IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

LG ELECTRONICS U.S.A., INC. and LG ELECTRONICS, INC.,	)	
Plaintiffs,	)	
v.	)	C.A. No.
WHIRLPOOL CORPORATION,	)	
	)	DEMAND FOR JURY TRIAL
Defendant.	)	

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs LG Electronics U.S.A., Inc. and LG Electronics, Inc. (collectively "LG"), through counsel, allege as follows:

NATURE OF THE ACTION

1. This is an action seeking redress for patent infringement under the patent laws of the United States, Title 35, United States Code.

THE PARTIES

2. Plaintiff LG Electronics U.S.A., Inc. ("LG USA") is a Delaware corporation having a principal place of business at 1000 Sylvan Avenue, Englewood Cliffs, New Jersey 07632.

3. Plaintiff LG Electronics, Inc. ("LG Electronics") is a Korean corporation having a principal place of business at LG Twin Towers, 20 Yoido-dong, Yeongdeungpo-gu, Seoul, Korea 150-721.

4. LG U.S.A. is a wholly owned subsidiary of LG Electronics.

5. On information and belief, Defendant Whirlpool Corporation ("Whirlpool") is a Delaware corporation having a principal place of business at 2000 North M-63, Benton Harbor, Michigan 49022.

JURISDICTION AND VENUE

6. This Court has subject matter jurisdiction under the provisions of 28 U.S.C. §§ 1331 and 1338(a).

7. This Court has personal jurisdiction over Whirlpool, as Whirlpool is incorporated in the State of Delaware.

8. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b), 1391(c), and 1400(b).

COUNT ONE: INFRINGEMENT OF U.S. PATENT NO. 7,316,121

9. LG realleges and incorporates by reference each of paragraphs 1-8 above.

10. On January 8, 2008, the United States Patent and Trademark Office ("PTO") duly and legally issued U.S. Patent No. 7,316,121 ("the '121 patent"), entitled "Dispenser of Icemaker in Refrigerator." A true and correct copy of the '121 patent is attached hereto as Exhibit A.

11. LG Electronics is the owner by assignment of the '121 patent and LG USA has the right to offer for sale and sell in the United States products covered by the '121 patent.

12. On information and belief, Whirlpool has been making, using, selling, and/or offering for sale refrigerators that practice the invention of the '121 patent and thus infringe one or more claims of the '121 patent. Said refrigerators include, but are not limited to, Whirlpool model nos. GC5NHAXS, GF6NFEXT, GD5VVAXT, GS6NBEXR, GS6NVEXS, and GD5NVAXS.

13. On information and belief, Whirlpool has induced infringement of and contributorily infringed the '121 patent, causing third parties to use certain refrigerators in a

manner that infringes the '121 patent, including, but not limited to, Whirlpool model nos. GC5NHAXS, GF6NFEXT, GD5VVAXT, GS6NBEXR, GS6NVEXS, and GD5NVAXS.

14. On information and belief, Whirlpool has been infringing the '121 patent and will continue to do so unless and until enjoined by this Court.

15. Whirlpool's acts of infringement of the '121 patent have caused LG irreparable injury and damages in an as-yet-undetermined amount and, unless and until enjoined by this Court, will continue to do so.

16. On information and belief, Whirlpool's acts of infringement of the '121 patent have been and continue to be willful and deliberate, rendering this case eligible for enhanced damages under 35 U.S.C. § 284 and attorney fees under 35 U.S.C. § 285.

COUNT TWO: INFRINGEMENT OF U.S. PATENT NO. 6,834,922

17. LG realleges and incorporates by reference each of paragraphs 1-16 above.

18. On December 28, 2004, the United States Patent and Trademark Office ("PTO") duly and legally issued U.S. Patent No. 6,834,922 ("the '922 patent"), entitled "Vegetable Compartment in Refrigerator." A true and correct copy of the '922 patent is attached hereto as Exhibit B.

19. LG Electronics is the owner by assignment of the '922 patent and LG USA has the right to offer for sale and sell in the United States products covered by the '922 patent.

20. On information and belief, Whirlpool markets, manufactures, sells, and/or offers for sale Maytag brand refrigerators, including, but not limited to, Maytag model no. MFI2568AE.

21. On information and belief, Whirlpool markets, manufactures, sells, and/or offers for sale Amana brand refrigerators, including, but not limited to, Amana model no. AFI2538AE.

22. On information and belief, Whirlpool markets, manufactures, sells, and/or offers for sale KitchenAid brand refrigerators, including, but not limited to, KitchenAid model no. KBFS20ETSS.

23. On information and belief, Whirlpool markets, manufactures, sells, and/or offers for sale Jenn-Air brand refrigerators, including, but not limited to, Jenn-Air model no. JFI2089AEP.

24. On information and belief, Whirlpool has been making, using, selling, and/or offering for sale refrigerators that practice the invention of the '922 patent and thus infringe one or more claims of the '922 patent. Said refrigerators include, but are not limited to, Whirlpool model nos. GX5FHDXT and GC5NHAXS, Maytag model no. MFI2568AE, Amana model no. AFI2538AE, KitchenAid model no. KBFS20ETSS, and Jenn-Air model no. JFI2089AEP.

25. On information and belief, Whirlpool has induced infringement of and contributorily infringed the '922 patent.

26. On information and belief, Whirlpool has been infringing the '922 patent and will continue to do so unless and until enjoined by this Court.

27. Whirlpool's acts of infringement of the '922 patent have caused LG irreparable injury and damages in an as-yet-undetermined amount and, unless and until enjoined by this Court, will continue to do so.

28. On information and belief, Whirlpool's acts of infringement of the '922 patent have been and continue to be willful and deliberate, rendering this case eligible for enhanced damages under 35 U.S.C. § 284 and attorney fees under 35 U.S.C. § 285.

COUNT THREE: INFRINGEMENT OF U.S. PATENT NO. 7,147,292

29. LG realleges and incorporates by reference each of paragraphs 1-28 above.

30. On December 12, 2006, the United States Patent and Trademark Office ("PTO") duly and legally issued U.S. Patent No. 7,147,292 ("the '292 patent"), entitled "Obturator for Refrigerator." A true and correct copy of the '292 patent is attached hereto as Exhibit C.

31. LG Electronics is the owner by assignment of the '292 patent and LG USA has the right to offer for sale and sell in the United States products covered by the '292 patent.

32. On information and belief, Whirlpool markets, manufactures, sells, and/or offers for sale Maytag brand refrigerators, including, but not limited to, Maytag model no. MFI2568AE.

33. On information and belief, Whirlpool has been making, using, selling, and/or offering for sale refrigerators that practice the invention of the '292 patent and thus infringe one or more claims of the '292 patent. Said refrigerators include, but are not limited to, Maytag model no. MFI2568AE.

34. On information and belief, Whirlpool has induced infringement of and contributorily infringed the '292 patent.

35. On information and belief, Whirlpool has been infringing the '292 patent and will continue to do so unless and until enjoined by this Court.

36. Whirlpool's acts of infringement of the '292 patent have caused LG irreparable injury and damages in an as-yet-undetermined amount and, unless and until enjoined by this Court, will continue to do so.

37. On information and belief, Whirlpool's acts of infringement of the '292 patent have been and continue to be willful and deliberate, rendering this case eligible for enhanced damages under 35 U.S.C. § 284 and attorney fees under 35 U.S.C. § 285.

JURY DEMAND

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, LG requests a trial by jury for all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, LG respectfully requests the following relief:

A. the entry of judgment that Whirlpool has infringed one or more claims of the '121, '922, and '292 patents;

B. the entry of judgment that Whirlpool's infringement of the '121, '922, and '292 patents has been deliberate and willful;

C. a permanent injunction enjoining Whirlpool, its officers, agents, servants, employees, and attorneys, and those persons in active concert or participation with them, from further infringement of the '121, '922, and '292 patents;

D. the entry of judgment awarding LG damages for Whirlpool's infringement of the '121, '922, and '292 patents;

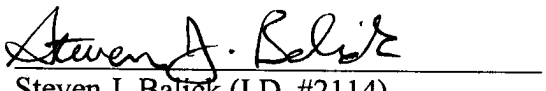
E. the entry of judgment awarding LG enhanced damages up to three times their amount pursuant to 35 U.S.C. § 284;

F. the entry of judgment awarding LG pre- and post-judgment interest on its damages, together with all costs and expenses;

G. the entry of judgment awarding LG reasonable attorney fees pursuant to 35 U.S.C. § 285; and

H. such other relief as this Court may deem just and proper.

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Dated: April 24, 2008

EXHIBIT A

US007316121B2

(12) **United States Patent**
Lee et al.

(10) **Patent No.: US 7,316,121 B2**
(45) **Date of Patent: Jan. 8, 2008**

(54) **DISPENSER OF ICEMAKER IN REFRIGERATOR**

(75) Inventors: **Wook Yong Lee**, Gwangmyeong-si (KR); **Eui Yeop Chung**, Seoul (KR); **Seung Hwan Oh**, Seoul (KR); **Myung Ryul Lee**, Seongnam-si (KR); **Chang Ho Seo**, Seoul (KR); **Seong Jae Kim**, Ansan-si (KR); **Sung Hoon Chung**, Seoul (KR)

(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/833,009**

(22) Filed: **Apr. 28, 2004**

(65) **Prior Publication Data**

US 2005/0056043 A1 Mar. 17, 2005

(30) **Foreign Application Priority Data**

Sep. 17, 2003 (KR) 10-2003-0064503

(51) **Int. Cl.**
F25C 5/18 (2006.01)

(52) **U.S. Cl.** **62/344**; 222/559

(58) **Field of Classification Search** 62/344, 62/389–390; 141/174; 222/559, 561, 526, 222/504, 530, 538
See application file for complete search history.

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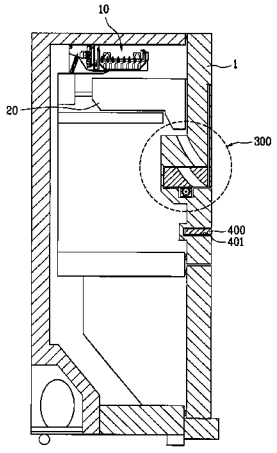
Japan Office Action with English Translation dated Dec. 19, 2006, Application No. 2001-159282 (4 pages).

Primary Examiner—William E. Tapolcai
(74) *Attorney, Agent, or Firm*—Fish & Richardson P.C.

(57) **ABSTRACT**

Disclosed is a dispenser of an icemaker in a refrigerator for maximizing an inner space when a total size is the same, and for minimizing the total size when the inner space is the same. The dispenser of the icemaker in the refrigerator includes an ice chute being a passage through which the ice produced from the icemaker is discharged; and a container supporter provided at an outer case and disposed to be perpendicular to an outer surface of the outer case when the ice is discharged outside through the ice chute, the contain supporter allowing a container seated thereon to receive the ice discharged from the ice chute. The ice chute is closed and not exposed outside when the ice-discharging process is finished, and the container supporter is not exposed to the outer surface of the outer case.

