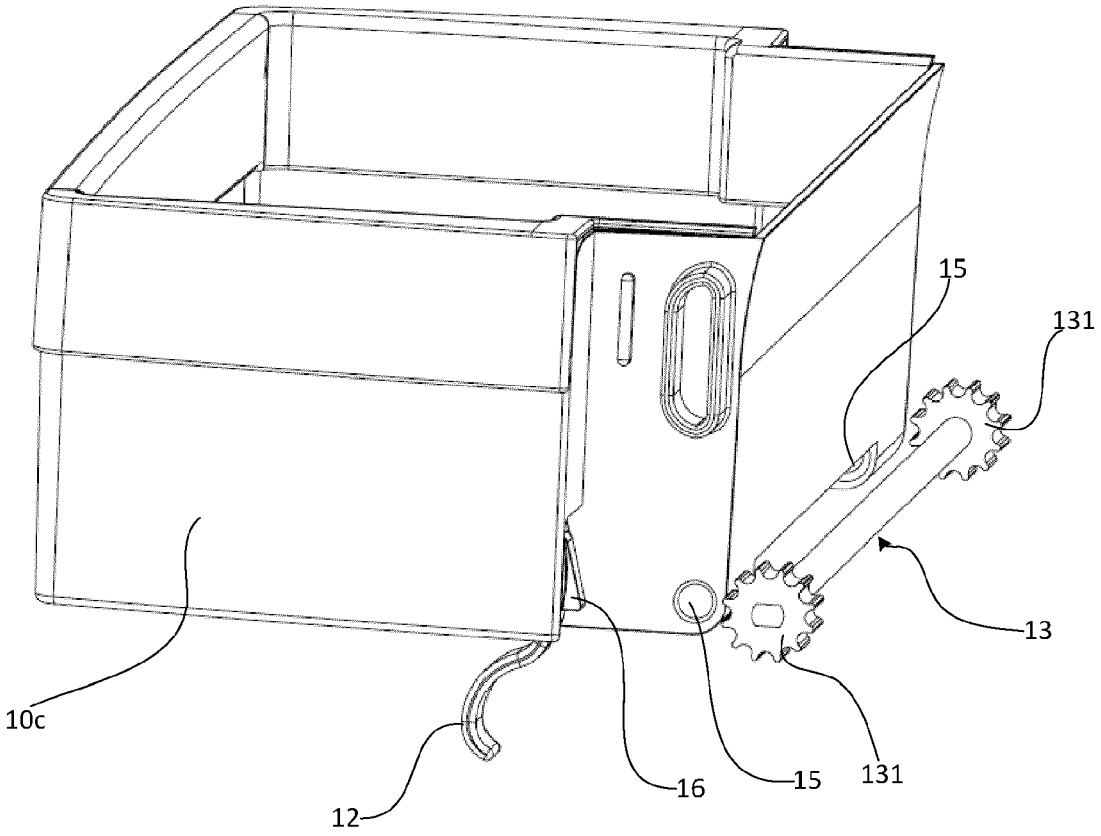


FIG. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 16 17 0849

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 489 967 A1 (ELECTROLUX HOME PROD CORP [BE]) 22 August 2012 (2012-08-22) * paragraphs [0019] - [0072]; figures 1-24 * -----	1-11	INV. F25D23/04
X	DE 20 2007 013412 U1 (LIEBHERR HAUSGERAETE LIENZ [AT]) 12 February 2009 (2009-02-12) * paragraphs [0002] - [0053]; figure 1 * -----	1-11	
X	DE 20 2007 013355 U1 (LIEBHERR HAUSGERAETE [DE]) 25 September 2008 (2008-09-25) * paragraphs [0003] - [0077]; figures 1-10 * -----	1-8,11	
			TECHNICAL FIELDS SEARCHED (IPC) F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	8 November 2016	Kolev, Ivelin

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 17 0849

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.

08-11-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2489967 A1	22-08-2012	CN 103370588 A	23-10-2013
		EP 2489967 A1	22-08-2012
		KR 20140016291 A	07-02-2014
		RU 2013142442 A	27-03-2015
		US 2014042886 A1	13-02-2014
		WO 2012110393 A1	23-08-2012
DE 202007013412 U1	12-02-2009	DE 102008048838 A1	02-04-2009
		DE 202007013412 U1	12-02-2009
DE 202007013355 U1	25-09-2008	DE 202007013355 U1	25-09-2008
		EP 2056049 A2	06-05-2009

EPO FORM P0459

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

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

- CN 101978233 B **[0002]**