85 Claims, 15 Drawing Sheets



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FIG. 1
Prior Art

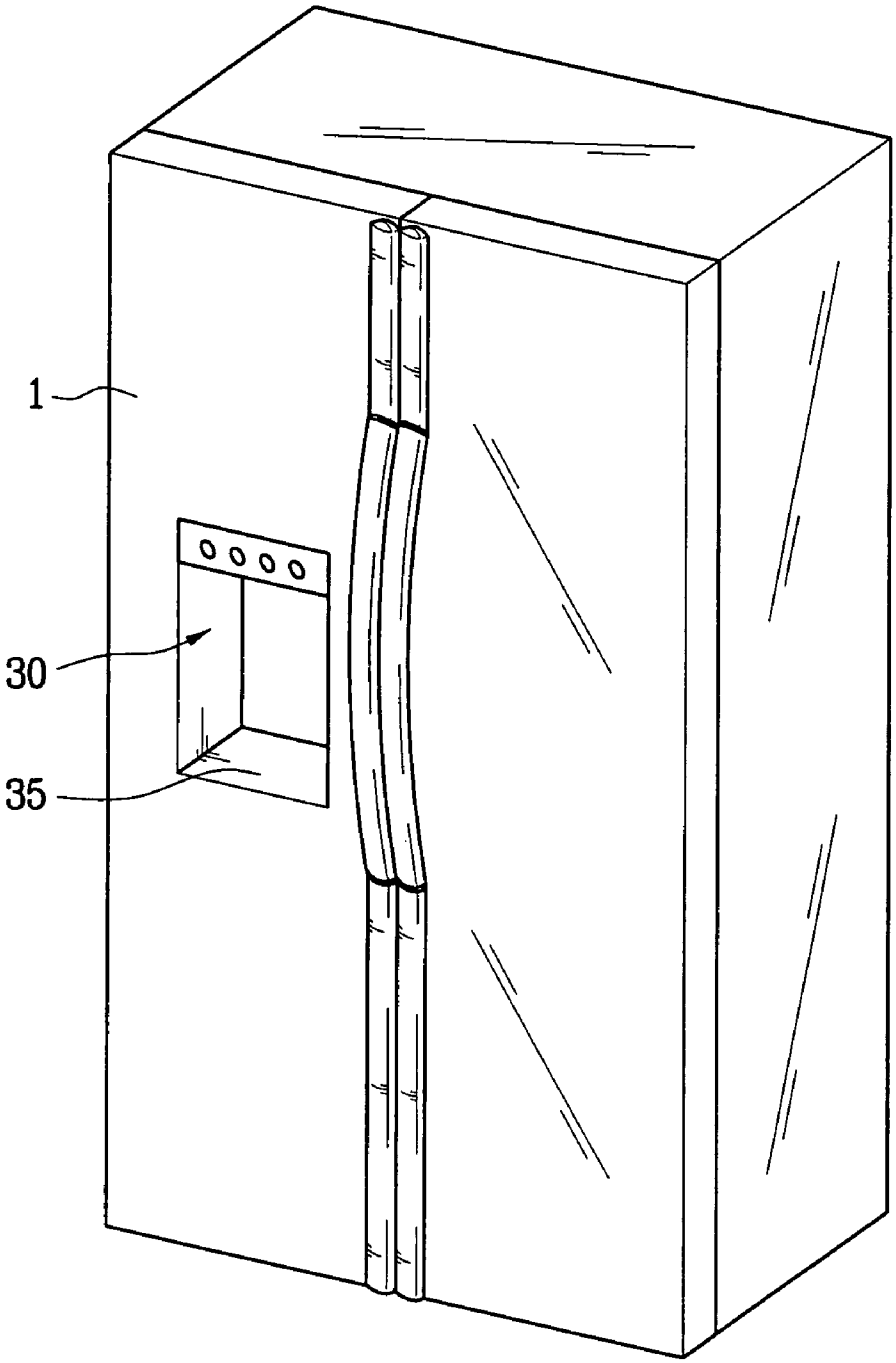


FIG. 2
Prior Art

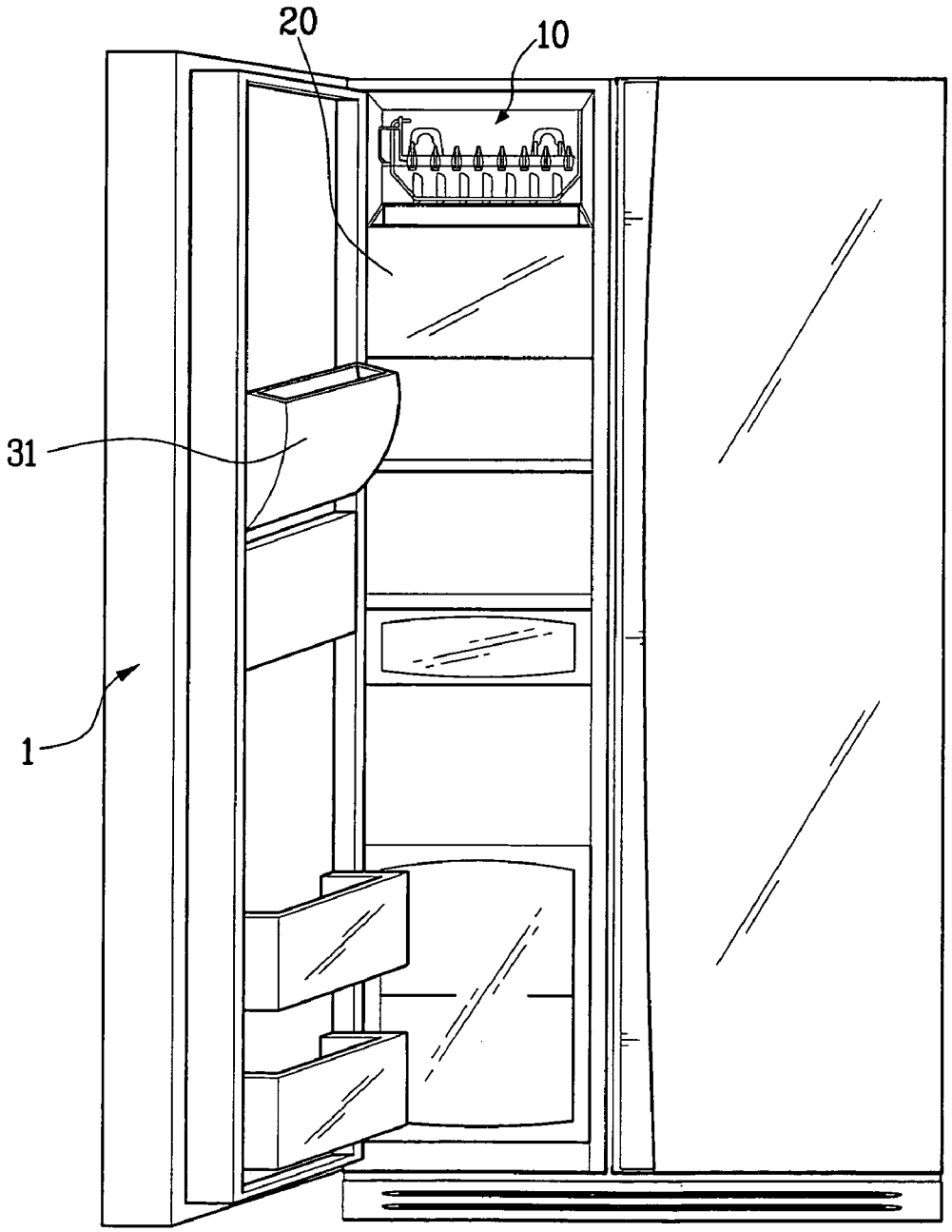


FIG. 3
Prior Art

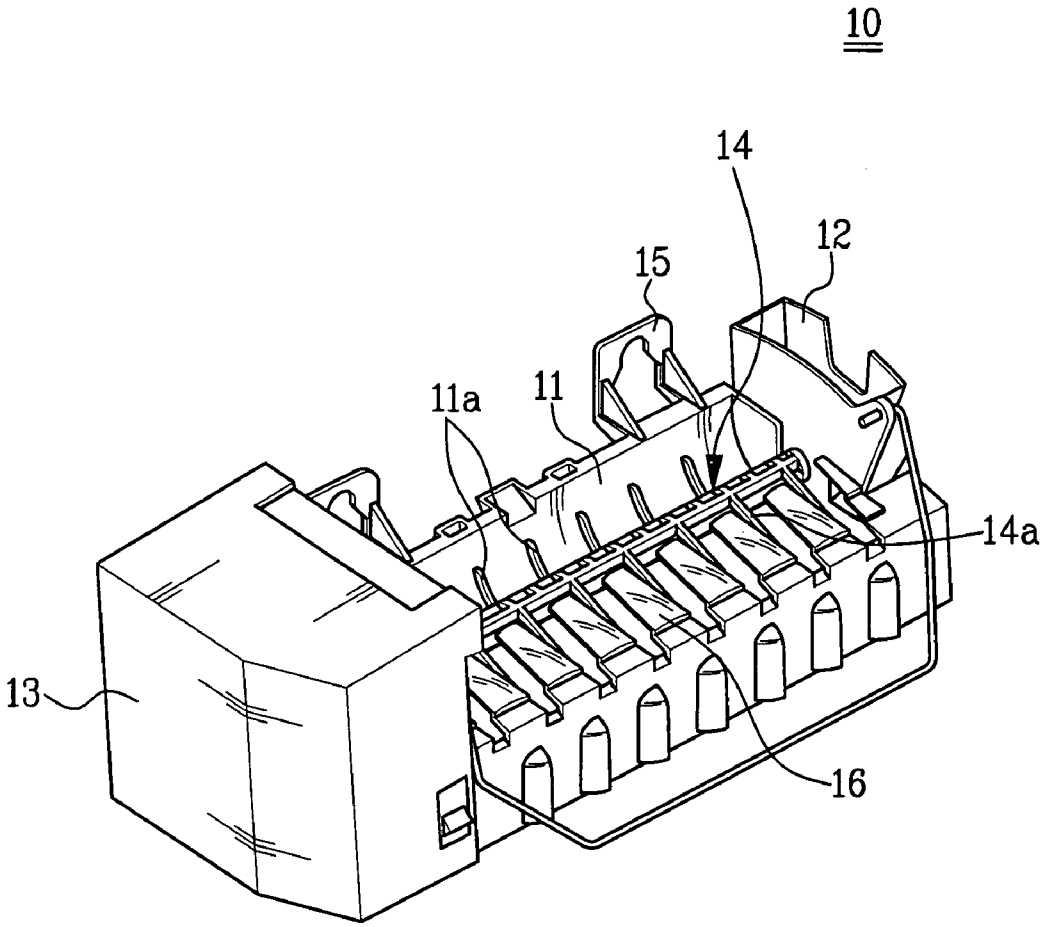


FIG. 4
Prior Art

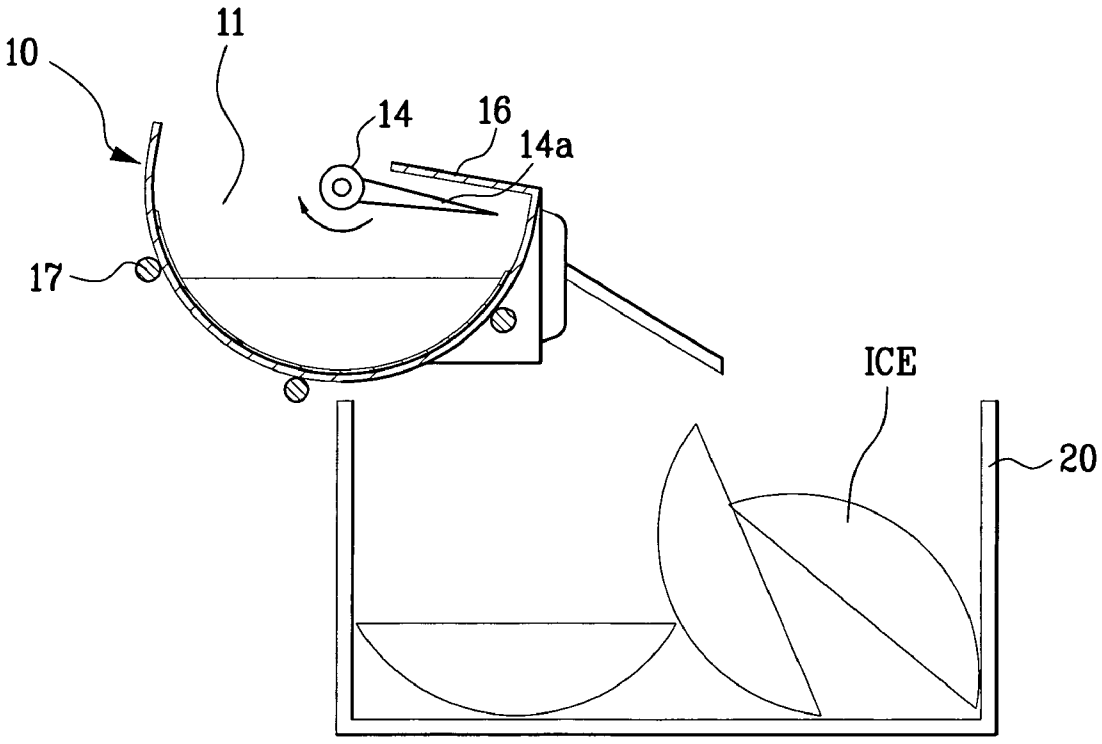


FIG. 5
Prior Art

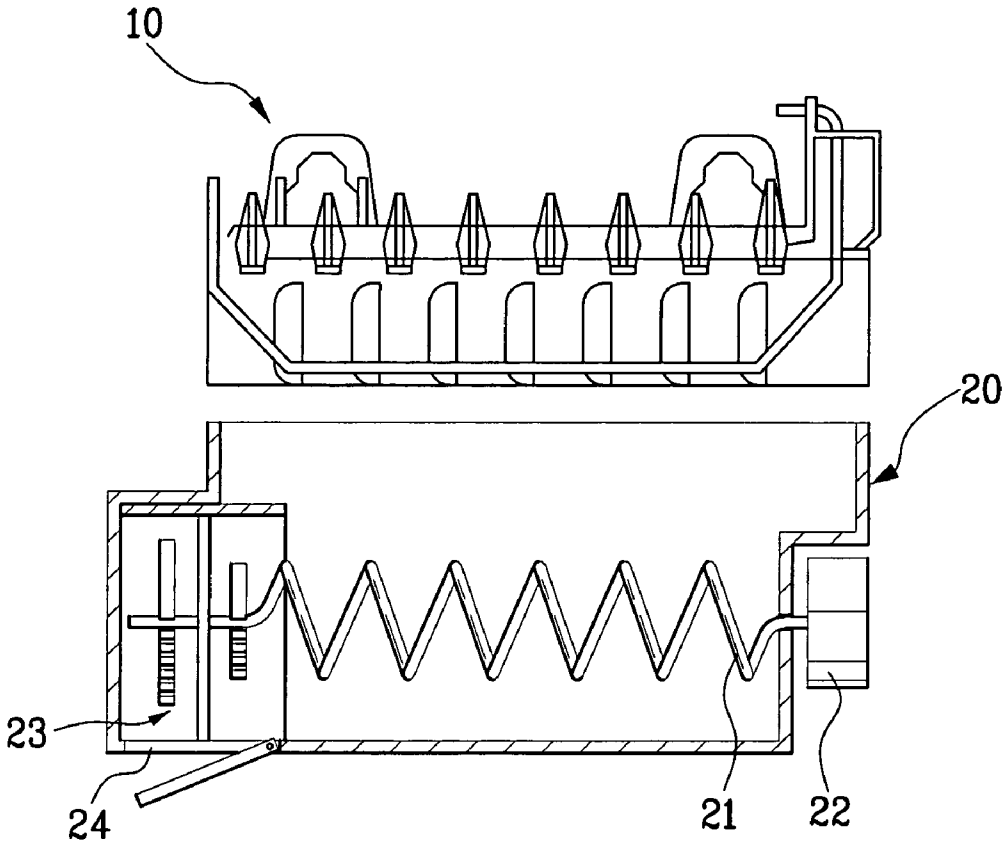


FIG. 6

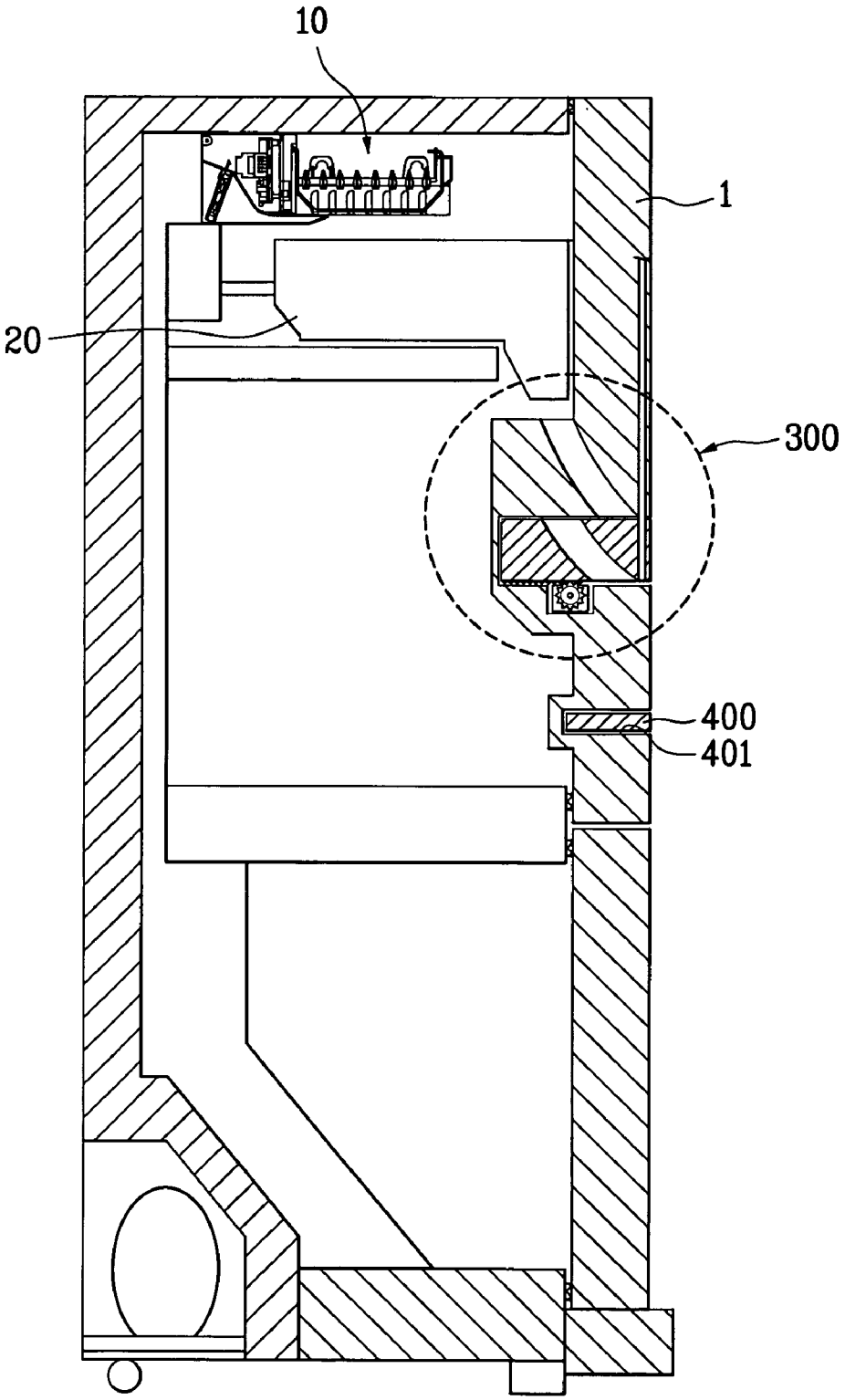


FIG. 7

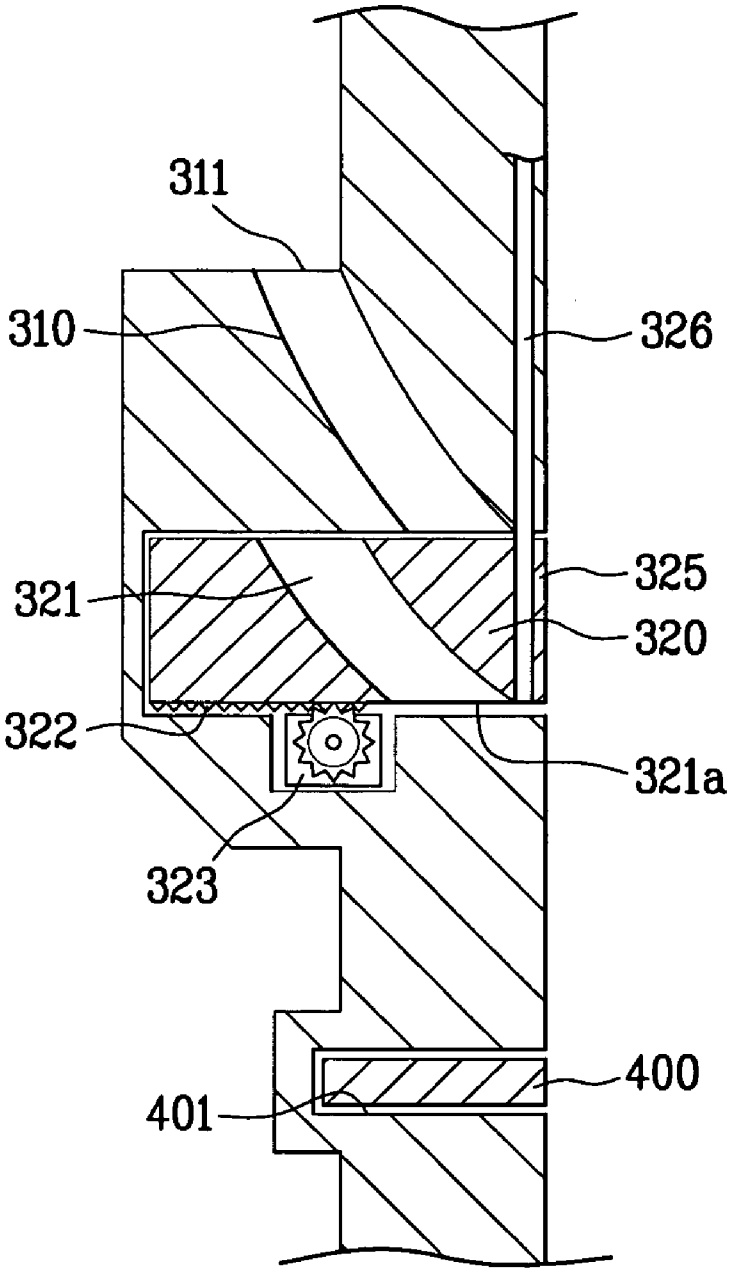


FIG. 8

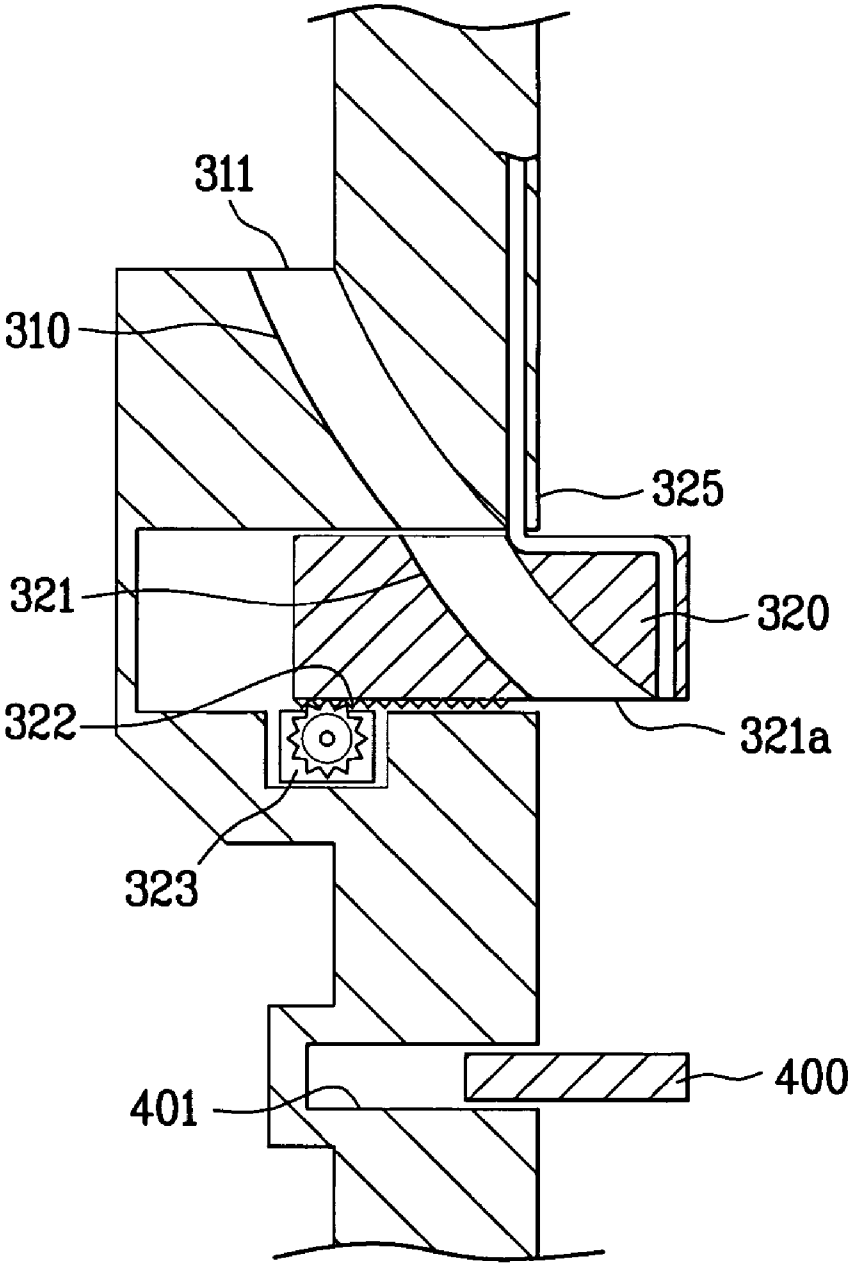


FIG. 9

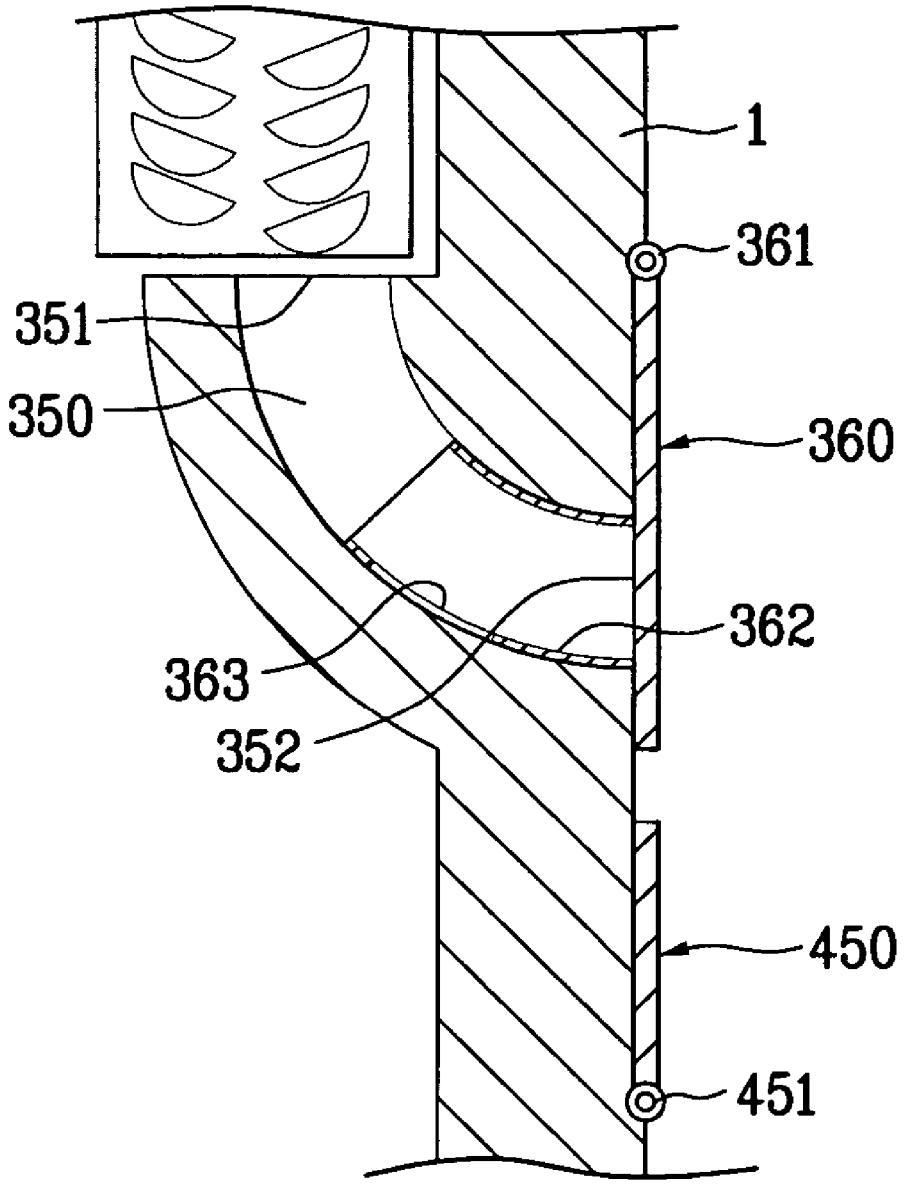


FIG. 10

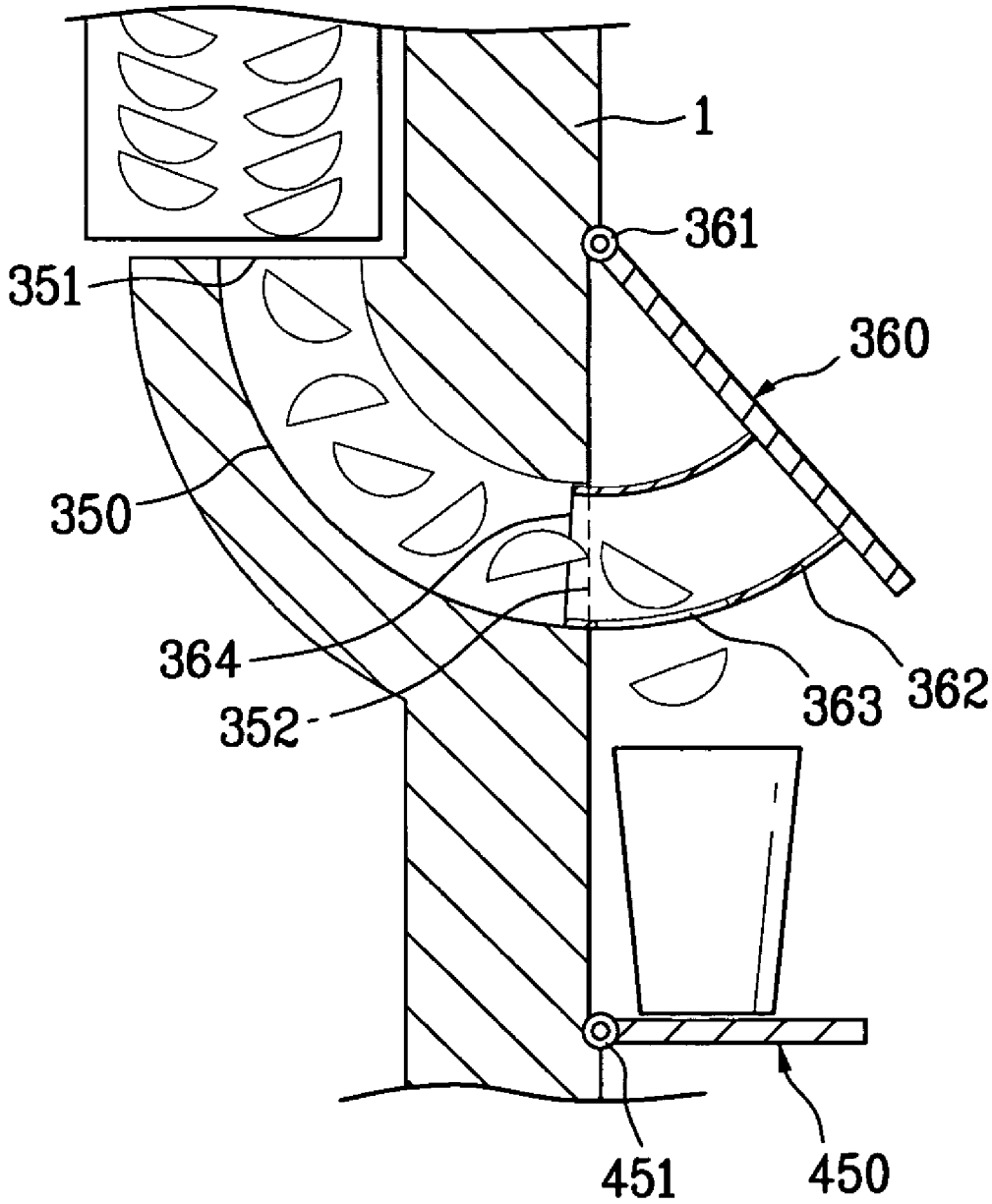


FIG. 11

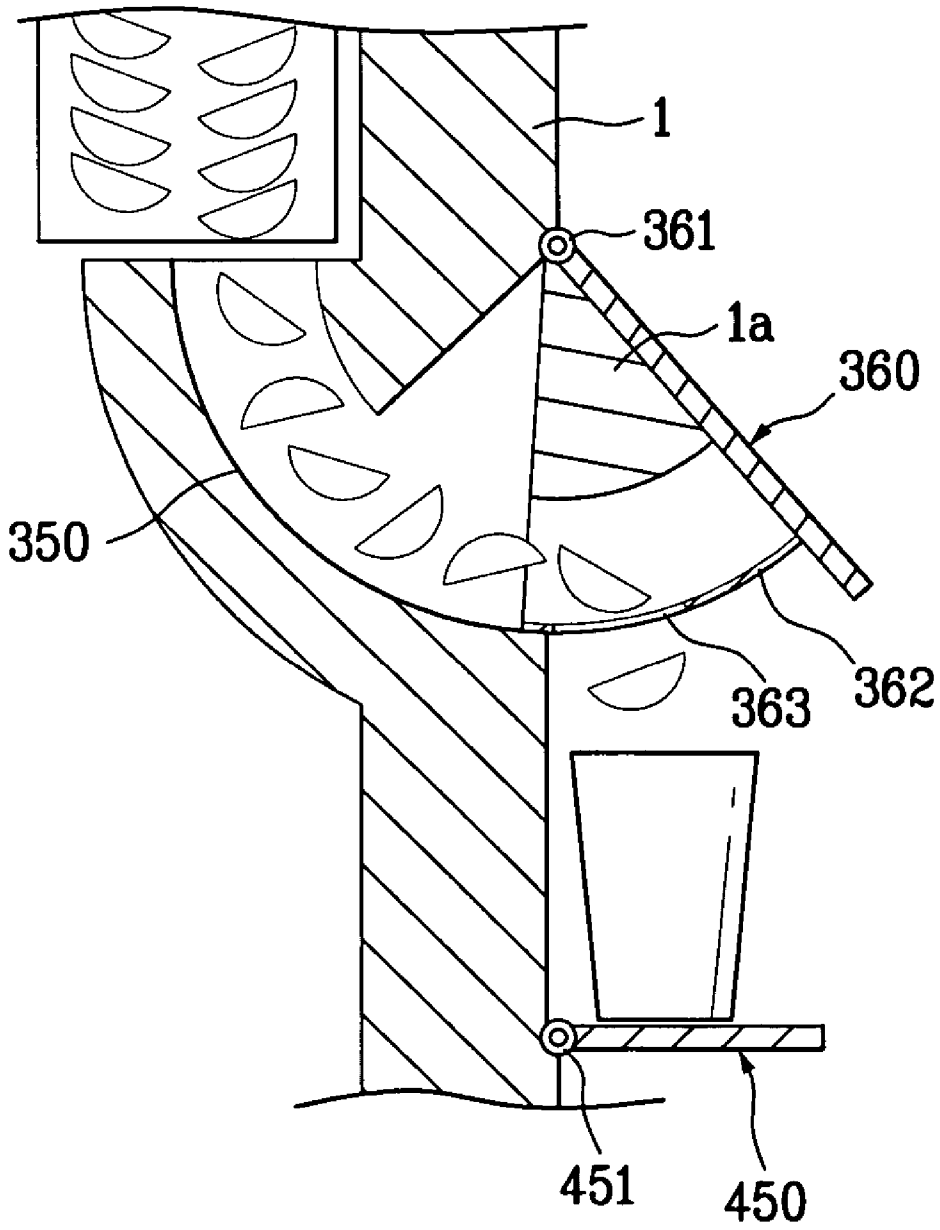


FIG. 12

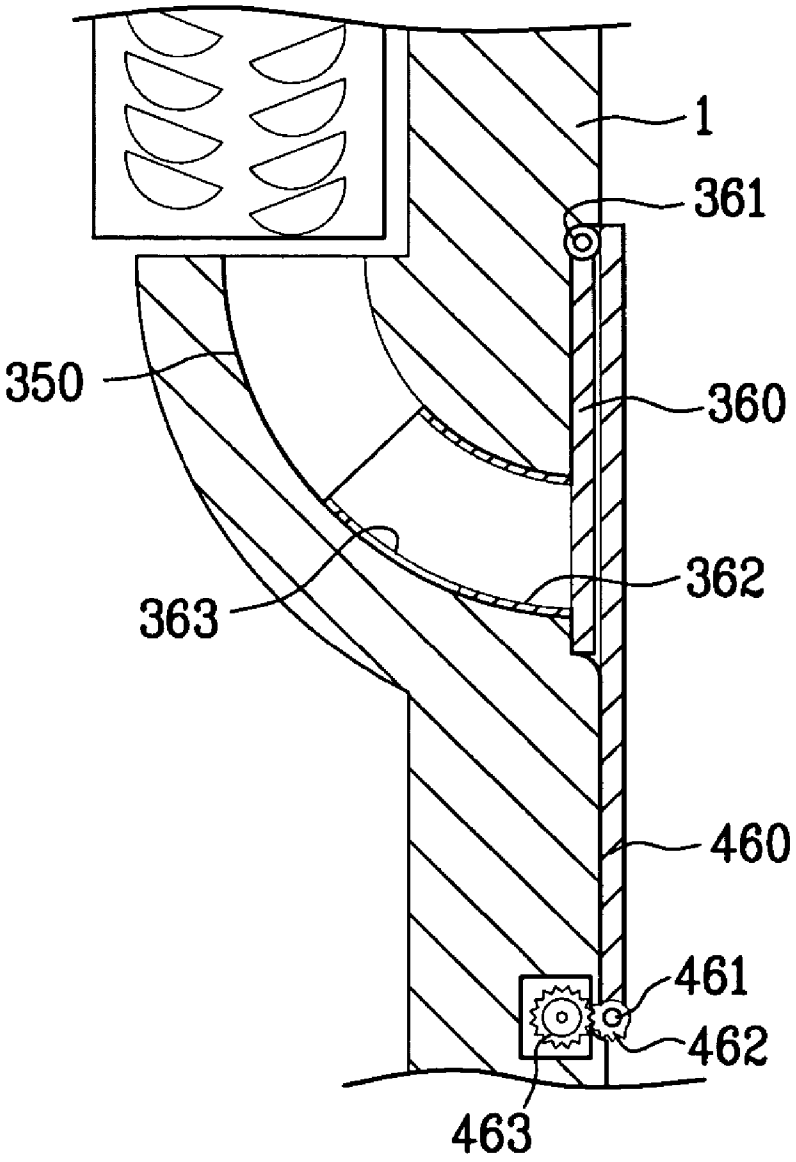


FIG. 13

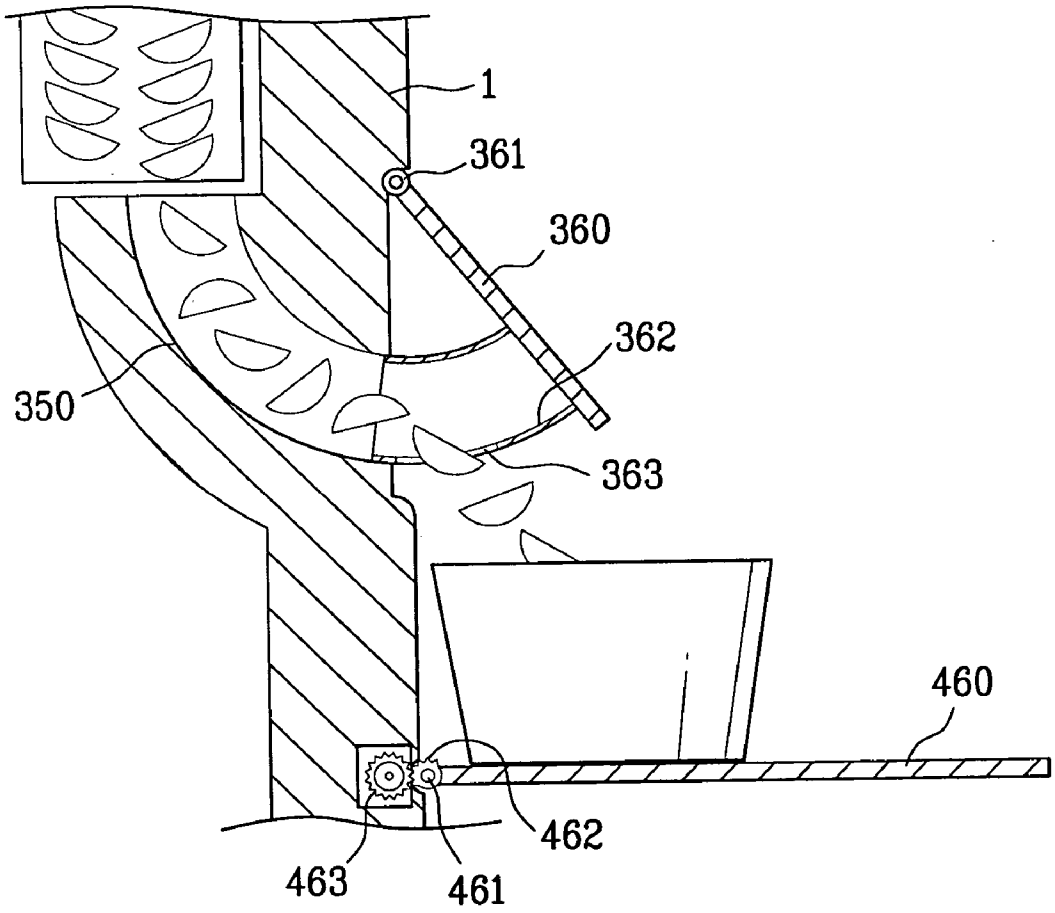


FIG. 14A

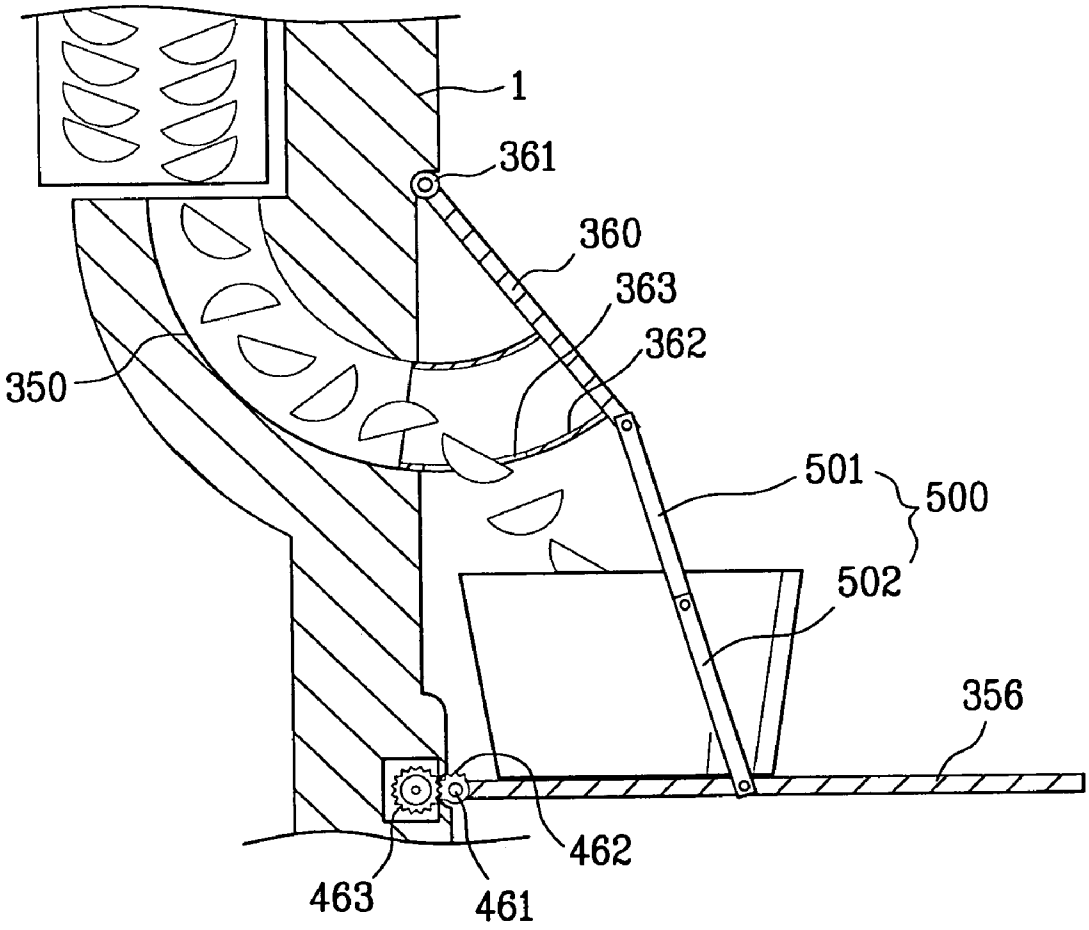
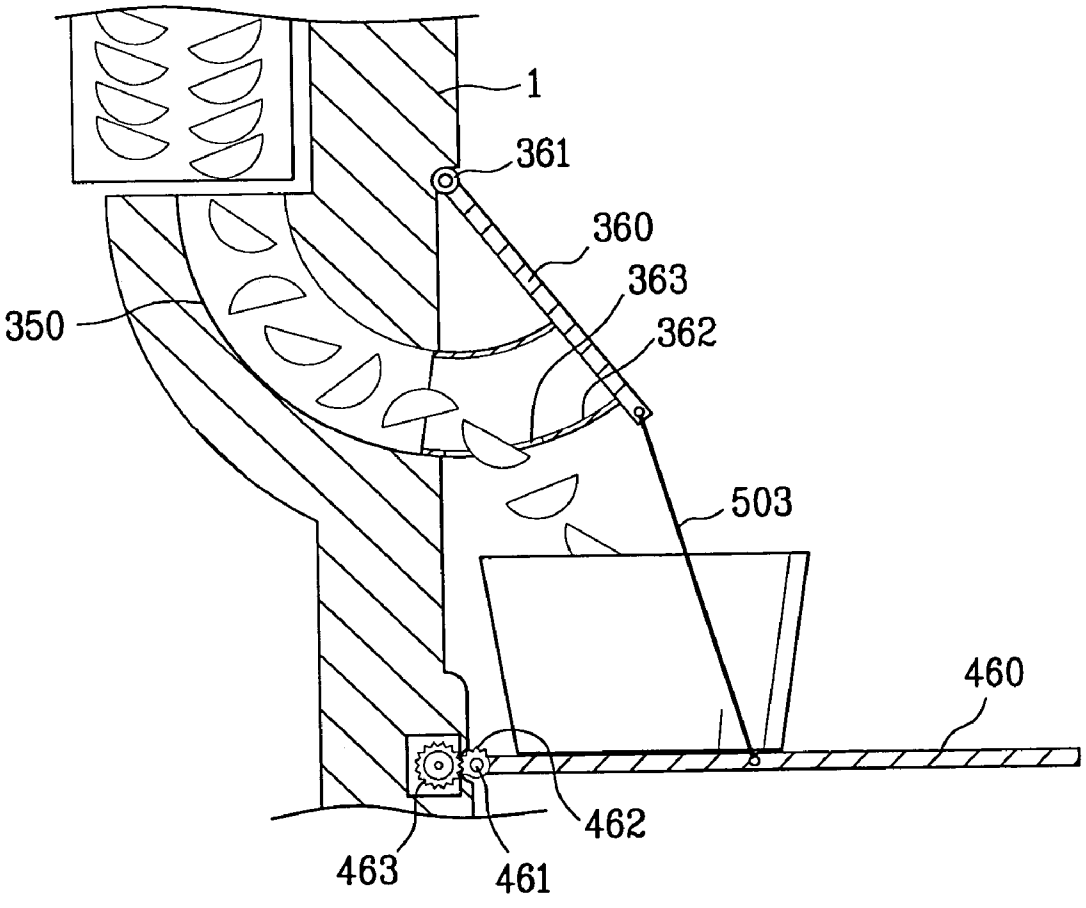


FIG. 14B



DISPENSER OF ICEMAKER IN REFRIGERATOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of Korean Application No. P2003-64503, filed on Sep. 17, 2003, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a dispenser of an icemaker in a refrigerator, and more particularly, to the dispenser of the ice-making apparatus with a structure for maximizing an inner space of the refrigerator.

2. Discussion of the Related Art

In general, a refrigerator is divided into a cooling chamber and a freezer. The cooling chamber keeps a temperature at about 3° C.–4° C. for keeping food and vegetables fresh for a long time. The freezer keeps a temperature at a sub-zero temperature for keeping and storing meat and fish frozen for a long time and for making and storing ice.

The recent refrigerator is developed for performing various additional functions besides a typical function thereof. The icemaker is one of the additional functions.

FIG. **1** illustrates a schematic diagram showing a conventional refrigerator. FIG. **2** illustrates a schematic diagram showing an interior of the refrigerator including a conventional ice-making apparatus. FIG. **3** illustrates a schematic diagram showing an icemaker of a conventional ice-making apparatus. FIG. **4** illustrates a diagram showing a process of discharging the ice from an icemaker. FIG. **5** illustrates an ice bank of an ice-making apparatus in the conventional refrigerator.

Referring to FIG. **1** to FIG. **5**, an icemaker **10** is fixed at an upper part of the freezer in the refrigerator. The icemaker **10** is a device for freezing water and automatically discharging ice.

A structure of a conventional icemaker **10** includes an ice-making chamber **11**, a water supplier **12** provided at a side of the ice-making chamber **11** for supplying water to the ice-making chamber **11**, a controller **13** provided on outside of the ice-making chamber **11** and having a motor (not shown), and an ejector for discharging the ice produced from the ice-making chamber **11**.

At a rear side of the ice-making chamber **10**, a coupler **15** is provided for coupling the icemaker **10** with the freezer of the refrigerator.

The ice-making chamber **11** is formed in a semi-cylindrical form and having a projection **11***a* therein for dividing the inner space such that the ice is produced in a predetermined size.

The ejector **14** includes an axis formed to cross a center of the ice-making chamber **11** and a plurality of ejector fins **14***a* formed at a side of the axis of the ejector **14**. The plurality of ejector fins **14***a* is a means of discharging the produced ice to the ice bank **20**.

A sliding bar **16** is provided at a side of the plurality of ejector fins **14***a* for sliding the produced ice down. In more detail, the ice moved by the plurality of ejector fins **14***a* are placed on the sliding bar **16**, then slid down along the sliding bar **16**, and moved into an inside of an ice bank **20** formed at a lower part of the icemaker.

FIG. **4** illustrates a process of discharging ice from the icemaker **10** to the ice bank **20**. A heater **17** is provided at a lower part of the ice-making chamber **11**. The ice needs to be separated from a surface of the ice-making chamber for being moved. The heater **17** heats a lower surface of the ice-making chamber **11** and increases a temperature thereof for melting a surface of the ice so as to move the ice.

At a door **1** of the cooling chamber of the refrigerator, the ice bank **20** and a dispenser **30** are provided except the icemaker **10**. The ice bank **20** is an apparatus for storing the ice produced from the icemaker **10** and discharging the ice when a user wants the ice to use.

Referring to FIG. **5**, the ice bank **20** includes an ice remover **21**, a motor **20** for rotating the ice remover, an ice crusher **23**, and an ice discharger **24**.

The ice remover **21** formed in a spiral form removes the ice supplied from the icemaker **10** to the ice crusher **23** when the motor **22** rotates.

The ice passed through the crusher **23** is discharged to the dispenser **30** through the ice discharger **24**. The dispenser **30** includes a discharging passage **31** and a container supporter **35** provided at a lower part of the discharging passage.

The discharging passage **31** includes an inlet provided on an inner wall of the door **1**, an outlet provided on an outer wall of the door **1**, and a pipe for communicating the inlet with the outlet. In this case, the inlet of the discharging passage is provided at a higher place than the outlet.

The container supporter **35** is provided at a lower part of the discharging passage. In more detail, a vertical plane provided on the outer wall of the door at a lower part of the outlet of the discharging passage **31** includes a groove formed in a quadrilateral form.

A process of discharging the ice from the ice-making apparatus structured as aforementioned will be described as follows.

First, the icemaker being supplied with water through a water supply pipe produces the ice, and removes the ice to the ice bank provided at a lower part of the icemaker by using the ejector.

The ice bank storing the ice discharges the ice outside through the ice-discharging passage when the user wants to use the ice. The ice discharged outside is entered into a container and provided to the user, the container securely provided on the container supporter including the groove formed on the outer wall of the door.

However, the dispenser of the icemaker has following problems. First, the container supporter of the dispenser includes the groove with a predetermined depth on the outer wall of the door of the refrigerator. Accordingly, the door needs to be thicker than a predetermined thickness. The thick door takes up much of an inner space of the refrigerator. Therefore, a total size of the refrigerator is increased when the inner space of the refrigerator is made to be larger than a predetermined size.

Second, an outlet side of the discharging passage of the dispenser is exposed outside and dirt is collected thereon resulting in a problem of polluting the ice discharged outside by the dirt.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a dispenser of an icemaker in a refrigerator that substantially obviates one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide an apparatus having a function of discharging ice with a dispenser of an icemaker for maximizing an inner space of the apparatus.

Another object of the present invention is to provide an apparatus having a function of discharging ice with a dispenser of an icemaker for minimizing a total size of the dispenser.

A further object of the present invention is to provide an apparatus having a function of discharging ice with a dispenser of an icemaker for completely isolating an inside of an outer case from an outside thereof.

Additional advantages, objects, and features of the invention will be set forth in part in the description Which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a dispenser of an icemaker of the present invention includes an ice chute provided as a passage through which the ice produced from the icemaker provided inside of an outer case is discharged, and a container supporter provided at the outer case and disposed to be perpendicular to an outer surface of the outer case when the ice is discharged outside through the ice chute, the container supporter allowing a container seated thereon to receive the ice discharged from the ice chute.

The ice chute is closed and not exposed outside when the ice is not discharged. The ice chute includes a first chute having an inlet provided on an inner wall of a front surface of the outer case and a passage extended downward in a wall direction of the outer case, and a sliding member having a second chute diagonally extended, the sliding member moving forward to be perpendicular to the front surface of the outer case for communicating the second chute with the first chute when the ice is discharged, and being inserted into the outer case when the ice is not discharged.

The sliding member further includes a rack provided at a bottom surface thereof; and a pinion provided at a bottom of the rack and mated with the rack.

The dispenser of the icemaker further includes a cover having a first end coupled with a lower end of a front surface of the sliding member, and a second end extended upward and fixed on the front surface of the outer case.

Meanwhile, the ice chute includes an ice-discharging pipe having an inlet provided on an inner surface of the outer case and an outlet provided on an outer surface of the outer case, and a cover provided at the outer case for opening and closing the outlet of the ice-discharging pipe.

In this case, the cover is rotatably provided around a top end being coupled with the front surface of the outer case. The cover also includes a subsidiary pipe provided on a portion being in contact with the outlet portion of the ice-discharging pipe to be inserted into an inside of a passage on the outlet side of the ice discharging pipe.

The subsidiary pipe comprises an ice-passing hole at a lower part thereof for discharging the ice when the cover is rotated upward.

The container supporter is rotated downward to be perpendicular to the front surface of the outer case when the ice is discharged. The container supporter rotates upward and covers the cover.

The dispenser of the icemaker further includes a link member for coupling the container supporter with the cover.

The container supporter is inserted into a wall of the outer case when the ice is not discharged through the ice chute.

The container supporter includes a rack provided at a bottom surface thereof, and a pinion provided under the rack and mated with the rack.

Contrary to the structure mentioned above, the container supporter may be provided under the ice chute and have an end being rotatably coupled with the front surface of the outer case.

The container supporter is rotated downward to be perpendicular to the front surface of the outer case when the ice is discharged. The container supporter closes the ice chute when the ice is not discharged.

The container supporter includes a rotating axis horizontally provided at an end of the outer wall of the outer case, a driven gear provided at the rotating axis, and a driving gear mated with the driven gear.

Owing to the dispenser of the icemaker with aforementioned structure, an inner space of the ice-discharging apparatus such as a refrigerator is maximized or a total size of the apparatus is minimized.

It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings;

FIG. **1** illustrates a schematic diagram showing a conventional refrigerator.

FIG. **2** illustrates a schematic diagram showing an interior of the refrigerator including a conventional ice-making apparatus.

FIG. **3** illustrates a schematic diagram showing an icemaker of a conventional ice-making apparatus.

FIG. **4** illustrates a diagram showing a process of discharging ice from an icemaker.

FIG. **5** illustrates an ice bank of an ice-making apparatus in the conventional refrigerator.

FIG. **6** illustrates a diagram showing a refrigerator with a dispenser of an ice-making apparatus in accordance with a first embodiment of the present invention.

FIG. **7** illustrates a magnified view of a dispenser of an ice-making apparatus in accordance with a first embodiment of the present invention.

FIG. **8** illustrates a diagram showing a dispenser of an ice-making apparatus in a state of discharging ice accordance with a first embodiment of the present invention.

FIG. **9** illustrates a diagram showing a dispenser of an ice-making apparatus in accordance with a second embodiment of the present invention.

FIG. **10** illustrates a diagram showing a dispenser of an ice-making apparatus in a state of discharging ice accordance with a second embodiment of the present invention.

FIG. **11** illustrates a diagram showing a dispenser of an ice-making apparatus in a state of discharging ice accordance with a third embodiment of the present invention.

FIG. **12** illustrates a diagram showing a dispenser of an ice-making apparatus in accordance with a fourth embodiment of the present invention.

FIG. **13** illustrates a diagram showing a dispenser of an ice-making apparatus in a state of discharging ice accordance with a fourth embodiment of the present invention.

FIGS. **14**A and **14**B illustrate a diagram showing a coupling material in accordance with a fourth embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

In general, an icemaker is an apparatus for freezing supplied water in a predetermined size and discharging outside for supplying ice to a user when the user wants to use the ice. The icemaker provides crushed ice or uncrushed ice to the user in accordance with a choice of the user.

In general, a refrigerator is provided with the icemaker, however, may be provided with a drinking apparatus such as a purifier.

Hereinafter, a preferred embodiment of the dispenser discharging and supplying the ice to the user outside will be described referring to FIG. **6** and FIG. **15** in accordance with the icemaker with such function mentioned above.

Referring to FIG. **6** to FIG. **7**, a first embodiment of the dispenser of the icemaker in accordance with the present invention includes an ice chute **300** provided at a door and forming a front surface of an outer case of the refrigerator, and a container supporter **400** provided at a lower part of the ice chute **300**.

The ice chute **300** is a passage through which the ice produced from the icemaker is discharged. It is desirable that the passage is closed for preventing the ice from being exposed outside when the ice is not discharged.

In other words, the ice chute **300** includes an inlet through which the ice is inserted from a side of the icemaker, and an outlet through which the ice is discharged.

When the ice is not discharged, it is desirable that the outlet is closed for preventing dirt from being collected thereon.

Ice chute **300** includes a first chute **310** having an inlet **311** provided on an inner wall of the door and a passage extended bottomward in a direction of an outer wall of the door, and a sliding member **320** with a second chute **321** communicating with the first chute **310** when the ice is discharged and having an outlet **321***a* exposed outside.

In more detail, the sliding member **320** moves toward the front of the door and projects to be perpendicular to the front surface of the door. In this instance, the second chute **321** is communicated with the first chute **310**.

When the ice is not discharged from the ice chute, the sliding member **320** is inserted into a groove formed on the outer surface of the door **1**. In this case, it is desirable that the sliding member **320** is not projected toward outside of the door surface and the sliding member includes a guide rail for a smooth movement. The sliding member **320** also includes a handle on a front surface thereof for being manually inserted or ejected.

The dispenser also includes a spring or an oil pressure means (not illustrated) provided between a rear surface of the sliding member **320** and the groove for pressing a rear surface of the container supporter. The dispenser includes a binding for biding the sliding member. When the binding is released, the sliding member is ejected to a front of the door. If a front surface of the sliding member is pressed, the sliding member is inserted into the groove and locked by the biding.

Contrary to the above statement, the sliding member **320** can be automatically inserted and ejected. For this, the sliding member includes a rack **322** provided at a lower surface thereof, and a pinion **323** provided at a lower part of the rack **322**. A motor (not illustrated) driven by a controller rotates the pinion **323**.

In other words, when the user wants to use the ice and presses an ejection button provided at the controller (not illustrated), the motor rotates the pinion **323** and the rack **322** to, and projects the sliding member **320** by moving the sliding member **320** toward the front. The first chute **310** and the second chute **321** are communicated to discharge the ice. When the process for discharging the ice is finished, the motor is inversely rotated to insert the sliding member **320** into the groove so as to close the ice chute **300**.

The dispenser of icemaker with a structure mentioned above, further includes a cover **325** having a first end coupled with a front lower end of the sliding member and a second end fixed on the front surface of the door **1**. The cover **325** covers an external appearance of the ice chute **300** as well as prevents dirt from being collected on a top surface of the sliding member.

Is it desirable that a pipe for supplying drinking water is provided between the cover **325** and the door **1** so as to supply water in the container provided at the container supporter **400** when the user wants water or water with the ice.

At the container supporter **400**, a container for receiving the discharged ice is provided at a lower part of the ice chute. The container supporter **400** is provided at the door **1** forming the front surface of the outer case, projected vertically above the front surface of the door **1** when the ice is discharged to outside through the ice chute **300**.

Contrary to this, when the ice is not discharged, the container supporter is inserted into the groove **401** formed on the door. In this case, it is desirable that the container supporter is not projected to outside of the door and having a guide rail provided at the groove for smoothly moving.

In this case, the container supporter **400** includes a handle (not illustrated) on the front surface thereof so as to be inserted and ejected manually.

The dispenser also includes a spring or an oil pressure means (not illustrated) provided between a rear surface of the sliding member **320** and the groove for pressing the rear surface of the container supporter, and a binding for biding the sliding member. When the binding is released, the sliding member is ejected on the front of the door. If a front surface of the sliding member is pressed, the sliding member is inserted into the groove and locked by the biding.

Contrary to this, the container supporter can be automatically inserted or ejected. For this, the container supporter, as the sliding member, includes the rack provided at the lower surface thereof, and the pinion provided at the lower part of the rack, the pinion rotatably provided

For this, the sliding member includes a rack **322** provided on a lower surface thereof, and a pinion provided at a lower part of the rack and mated with the rack so as to rotate together by a motor (not illustrated) driven by a controller.

In other words, when the user wants the ice and presses the ejection button, the motor rotates the pinion and the rack, and the container supporter is moved to the front and projected on the front of the door. When the ice discharging process is finished, the motor is inversely rotated to insert the sliding member **320** into the groove. In the dispenser of

the icemaker with the structure mentioned above, it is desirable that the container supporter **410** is ejected earlier than the sliding member **320**.

In other words, it is desirable that the ice is discharged after the container supporter is ejected, the container is provided on top of the container supporter, and the sliding member is ejected.

A second embodiment of the dispenser of the icemaker in accordance with the present invention will be described in reference to FIG. **9** to FIG. **10**.

Referring to FIG. **9**, the dispenser of the icemaker includes an ice-discharging pipe, the pipe having an inlet **351** formed on an inner surface of the door **1** of the refrigerator and an outlet **352** formed on an outer surface of the door, a cover **360** provided on the outer surface of the door for opening and closing the outlet **352**, and a container supporter **450** having the container securely provided thereon for receiving the ice discharged outside through the ice-discharging pipe.

The inlet **351** is provided at an upper part of the outlet **352** for discharging the ice inserted from the icemaker by gravity. The cover **360** having a top end coupled with the door **1** of the refrigerator is rotatably provided around the top end **361**.

The cover **360** also includes a subsidiary pipe **362** provided on the inner surface of the cover in contact with the outlet of the ice-discharging pipe so as to insert the ice into the inside of passage on a side of the outlet **352** of the ice-discharging pipe.

The subsidiary pipe **362** includes an ice-passing hole **363** provided at a lower part thereof in order to discharge the ice when the top cover is rotated upward.

In other words, when the cover **360** is rotated, the ice-passing hole **363** of the subsidiary pipe **362** is exposed to the outside of the ice-discharging pipe **350** and the ice is discharged. In this instance, an end **364** of the subsidiary pipe is not exposed to the outside of the ice-discharging pipe.

Although the user can manually opens and closes the cover **360**, the outlet of the ice-discharging pipe is automatically opened and closed in accordance with the second embodiment.

Meanwhile, the container supporter **450** is provided at the lower part of the cover and has an end rotatably coupled with the front surface of the refrigerator.

When the ice is discharged, the container supporter **450** is rotated downward around the lower end **451** to be projected vertically on the front surface of the door **1**.

When the ice is not discharged, the container supporter is rotated upward around the lower end **451** to be in contact with the front surface of the door.

Although not illustrated, in the present embodiment, the container supporter and the cover are formed in a semicircular form for an external appearance.

It is desirable that grooves formed in same forms as the cover and the container supporter are provided on the outer wall of the door such that the container supporter and the cover are not projected on the front surface of the door when the ice is not discharged. In the mean time, when the ice is not discharged, it is not the cover but the container supporter directly opening and closing the ice chute.

The container supporter **450** automatically rotates and includes a rotating axis provided horizontally at an end coupled with the outer wall of the outer case, a driven gear provided at the rotating axis, and a driving gear coupled with the driven gear. The structure will be described again in describing a fourth embodiment of the present invention.

The motor operated by the controller (not illustrated) rotates the driving gear. The rotating method is applicable to a rotation of the cover **360**.

Contrary to the above statement, a portion **1***a* located at an inside of the cover on the outer wall of the door and the cover **360** are formed as a single body, and the top portion of the subsidiary pipe **362** includes the portion **1***a* on the outer wall of the door, the portion **1***a* integrated with the cover **360**.

The dispenser of the icemaker with the structure mentioned above is a third embodiment illustrated in FIG. **11**. In accordance with the third embodiment of the present invention, the other components except the structure of the third embodiment is the same as the second embodiment and it will be omitted.

Meanwhile, the container supporter **460** covers the cover **360** as illustrated in FIG. **12** to FIG. **14**. The structure mentioned above is a fourth embodiment. In accordance with the present invention, all other compositions except the components explained below are the same as the second and the third embodiments.

In accordance with the present invention, as illustrated in FIG. **14**, the dispenser of the icemaker includes a link member **500** coupling the container supporter **460** and the cover **360**.

The link member **500** has a first end coupled with the lower side of the cover **360** and a second end coupled with a side of the container supporter **460**. For this, the link member includes a top coupler **501** rotatably coupled with the lower side of the cover, and a bottom coupler **502** having a first end rotatably coupled with a second end of the top coupler and a second end rotatably coupled with the lower side of the container supporter.

Contrary to the above statement, the link member **500** may include a soft string **503**. The link member **500** becomes parallel to the cover for supporting weight of the container supporter having the container when the container supporter is rotated downward to be perpendicular to the outer wall of the outer case for discharging the ice.

The container supporter **460** is automatically rotated. For this, the container supporter **460** includes a rotating axis **461** provided horizontally at an end coupled with the outer wall of the outer case, a driven gear **462** provided at the rotating axis, and a driving gear **463** mated with the driven gear for driving the driven gear.

The dispenser of the icemaker with the structure mentioned above is operated as follows. First, when the user wants the ice and presses the ejection button of the controller, the container supporters (**400**, **450**, **460**) are provided to be perpendicular to the front surface of the door of the refrigerator.

For this, the container supporter **400** in the first embodiment of the present invention is withdrawn to the front surface of the door by the rotation of the pinion and the container supporters **450** and **460** in the second and fourth embodiments are rotated downward by the driving gear to be perpendicular to the front surface of the door.

Next, when the ice chute **300** and **350** are opened, the ice is discharged outside and received into the container provided on top of the container supporter. Then, the user takes the ice to put in a beverage or in food. The opening process of the ice chute is described above and a detailed description will be omitted.

When the ice is discharged as much as the user needs, the container supporter is inserted into the inside of the groove provided at the door or is rotated upward by the driving gear, and adhered to the front surface of the door to be horizontal

thereto in accordance with the present embodiment. Then, the container supporter or the cover closes the outlet of the ice chute.

Effects of the present invention with above mentioned structure is summarized as follows. First, a space taken by the container supporter or the ice chute is minimized and an inner space of the refrigerator or an apparatus with an ice-discharging function is maximized in accordance with the present invention.

Second, the space taken by the container supporter of the ice chute is minimized and the total size of the refrigerator or the apparatus with an ice-discharging function is minimized in accordance with the present invention.

Third, the outlet of the ice chute provided on the ice discharging passage is completely closed when the ice is not discharged in order to prevent the dirt from being collected on the passage in accordance with the present invention.

Fourth, the external appearance is improved because the ice chute and the container supporter are not projected outside or caved-in in accordance with the present invention.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A dispenser for an appliance comprising:

a water dispensing assembly comprising a chute through which water is discharged; and

a container support provided at an outer casing and configured to be perpendicular to an outer surface of the outer casing when water is discharged through the chute, the container support being configured to allow a container received thereon to receive water discharged through the chute,

wherein the container support is retractable into a wall of the outer casing.

2. The dispenser of claim **1**, wherein the container support comprises:

a rack provided at a bottom surface of the container support; and

a pinion provided beneath the rack and engaged with the rack.

3. The dispenser of claim **2** further comprising a motor configured to rotate the pinion to move the container support by engagement of the rack and pinion.

4. The dispenser of claim **1** wherein the container support and at least a portion of the water dispensing assembly are configured for coordinated movement between advanced and retracted positions.

5. The dispenser of claim **1** further comprising a motor configured to move the container support.

6. The dispenser of claim **1** wherein the water dispensing assembly is configured to dispense liquid.

7. The dispenser of claim **1** wherein the water dispensing assembly is configured to dispense ice.

8. The dispenser of claim **1** wherein the water dispensing assembly is configured to dispense liquid and ice simultaneously.

9. The dispenser of claim **1** wherein the water dispensing assembly is configured to dispense water irrespective of a position of the container support.

10. A dispenser for an appliance comprising:

a water dispensing assembly configured to move, such that an outlet of the water dispensing assembly is positioned outside an outer surface of a door of an appliance in at least one position of water dispensing assembly movement; and

a container support configured to extend along a plane perpendicular to the door such that the container support is configured for movement between a withdrawn and an extended position, the container support being configured to, in the extended position, support a container being filled by the water dispensing assembly when the outlet of the water dispensing assembly is positioned outside an outer surface of the door.

11. The dispenser of claim **10** further comprising:

a first mechanical drive mechanism configured to move the water dispensing assembly; and

a second mechanical drive mechanism configured to extend the container support along a plane perpendicular to the door between the withdrawn and extended positions,

wherein the second mechanical drive mechanism is configured to extend the container support along a plane perpendicular to the door prior to the first mechanical drive mechanism moving the water dispensing assembly to a position at which the outlet of the water dispensing assembly is positioned outside an outer surface of the door.

12. The dispenser of claim **11** wherein the first mechanical drive mechanism and the second mechanical drive mechanism are activated by a single input device.

13. The dispenser of claim **10** wherein the movement of the water dispensing assembly is independent from the movement of the container support.

14. The dispenser of claim **10** further comprising a mechanical drive mechanism configured to extend the container support along a plane perpendicular to the door between the withdrawn and extended positions.

15. The dispenser of claim **14** wherein the mechanical drive mechanism includes a spring.

16. The dispenser of claim **14** wherein the mechanical drive mechanism includes an oil pressure assembly.

17. The dispenser of claim **14** wherein the mechanical drive mechanism includes a motor.

18. The dispenser of claim **17** wherein the container support includes a rack and the motor is configured to rotate a pinion mated with the rack.

19. The dispenser of claim **14** wherein the mechanical drive mechanism is configured to retract the container support along a plane perpendicular to the door between the withdrawn and extended positions.

20. The dispenser of claim **10** further comprising a mechanical drive mechanism configured to move the water dispensing assembly.

21. The dispenser of claim **20** wherein the mechanical drive mechanism includes a spring.

22. The dispenser of claim **20** wherein the mechanical drive mechanism includes an oil pressure assembly.

23. The dispenser of claim **20** wherein the mechanical drive mechanism includes a motor.

24. The dispenser of claim **23** wherein the water dispensing assembly includes a rack and the motor is configured to rotate a pinion mated with the rack.

25. The dispenser of claim **10** wherein the outlet of the water dispensing assembly is not exposed when the outlet of the water dispensing assembly is positioned inside an outer surface of the door.

26. The dispenser of claim **10** wherein the water dispensing assembly is configured to dispense liquid.

27. The dispenser of claim 10 wherein the water dispensing assembly is configured to dispense ice.

28. The dispenser of claim 10 wherein the water dispensing assembly includes a sliding member and an end portion of a water supply pipe attached to the sliding member.

29. The dispenser of claim 28 wherein the water supply pipe extends when the outlet of the water dispensing assembly is positioned outside an outer surface of the door.

30. The dispenser of claim 10 wherein the water dispensing assembly includes a sliding member and an ice chute.

31. The dispenser of claim 30 wherein the ice chute communicates with a second ice chute extending from an icemaker when the outlet of the water dispensing assembly is positioned outside an outer surface of the door, the second ice chute and the icemaker remaining inside the outer surface of the door.

32. The dispenser of claim 10 wherein the outlet of the water dispensing assembly includes an outlet of a water supply pipe.

33. The dispenser of claim 10 wherein the outlet of the water dispensing assembly includes an outlet of an ice chute.

34. The dispenser of claim 10 wherein the water dispensing assembly is configured to move about a plane perpendicular to the door of the appliance.

35. The dispenser of claim 10 wherein the water dispensing assembly is configured to dispense liquid and ice simultaneously.

36. A dispenser for an appliance comprising:

a movable member;

a water supply mechanism attached to the movable member; and

a mechanical drive mechanism configured to, upon activation of a user control, apply force other than supplied by a user to motivate movement of the movable member from a first position at which an outlet of the water supply mechanism is positioned behind a plane representing an outer surface of a door of an appliance to a second position at which the outlet of the water supply mechanism is positioned in front of the plane representing the outer surface of the door.

37. The dispenser of claim 36 wherein the mechanical drive mechanism includes a spring.

38. The dispenser of claim 36 wherein the mechanical drive mechanism includes an oil pressure assembly.

39. The dispenser of claim 36 wherein the mechanical drive mechanism includes a motor.

40. The dispenser of claim 39 wherein the movable member includes a rack and the motor is configured to rotate a pinion mated with the rack.

41. The dispenser of claim 36 further comprising a container support configured to extend along a plane perpendicular to the door.

42. The dispenser of claim 41 wherein the container support in an extended position is configured to support a container being filled when the movable member is in the second position.

43. The dispenser of claim 36 wherein the water supply mechanism is configured to dispense liquid.

44. The dispenser of claim 36 wherein the water the water supply mechanism is configured to dispense ice.

45. The dispenser of claim 36 wherein the water supply mechanism is configured to dispense liquid and ice simultaneously.

46. The dispenser of claim 36 wherein the outlet of the water supply mechanism includes an outlet of a water supply pipe.

47. The dispenser of claim 36 wherein the outlet of the water supply mechanism includes an outlet of an ice chute.

48. The dispenser of claim 36 wherein the mechanical drive mechanism is configured to apply force to the movable member to motivate movement of the movable member about a plane perpendicular to the door of the appliance.

49. A dispenser for an appliance comprising:

a water dispensing assembly;

first moving means for moving the water dispensing assembly between a position at which an outlet of the water dispensing assembly is positioned outside an outer surface of a door of an appliance and at least one another position;

a container support; and

second moving means for moving the container support along a plane perpendicular to the door between a withdrawn and an extended position,

the container support configured to support a container being filled by the water dispensing assembly when the first moving means moves the water dispensing assembly to the position at which the outlet of the water dispensing assembly is positioned outside the outer surface of the door of the appliance and the second moving means moves the container support to the extended position.

50. The dispenser of claim 49 wherein the second moving means moves the container support to the extended position prior to the first moving means moving the water dispensing assembly to the position at which the outlet of the water dispensing assembly is positioned outside the outer surface of the door of the appliance.

51. The dispenser of claim 49 further comprises a single user input for activating the first moving means and the second moving means.

52. The dispenser of claim 49 wherein the movement of the first moving means is independent from the movement of the second moving means.

53. The dispenser of claim 49 wherein the water dispensing assembly dispenses liquid.

54. The dispenser of claim 49 wherein the water dispensing assembly dispenses ice.

55. The dispenser of claim 49 wherein the water dispensing assembly dispenses liquid and ice simultaneously.

56. The dispenser of claim 49 wherein the first moving means moves the water dispensing assembly about a plane perpendicular to the door of the appliance.

57. A dispenser for an appliance comprising:

a movable member;

a water supply mechanism attached to the movable member; and

a user input for enabling activation of the user input, applying a force to motivate movement of the movable member from a first position at which an outlet of the water supply mechanism is positioned behind a plane representing an outer surface of a door of an appliance to a second position at which the outlet of the water supply mechanism is positioned in front of the plane representing the outer surface of the door, the force applied by the positioning means being other than the force input by the user to the user input.

58. The dispenser of claim 57 further comprising a container support.

59. The dispenser of claim 58 further comprising means for moving the container support along a plane perpendicular to the door.

60. The dispenser of claim 59 wherein the container support supports a container being filled when the movable member is moved by the positioning means to the second position.

61. The dispenser of claim 57 wherein the water supply mechanism dispenses liquid.

62. The dispenser of claim 57 wherein the water supply mechanism dispenses ice.

63. The dispenser of claim 57 wherein the water supply mechanism dispenses liquid and ice simultaneously.

64. The dispenser of claim 57 wherein the positioning means applies force to motivate movement of the movable member about a plane perpendicular to the door of the appliance.

65. A method of filling a container with water using a dispenser of an appliance, the method comprising:

extending a container support along a plane perpendicular to a door of an appliance from a withdrawn position to an extended position;

placing a container on the container support when the container support is in the extended position;

moving a water dispensing assembly to a position at which an outlet of the water dispensing assembly is outside of an outer surface of the door of the appliance; and

enabling the water dispensing assembly to dispense water into the container.

66. The method of filling a container of claim 65 wherein extending a container support along a plane perpendicular to a door of an appliance from a withdrawn position to an extended position includes manually moving the container support along the plane perpendicular to the door of the appliance from the withdrawn position to the extended position.

67. The method of filling a container of claim 65 wherein extending a container support along a plane perpendicular to a door of an appliance from a withdrawn position to an extended position includes activating an input device to cause a mechanical drive mechanism to move the container support along the plane perpendicular to the door of the appliance from the withdrawn position to the extended position.

68. The method of filling a container of claim 67 wherein by activating the input device to cause the mechanical drive mechanism to move the container support, a force is generated in excess of a force applied by a user.

69. The method of filling a container of claim 65 wherein moving a water dispensing assembly includes manually moving the water dispensing assembly.

70. The method of filling a container of claim 65 wherein moving a water dispensing assembly includes activating an input device to cause a mechanical drive mechanism to move the water dispensing assembly.

71. The method of filling a container of claim 70 wherein by activating the input device to cause the mechanical drive mechanism to move the water dispensing assembly, a force is generated in excess of a force applied by a user.

72. The method of filling a container of claim 65 wherein extending a container support along a plane perpendicular to a door of an appliance from a withdrawn position to an extended position and moving a water dispensing assembly include activating a single input device to cause a first mechanical drive mechanism to move the container support and a second mechanical drive mechanism to move the water dispensing assembly.

73. The method of filling a container of claim 72 wherein the first mechanical drive mechanism is configured to move the container support prior to the second mechanical drive mechanism moving the water dispensing assembly.

74. The method of filling a container of claim 65 wherein enabling the water dispensing assembly to dispense water into the container includes enabling the water dispensing assembly to dispense liquid into the container.

75. The method of filling a container of claim 65 wherein enabling the water dispensing assembly to dispense water into the container includes enabling the water dispensing assembly to dispense ice into the container.

76. The method of filling a container of claim 65 wherein enabling the water dispensing assembly to dispense water into the container includes enabling the water dispensing assembly to dispense liquid and ice into the container simultaneously.

77. The method of filling a container of claim 65 wherein extending a container support along a plane perpendicular to a door of an appliance from a withdrawn position to an extended position is performed before moving a water dispensing assembly to a position at which an outlet of the water dispensing assembly is outside of an outer surface of the door of the appliance.

78. The method of filling a container of claim 65 wherein extending a container support along a plane perpendicular to a door of an appliance from a withdrawn position to an extended position is performed after moving a water dispensing assembly to a position at which an outlet of the water dispensing assembly is outside of an outer surface of the door of the appliance.

79. The method of filling a container of claim 65 wherein placing a container on the container support when the container support is in the extended position is performed before moving a water dispensing assembly to a position at which an outlet of the water dispensing assembly is outside of an outer surface of the door of the appliance.

80. The method of filling a container of claim 65 wherein placing a container on the container support when the container support is in the extended position is performed after moving a water dispensing assembly to a position at which an outlet of the water dispensing assembly is outside of an outer surface of the door of the appliance.

81. The method of filling a container of claim 65 further comprising retracting the container support along the plane perpendicular to the door of the appliance from the extended position to the withdrawn position.

82. The method of filling a container of claim 65 further comprising moving the water dispensing assembly to a position at which an outlet of the water dispensing assembly is inside of the outer surface of the door of the appliance.

83. A method of manufacturing a dispenser for an appliance, the method comprising:

attaining a water dispensing assembly;

configuring the water dispenser assembly with an outlet that is positioned outside of an outer surface of a door of an appliance and that is movable between at least two water dispensing positions;

attaining a container support; and

configuring the container support to extend along a plane perpendicular to the door such that the container support is configured for movement between a withdrawn and an extended position, the container support being configured to, in the extended position, support a container being filled by the water dispensing assembly when the outlet of the water dispensing assembly is positioned outside an outer surface of the door.

84. A method of manufacturing a dispenser for an appliance, the method comprising:

attaining a movable member;

attaining a water supply mechanism;

attaching the water supply mechanism to the movable member;

attaining a mechanical drive mechanism;

attaining a user control; and

configuring the mechanical drive mechanism to, upon activation of the user control, apply a force other than supplied by a user to motivate movement of the movable member from a first position at which an outlet of the water supply mechanism is positioned behind a plane representing an outer surface of a door of an appliance to a second position at which the outlet of the water supply mechanism is positioned in front of the plane representing the outer surface of the door.

85. The method of manufacturing a dispenser for an appliance of claim **84** wherein the mechanical drive mechanism applies a force greater than a force imparted by a user activating the user control.

* * * * *

EXHIBIT B

US006834922B2

(12) **United States Patent**
Cho

(10) **Patent No.: US 6,834,922 B2**
(45) **Date of Patent: Dec. 28, 2004**

(54) **VEGETABLE COMPARTMENT IN REFRIGERATOR**

(75) Inventor: **Seok Hyun Cho**, Changwon-shi (KR)

(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

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(51) **Int. Cl.**[7] **A47B 88/00**
(52) **U.S. Cl.** **312/331**; 312/330.1; 312/408
(58) **Field of Search** 312/330.1, 333, 312/295, 310, 401, 402, 408, 331

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(57) **ABSTRACT**

A refrigerator compartment having a drawer-type container includes an opening in a top side thereof, and a first rail at a side surface thereof having sloped and horizontal parts. A partition member on the container has a first plate, a second plate, and a link member. The second plate covers an area of the opening of the container, and the first plate is connected to the second plate such that the first plate can pivot relative to the second plate. The link member extends from the first plate and contacts the first rail, for lifting the first plate as the link member moves up the sloped part of the first rail when the container is pulled out. The accessible area of the opening of the container is enlarged as the first plate moves up when the container is pulled out.

24 Claims, 5 Drawing Sheets

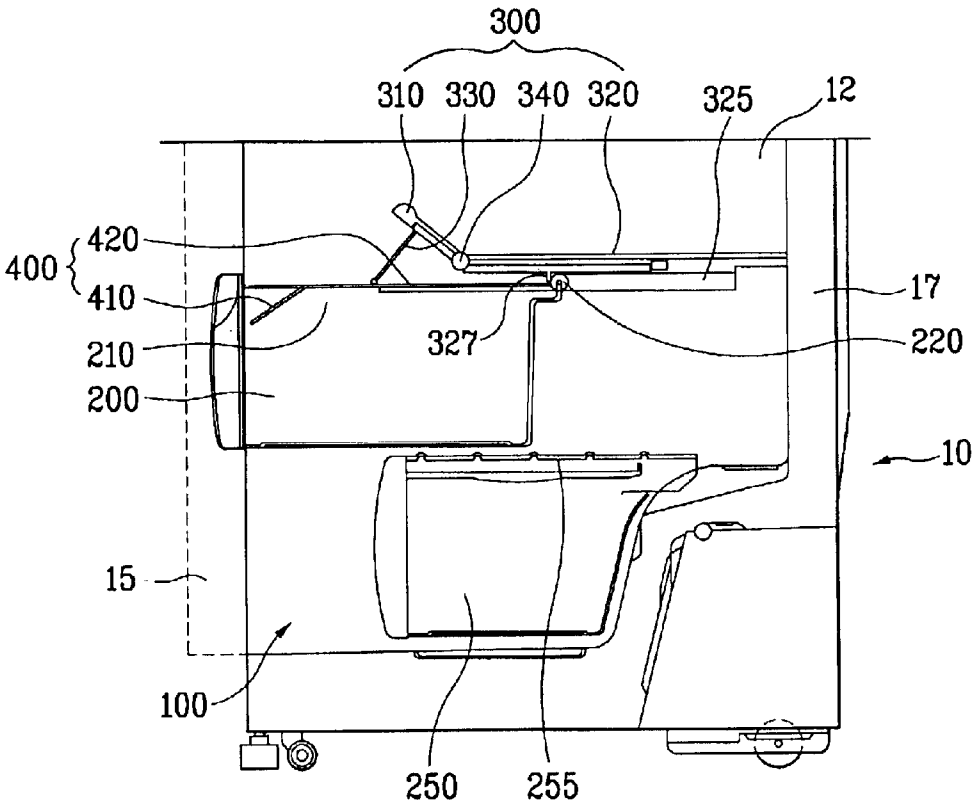


FIG.1

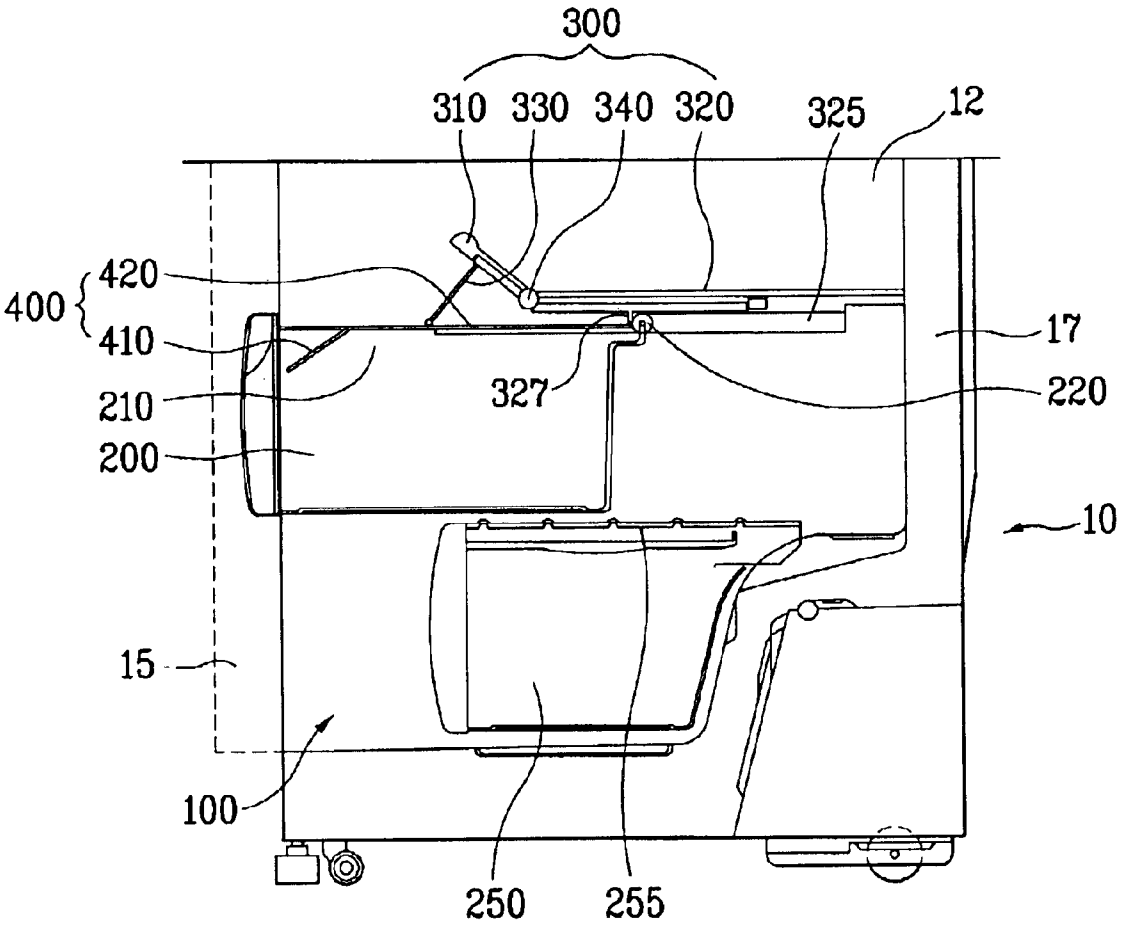

300
310
330
340
320
325
12
400
420
410
210
200
327
17
220
10
15
100
250
255

FIG. 2

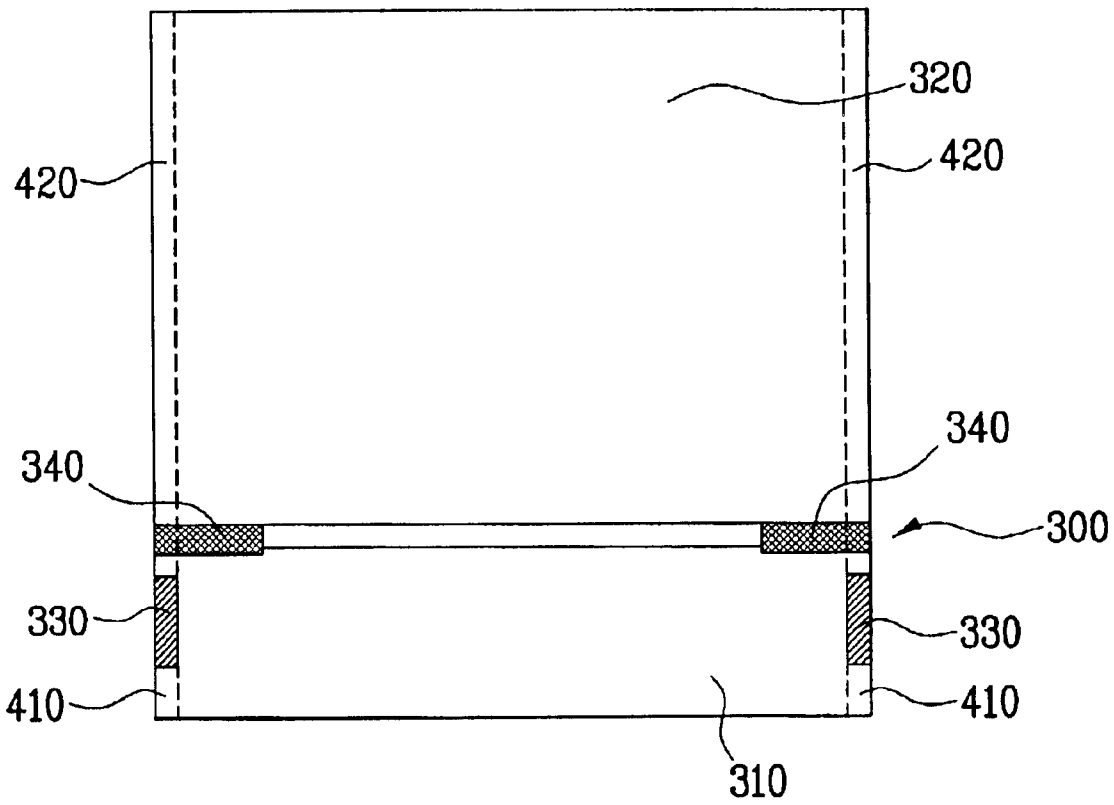


FIG. 3A

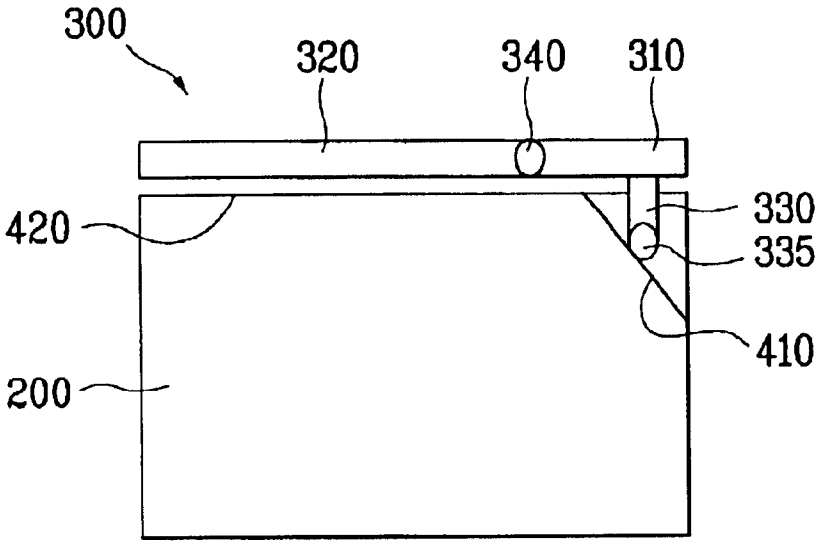

300
320
340
310
330
335
420
410
200

FIG. 3B

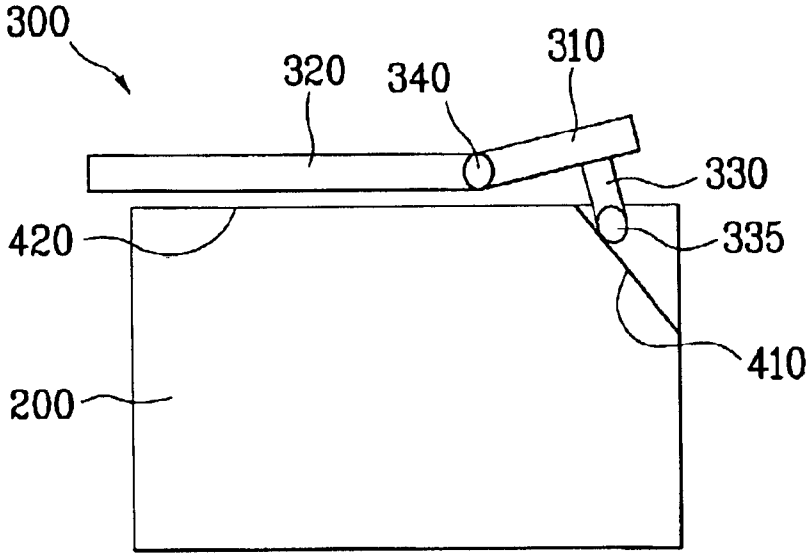

300
320
340
310
330
335
420
410
200

FIG. 3C

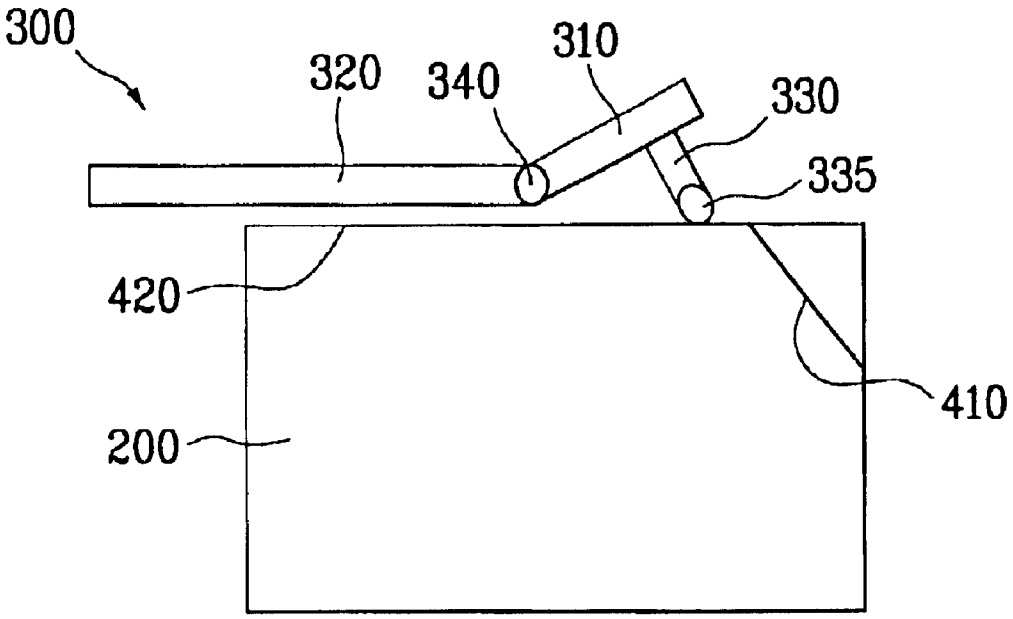
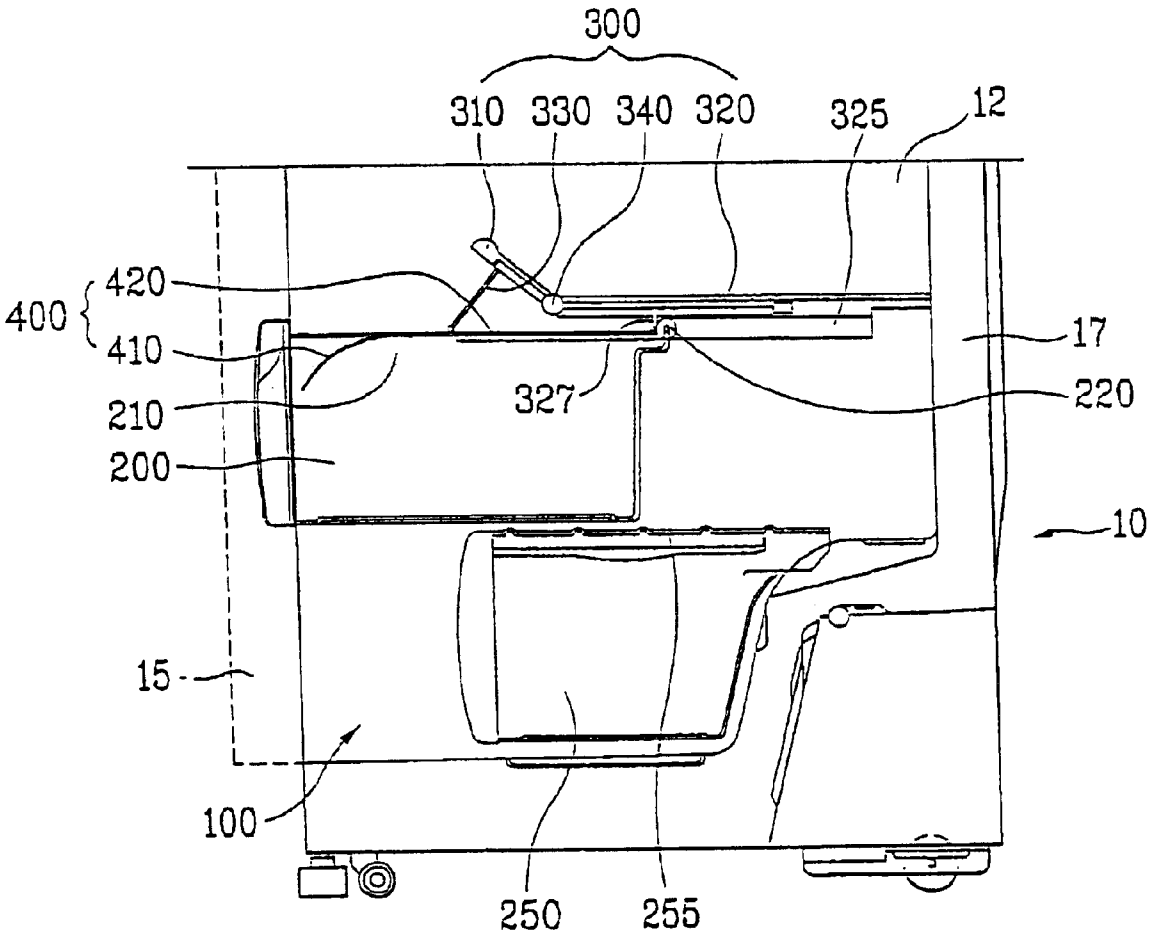


FIG. 4


300
310
330
340
320
325
12
400
420
410
210
200
327
17
220
10
15
100
250
255

VEGETABLE COMPARTMENT IN REFRIGERATOR

This application claims the benefit of the Korean Application No. P2002-22549 filed on Apr. 24, 2002, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a vegetable compartment in a refrigerator for fresh storage of vegetable.

2. Background of the Related Art

The refrigerator is an appliance for fresh, and long time storage of food. The refrigerator is provided with food storage chambers therein, which is always kept at a low temperature by means of a refrigerating cycle for maintaining a fresh state of the food.

The food storage chambers are provided with different characteristics so that the user selects a storage method suitable for different kinds of food taking kinds, characteristics and storage periods of the food into account. Of the food storage chambers, typical ones are the freezing chamber, the refrigerating chamber, and the vegetable compartment.

Of the storage chambers, the vegetable compartment is provided with optimal temperature and humidity for fresh storage of vegetable having a storage period shorter than processed food, always. The vegetable compartment is an independent space partitioned with a partition in the refrigerating chamber which is in general at a low temperature. A related art vegetable compartment in the refrigerator will be described.

The related art vegetable compartment in the refrigerator is a separate space partitioned from other space of the refrigerating chamber by a partition plate, also serving as a shelf, on a lower side of the refrigerating chamber. The vegetable compartment is provided with a container, top of which is opened, for putting vegetable therein. Since the container is right below the partition plate, the partition plate actually serves as a cover of the container, for covering the opened top side of the container.

For using the vegetable compartment, the user is required to open a door to the refrigerator, pull out the container, and put vegetable into the container through an inlet to the container, i.e., a part not covered with the partition plate of the opened top part of the container. However, if the container is pulled out longer than a predetermined length from the vegetable compartment, a bottom plate of the vegetable compartment can not support the contained. Therefore, for preventing the container from falling off the vegetable compartment, it is required that the pulling out length of the container is limited. However, the limitation of the pulling out length of the container substantially reduces a size of the inlet to the vegetable compartment too, which disables storage of large sized vegetable storage.

In the meantime, if it is intended to store large sized vegetable by all means, the user is required to cut the vegetable into pieces, or remove the partition plate, put the vegetable into the container and place the partition plate again.

However, the cutting of vegetable deteriorates freshness of the vegetable and can not keep proper tastes of the vegetable.

In the case of removal of the partition plate, since the partition plate also serves as a shelf, it is required to remove all the food stored on the partition plate, remove the partition plate, put the vegetable into the container, and return the partition plate and the food to original positions, which is very cumbersome.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a vegetable compartment in a refrigerator that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a vegetable compartment in a refrigerator, in which an inlet structure of a container is improved for convenient putting of large sized vegetable into the container.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the vegetable compartment in a refrigerator includes a container, a guide member, and a partition member. The container has an opening in a top side for pushing in or pulling out of the refrigerator. The guide member is fitted to the container along a direction the container is pushed in or pulled out and has a sloped part adjacent to a door of the refrigerator, which is sloped such that the sloped part becomes the higher as it goes in a direction the container is pushed in. The partition member in the refrigerator for covering a top of the container has a first plate adjacent to the door for enlarging an opened area of the opening as the first plate moves up guided by the sloped part when the container is pulled out.

The guide member includes, for an example, at least one first rail fitted to a side surface of the container. The guide member includes, for an example, the sloped part, and a horizontal part extended from an end at a high side of the sloped part to a direction the container is pushed in.

The sloped part includes a moderate straight slope rising along a direction the container is pushed in, or a moderate curved slope rising along a direction the container is pushed in. The first rail is fitted to each of opposite side surfaces of the container.

The partition member includes, for an example, a second plate, a first plate, and a link member. The second plate provided to be pushed in or pulled out of the refrigerator, for covering a part of the opening of the container. The first plate connected to the second plate, such that the first plate can make relative motion with respect to the second plate, for enlarging the opened area of the opening when the container is pulled out. The link member extended a predetermined length from the first plate such that a part thereof is in contact with the first rail, for moving up or down the first plate when the container is pushed in or pulled out, respectively. The first plate and the second plate are coupled with a hinge, or connected with a connection member of a flexible material.

The partition member further includes, for an example, a second rail fitted to an underside of the first plate for making smooth sliding in a state a part of the container is in contact therewith when the container is pushed in or pulled out. In this instance, the container further includes, for an example, a second roller for making a contain movement smooth as the second roller is in contact with the second rail and slides thereon.

The partition member further includes, for an example, a stopper at an end of the second rail for preventing the second roller from failing off the second rail and limiting a maximum pulling out range of the container when the container is pulled out to the maximum.

The link member is, for an example, in contact with the guide member, and includes, for an example, a first roller for reducing friction between the guide member and the link member as the first roller rotates when the container is pushed in or pulled out.

The vegetable compartment in a refrigerator of the present invention further includes a supplementary contained under the container for pushing in or pulling out of the refrigerator.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

In the drawings:

FIG. **1** illustrates a section showing one preferred embodiment of the present invention, schematically;

FIG. **2** illustrates a plan view of a vegetable compartment in FIG. **1**, schematically;

FIGS. **3**A~**3**C illustrate the steps of a process for pulling out the container from the vegetable compartment in FIG. **1**, schematically; and

FIG. **4** illustrates a section showing an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. In describing the embodiments, same parts will be given same names and reference symbols, and repetitive description of which will be omitted.

Referring to FIG. **1**, the vegetable compartment of the present invention is a separate space partitioned from a refrigerating chamber **12** with a partition member **300** provided to the refrigerating chamber **12** in a refrigerator **10**. The vegetable compartment **100** includes a container **200**, a guide member, and the partition member **300**.

An embodiment will be described in detail, in which the vegetable compartment is provided under the refrigerating chamber **12**, with reference to FIG. **1**. However, a position of the vegetable compartment **100** is not limited to under the refrigerating chamber **12**, but may be a separate space partitioned with the partition member **300** and the container **200** in a middle part of the refrigerating chamber **12**, if necessary. A detailed structure of the vegetable compartment is as follows.

Referring to FIG. **1**, the container **200** is provided to be pushed in and pulled out of the refrigerator **10**. The container has an opening **210** in a top side for putting/taking out vegetable.

In the meantime, the refrigerator designed to have a small capacity of the vegetable compartment **100** is provided with, for an example, one container **200**, and the refrigerator designed to have a large capacity of the vegetable compartment **100** is provided with, for an example, a supplementary container **250** additionally as shown in FIG. **1**. Of course, the supplementary container **250** has an opening in a top side, and, for maintaining freshness of the vegetable stored in the supplementary container **250**, there is a cover **255** provided to the opening of the supplementary container **250** additionally for covering the opening of the supplementary container **250**. A number of the supplementary containers provided thus are not limited.

The container **200** or the supplementary container **250** may be one piece or two or more pieces.

FIG. **1** illustrates an embodiment in which a guide member is a rail. However, the guide member is not limited to the rail, and the rail provided as the guide member is called as a first rail for convenience of description.

The first rail **400** provided as the guide member is provided to side surfaces of the container **200**, for an example, inside or outside surfaces of the side surfaces of the container **200** along a direction the container **200** is pushed in or pulled out. One first rail may be provided to one of the side surfaces of the container **200**, or one pair of the first rails may be provided to the side surfaces of the container **200**.

The first rail provided thus includes a sloped part **410** and a horizontal part **420**. As shown in FIG. **1**, the sloped part **410** is provided to a part adjacent to the door **15** of the refrigerator **10** in the side surfaces of the container **200**. The sloped part **410** is provided such that a horizontal height thereof becomes the higher as it goes the farther in a direction the container **200** is pushed in, in a direction of a rear wall **17** of the refrigerator **10** in a case of the embodiment shown in FIG. **1**.

Referring to FIG. **1**, the sloped part **410** of the first rail **400** provided thus has a moderate straight slope rising in a direction the container **200** is pushed in. However, the sloped part **410** is not limited to this, but may have a moderate curved sloped part **410** in the direction the container **200** is pushed in, for example, as shown in FIG. **4**.

Referring to FIG. **1**, the horizontal part **420** of the first rail **400** is extended a predetermined distance from one end of the sloped part **410**, in more detail, from one of ends of the sloped part **410** at a side a horizontal height is higher toward the direction the container **200** is pushed in.

Referring to FIG. **1**, the partition member **300**, provided to be pushed in/pulled out of the refrigerating chamber **12**, partitions the vegetable compartment **100** from the refrigerating chamber **12**. For supporting the partition member **300** in a state the partition member **300** is inserted in the refrigerating chamber **12**, ledges (not shown) are projected from both sides of inside walls of the refrigerating chamber **12** in the refrigerator **10** along the direction the partition member **300** is inserted. Therefore, the partition member **300** is supported in a state both edges of the partition members **300** are placed on the ledges.

The partition member **300** serves, not only as a partition for separating the refrigerating chamber **12** from the vegetable compartment, but also as a shelf. That is, in a case of the embodiment shown in FIG. **1**, since an upper space of the partition member **300** is the refrigerating chamber **12**, if food is placed on the partition member **300**, the partition member **300** serves as a shelf of the refrigerating chamber **12**.

Moreover, since the partition member **300** is on top of the container **200**, the partition member **300** covers the opening **210** of the container **200**, serving to form an inside space of the container **200** as an independent space.

The partition member **300** with the foregoing services includes a first plate **310**, a second plate **320**, and a link member **330**, of which details are as follows.

Referring to FIG. **1**, the second plate **320**, provided to be pushed in or pulled out of the refrigerating chamber **12**, covers a part of the opening **210** of the container **200**, i.e., a region adjacent to the rear wall **17** of the refrigerator **10**. Since the second plate **320** serves as a shelf in a state inserted into the refrigerating chamber **12** fully, the second plate **320** has a flat top surface. It is preferable that the second plate **320** is fitted such that the second plate **320** does not move together with the container **200** when the container **200** is pulled out or pushed in.

The first plate **310** is connected to an end of the second plate **320** adjacent to the door **15** to the refrigerator **10**, such that the first plate **310** can make relative motion with respect to the second plate **320**. The first plate **310** and the second plate **320** are connected with a hinge **340** or a connecting member (not shown) of a flexible plastic. The connecting member includes a first end connected to the first plate **310** and a second end connected to the second plate **2**.

Referring to FIG. **2**, one pair of the hinges **340** or the connection members (not shown) may be provided for connecting both sides of a width direction of the first plate **310** or the second plate **320**. However, the connection method is not limited to this, but one the hinge **340** or the connection member can be provided to connect a middle part of the width direction of the first plate and the second plate **320**. Moreover, a plurality of the hinges **340** or the connection members may be provided at regular or irregular intervals along a width direction of the first plate **310** and the second plate **320**.

Once the first plate **310** and the second plate **320** are connected with the hinge or the flexible connection member, the first plate **310** becomes rotatable with respect to the second plate **320** around the hinge or the connection member. As shown in FIG. **1**, once the first plate **310** has the foregoing structure, the first plate **310** can enlarge an opened area of the opening **210** as an end of the first plate **310** adjacent to the door **15** moves up guided by the sloped part **410** when the container **200** is pulled out, and the first plate **310** can cover an opened area of the opening **210** fully as the end of the first plate **310** adjacent to the door **15** moves down guided by the sloped part **410** when the container **200** is pushed in.

In the meantime, when the container **200** is pushed in, or pulled out, the first plate **310** moves down or up as the first plate **310** rotates around the hinge. Therefore, no food is placed on the first plate **310**, and, consequently, different form the second plate **320**, the first plate **310** does not serve as a shelf.

Referring to FIG. **1**, the link member **330** is extended from the first plate **310** for a predetermined length, for an example, such that an end thereof is in contact with the guide member, in the case of the first embodiment, the first rail **400**. When one first rail **400** is provided, one link member **330** is extended from the first plate **310** so as to contact with the first rail **400**. As shown in FIG. **2**, when one pair of the first rails **400** are provided, one pair of the link members **330** are extended from the first plate **310** and in contact with the first rails **400**, respectively.

A part where the link member **330** and the first plate **310** are joined are rigid unable to make a relative motion. The link member **330** and the first plate **310** may be attached after the link member **330** and the first plate **310** are fabricated as individual pieces, or may be formed as one unit.

If the link member **330** is extended from the first plate as above, the link member **330** and the first plate **310** are always movable altogether. That is, since the link member **330** is always in contact with the first rail **400** as above, the link member **330** moves up or down guided by the sloped part **410** and the horizontal part **420** of the first rail **400** when the container **200** is pushed in, or pulled out, according to which the first plate **310** rigidly joined with the link member **330** moves up or down as the first plate **310** rotates around the hinge **340**. According to this, as shown in FIG. **1**, when the container **200** is pulled toward the door side, the first plate **310** is lifted as the first plate **310** rotate upward, to enlarge an opening of the container **200**, i.e., an opened area of the opening **210** actually. When the container **200** is pushed toward the rear wall **17** of the refrigerator **10**, the link member **330** is moved down guided by the sloped part **410**, and the first plate **310** is restored to an original position.

Meanwhile, the link member **330** may be provided with a roller for reducing friction with the guide member and making smooth relative motion between two members. For convenience of description, the roller provided to the link member **330** is called as a first roller **335**.

The first roller **335** is provided to a contact part with the guide member, for an example, a contact part with the first rail **400** in the case of the embodiment shown in FIG. **1**. In the case of FIG. **1**, the first roller **335** is provided to an end of the link member **330**. The first roller **335** provided thus keeps contact with the guide member, the first rail **400** in the case of the embodiment in FIG. **1**, and rotates when the container is pulled out or pushed in, to reduce friction between the first rail **400** and the link member **330**.

In the meantime, the vegetable compartment of the present invention is provided with a structure for making the pushing in and pulling out of the container **200** smooth. To do this, the partition member **300** includes a rail, and the container **200** includes a roller, further. For convenience of description, the rail provided to the partition member **300** is called as a second rail **325**, and a rail provided to the container **200** is called as a second roller **220**.

Referring to FIG. **1**, the second rail **325** is fitted to an underside of the partition member **300**, in more detail, underside of the second plate **320**. The second rail **325** is fitted in the direction the container **200** is pushed in or pulled out, for guiding relative motion of the partition member **300** and the second plate **320** by designing a part of the container **200**, for an example, the second roller **220**, to slide smoothly in a state the second roller **220** is in contact with the second rail **325** when the container **200** is pushed in or pulled out.

The second roller **220** is provided to one side of the container **200**, for an example, to a top side of the container **200** as shown in FIG. **1**. The roller **220** is provided to, for an example, the top side of an end of the container **200** adjacent to the rear wall **17** of the refrigerator **10**, for smooth guidance of the relative motion of the container **200** and the partition member **300** as the second roller **220** is in contact with, and slides on the second rail **325**.

The vegetable compartment **100**, having the structure for making smooth relative motion of the partition member **300** and the container **200** by means of the roller and the rail, further includes means for limiting a pulling out range of the container **200** while preventing falling off of the container **200**. For this, the partition member **300** further includes a stopper **327**.

Referring to FIG. **1**, the stopper **327** is provided to an end of the second rail **325** adjacent to the door **15**, for limiting a maximum pulling out range of the container **200** while

preventing the second roller **220** from falling off the second rail **325** when the container **200** pulled out to the maximum.

The principle of enlargement/reduction of the opened area of the inlet to the container **200**, i.e., the opening **210** in using the vegetable compartment **100** will be described with reference to FIGS. **3**A~**3**B.

FIG. **3**A illustrates a configuration of the partition member **300** and the container **200** when the container **200** is pushed in the vegetable compartment fully. In the case of FIG. **3**A, the second plate **320** covers an area of the opening **210** in the container **200** in a state the second plate **320** is supported on the ledges on the inside wall of the refrigerating chamber **12**. The first roller **335** of the link member **330** is in contact with a lower part of the sloped part **410**, when the first plate **310** and the second plate **320** connected with the hinge **340** are leveled when seen from a side.

Under this state, if pulling out of the container **200** is started after the door **15** of the refrigerator **10** is opened, as shown in FIG. **3**B, the link member **330** moves up guided by the sloped part **410**, and, according to this, the first plate **310** rotates upward around the hinge **340**. When the first plate **310** rotates upward around the hinge **340**, the end of the first plate **310** adjacent to the door **15** is lifted, to enlarge the opened area of the inlet to the container **200**, i.e., the opening **210**, actually.

Then, as shown in FIG. **3**C, when the container **200** is pulled out further, the link member **330** comes from the sloped part **410** to the horizontal part **420**. After the link member **330** comes to the horizontal part **420** thus, only the container **200** is pulled out in a state the first plate **310** is left stationary.

When the container **200** is pulled out thus, since the first plate **310** moves up with a slope, to enlarge the opened area of the inlet of the container **200**, i.e., the opening **210**, even large sized vegetable can be put into the container **200** through the inlet of the container **200**.

After the vegetable is stored in the container **200**, the container **200** is pushed in toward the rear wall **17** of the refrigerator **10**. When the container **200** is pushed in, the link member **330** is guided by the horizontal part **420** of the first rail **400**, when the first plate **310** does not rotate. As the container **200** is pushed in further, the link member **330** comes from the horizontal part **420** to the sloped part **410**, when the first plate **310** rotates to move downward. As shown in FIG. **3**A, once the container **200** is pushed in fully, the first plate **310** is on the same plane with the second plate **320**, and the opening **210** of the container **200** is covered by the first plate **310** and the second plate **320**, fully.

The vegetable compartment **100** of the present invention enlarges the opened area of the opening **210** of the container **200** as the first plate **310** rotates upward around the hinge **340** when the container **200** is pulled out. The second plate **320** serves both as a shelf of the refrigerating chamber **12** and the cover on the opening **210** of the container **200**.

In the present invention, a size of an area serving as the shelf for placing food thereon, and a size of the enlargeable opened area of the container **200** are fixed by adjusting sizes of the second plate **320** and the first plate **310** when a size of the partition member **300** is the same.

In the meantime, when the size of the first plate **310** is the same, the enlargeable opened area of the container **200** is fixed depending on an upward maximum rotation angle of the first plate **310**. In this instance, the length of the link member **330** extended from the first plate **310**, and an angle between the link member **330** and the first plate **310**, a joint point of the link member **330** and the first plate **310**, and a position and a sloped angle of the sloped part **410** are taken into account in the design.

Since the vegetable compartment in a refrigerator of the present invention enlarges the opened area of the container as a part of the partition member rotates upward in pulling out the container, the vegetable can be put into the container conveniently, even large sized vegetable can be put in.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention.

For an example, the guide means for guiding the link member is not limited to the rail.

As one example, if a system is designed such that a rail like long projection is formed on an inside or outside surface of the container, and the link member is made to contact with a top of the projection, the system will serve as the guide means, adequately.

As another example, if a system is designed such that a long groove is formed in the inside or outside surface of the container, and a part of the link member, such as the first roller is placed thereon, so that the link member moves with respect to the container in a state the first roller is placed in the groove, the system will serve as the guide means, adequately.

Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A compartment for use in a refrigerator comprising:

a container having an opening in a top side, for alternately pushing in and pulling out of the refrigerator;

a guide member fitted to the container along a direction the container is pushed in or pulled out having a sloped part proximate to a door of the refrigerator, the sloped part sloped such that the sloped part becomes higher in a direction the container is pushed in; and

a partition member for at least partially covering the opening, having a first plate proximate to the door for enlarging an accessible area of the opening, wherein the first plate moves up guided by the sloped part when the container is pulled out.

2. The compartment as claimed in claim **1**, wherein the guide member includes at least one first rail fitted to a side surface of the container, wherein the first rail includes:

the sloped part, and

a horizontal part extended from an end at a high side of the sloped part to a direction the container is pushed in.

3. The compartment as claimed in claim **2**, wherein the first rail is fitted to each of opposite side surfaces of the container.

4. The compartment as claimed in claim **2**, wherein the sloped part includes a moderate straight slope rising along a direction the container is pushed in.

5. The compartment as claimed in claim **2**, wherein the sloped part includes a moderate curved slope rising along a direction the container is pushed in.

6. The compartment as claimed in claim **2** wherein the partition member includes a link member extended a predetermined length from the first plate such that a part thereof is in contact with the first rail, for moving up or down the first plate when the container is pushed in or pulled out, respectively.

7. The compartment as claimed in claim **6**, wherein the link member is in contact with the first rail, and includes a

first roller for reducing friction between the first rail and the link member as the first roller rotates when the container is pushed in or pulled out.

8. The compartment as claimed in claim **1**, wherein the partition member includes:

a second plate provided to be pushed in or pulled out of the refrigerator, for covering a part of the opening of the container,

the first plate connected to the second plate, such that the first plate can make relative motion with respect to the second plate, for enlarging the opened area of the opening when the container is pulled out, and

a link member extended a predetermined length from the first plate such that a part of the link member is in contact with the guide member, for moving the first plate downward when the container is pushed in and upward when the container is pulled out.

9. The compartment as claimed in claim **8**, wherein the first plate and the second plate are coupled with a hinge.

10. The compartment as claimed in claim **8**, wherein the first plate and the second plate are connected with a connection member of a flexible material, wherein the connection member includes:

a first end connected to the first plate, and

a second end connected to the second plate.

11. The compartment as claimed in claim **8**, wherein the link member includes a first roller for reducing friction between the guide member and the link member as the first roller rotates when the container is pushed in or pulled out.

12. The compartment as claimed in claim **8**, wherein the partition member includes a partition rail fitted to an underside of the first plate for making smooth sliding in a state a part of the container is in contact therewith when the container is pushed in or pulled out.

13. The compartment as claimed in claim **12**, wherein the container further includes a second roller for making a container movement smooth as the second roller is in contact with the partition rail and slides thereon.

14. The compartment as claimed in claim **13**, wherein the partition member further includes a stopper at an end of the partition rail for preventing the second roller from falling off the partition rail and limiting a maximum pulling out range of the container when the container is pulled out to the maximum.

15. The compartment as claimed in claim **1**, wherein the partition member further includes a partition rail fitted to an underside of the partition member, so that the container can make a smooth sliding in a state a part of the container is in contact with the partition rail in pushing in or puffing out of the container.

16. The compartment as claimed in claim **15**, wherein the container further includes a second roller for making a container motion smooth as the second roller is in contact with the partition rail and slides thereon.

17. The compartment as claimed in claim **16**, wherein the partition member further includes a stopper at an end of the partition rail for preventing the second roller from falling off the partition rail and limiting a maximum pulling out range of the container when the container is pulled out to the maximum.

18. The compartment as claimed in claim **1**, further comprising a supplementary container under the container for pushing in or pulling out of the refrigerator.

19. A compartment for storing items in a refrigerator comprising:

a container having an opening in a top side, for pushing in or pulling out of the refrigerator;

at least one first rail fitted to a side surface of the container having a sloped part adjacent to a door of the refrigerator, the sloped part being sloped such that the sloped part becomes higher in a direction the container is pushed in, and a horizontal part extended from an end at a high side of the sloped part to a direction the container is pushed in; and

a partition member including a second plate provided to be pushed in or pulled out of the refrigerator for covering a part of the opening of the container, and a first plate fitted to a part proximate to a door of the refrigerator, the first plate connected to the second plate, such that the first plate can make relative motion with respect to the second plate, for enlarging the uncovered area of the opening as the first plate moves up guided by the sloped part when the container is pulled out, and a link member extended a predetermined length from the first plate such that a part thereof is in contact with the first rail, for lowering and raising the first plate when the container is pushed in and pulled out, respectively.

20. The compartment as claimed in claim **19**, further comprising:

a second rail fitted to an underside of the partition member, so that the container can make a smooth sliding in a state a part of the container is in contact with the second rail in pushing in or pulling out of the container;

a second roller for making a container motion smooth as the second roller is in contact with the second rail; and

a stopper at an end of the second rail for preventing the second roller from falling off the second rail and limiting a maximum pulling out range of the container.

21. A storage compartment comprising:

a container having an access opening, wherein the container is configured to be displaceably disposed in a refrigerator;

a guide member formed on the container, the guide member including a first guide portion and a second guide portion, the first guide portion angled relative to the second guide portion, wherein the first guide portion is configured to be nearer than the second guide portion to a door-side of the refrigerator; and

a partition member configured to be positioned over the container, the partition member including a first plate to at least partially cover the access opening, the first plate configured to move according to the first guide portion to a propped position above the access opening by displacement of the container toward the door-side of the refrigerator.

22. The storage compartment of claim **21**, wherein the partition member further comprises a second plate to at least partially cover the access opening, wherein the first plate is configured to be nearer than the second plate to a door-side of the refrigerator, and wherein the first plate and the second plate are configured to be substantially planar when the container is in a stowed position.

23. The storage compartment of claim **21**, wherein the partition member further comprises at least one rail formed on an underside of the partition member, wherein the at least one rail rides along the guide member, and wherein the at least one rail causes the partition member to assume the propped position as the container is displaced toward the door-side of the refrigerator.

24. The storage compartment of claim **21**, further comprising a propping device having a first plate engagement portion and a guide member engagement portion, the guide member portion including a rotatable device that rides along the guide member.

* * * * *

EXHIBIT C

US007147292B2

(12) **United States Patent**
Lee et al.

(10) **Patent No.: US 7,147,292 B2**
(45) **Date of Patent: Dec. 12, 2006**

(54) **OBTURATOR FOR REFRIGERATOR**

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(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/232,571**

(22) Filed: **Sep. 3, 2002**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

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Jun. 4, 2002 (KR) 2002-31356

(51) **Int. Cl.**
E06B 7/16 (2006.01)

(52) **U.S. Cl.** **312/296**; 312/405; 49/492.1

(58) **Field of Classification Search** 312/405, 312/326, 327, 328, 329, 296; 49/489.1, 475.1, 49/498.1, 492.1
See application file for complete search history.

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Primary Examiner—Janet M. Wilkens
(74) *Attorney, Agent, or Firm*—Fleshner & Kim, LLP

(57) **ABSTRACT**

The present invention relates to an obturator for a refrigerator for cutting off heat or cool air transferred to and from a refrigerator. The present invention is comprised of a door gasket having an air bag that is transformed and rotated freely, and a projecting portion that is projected from at least one of the inner case and the refrigerator door liner, so that inflow of heat from outside or from a hot-line, into an inside of the refrigerator and leakage of the inside cool air of the refrigerator to the outside, are cut off or minimized and insulation performance is improved remarkably.

12 Claims, 12 Drawing Sheets

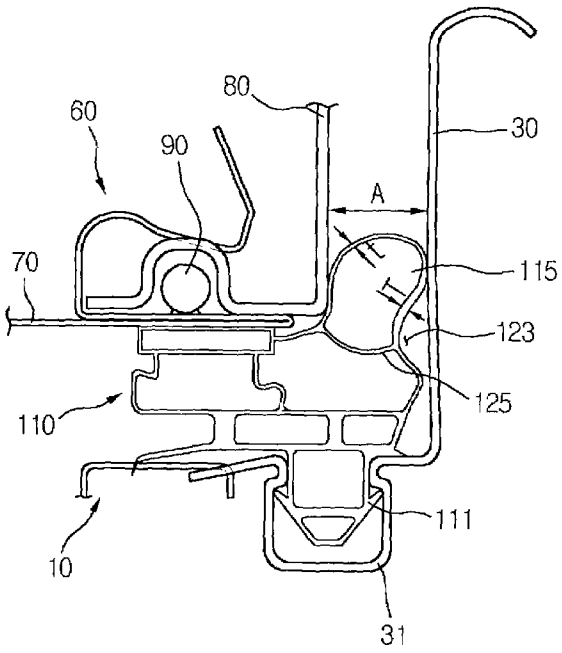


Fig. 1 (Related Art)

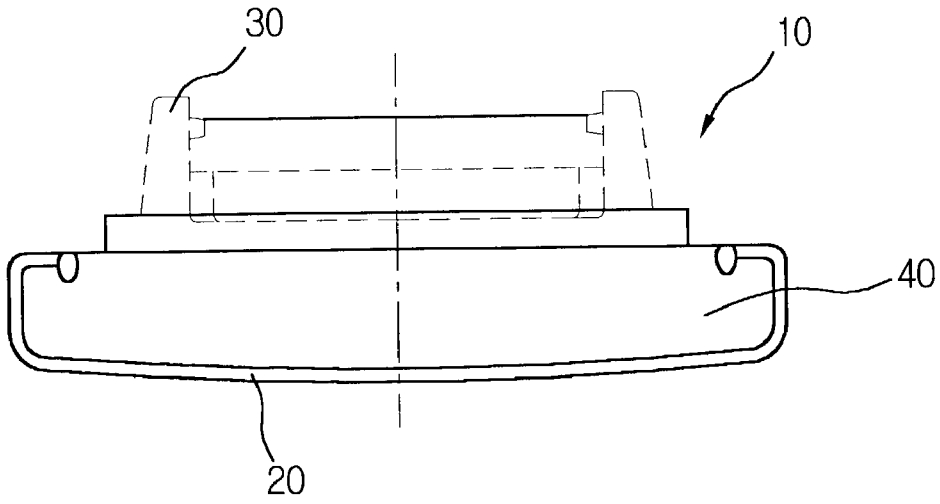


Fig. 2 (Related Art)

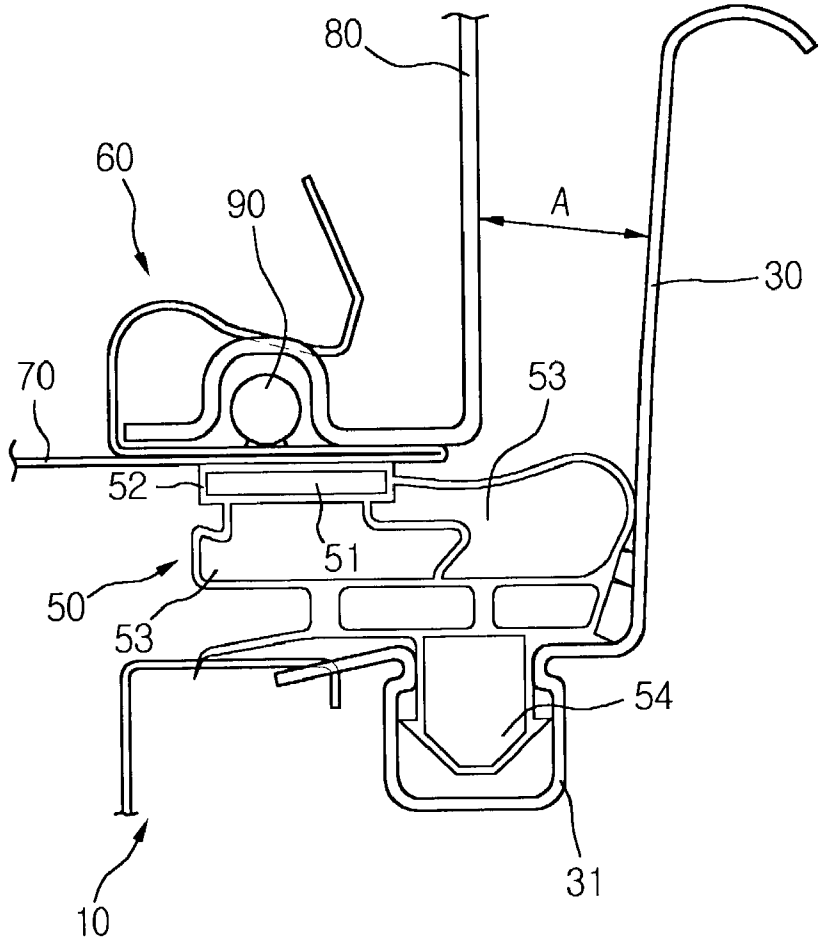


Fig. 3

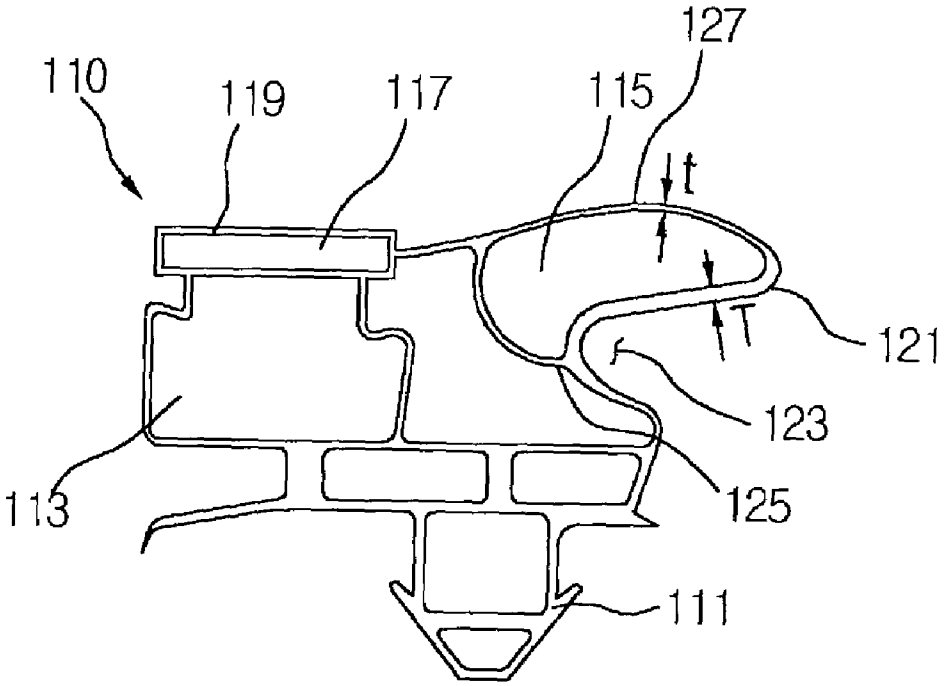

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Fig. 4

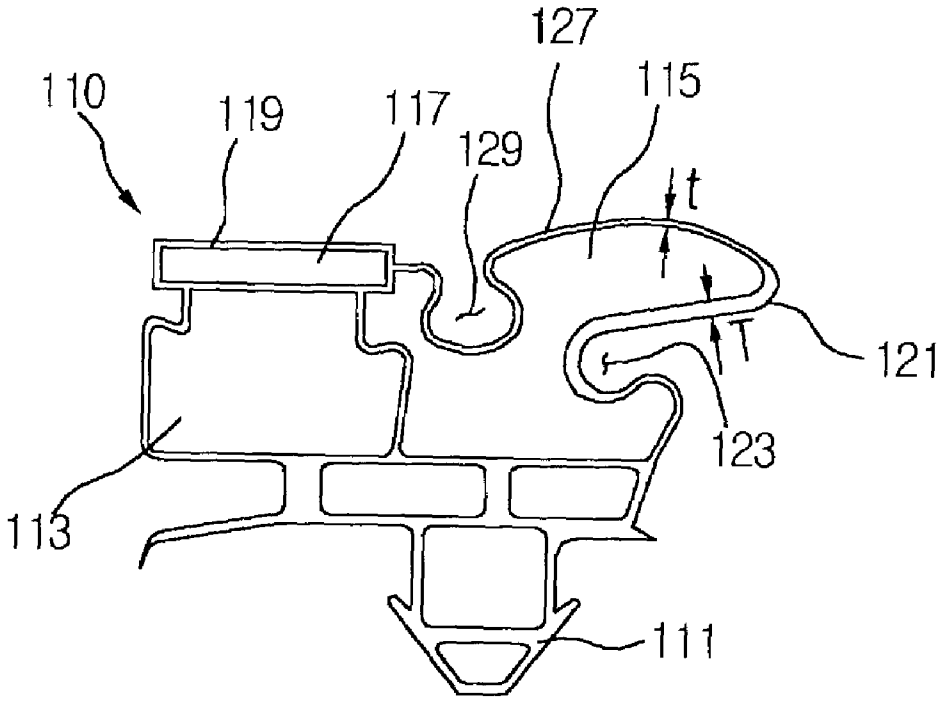

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Fig. 5

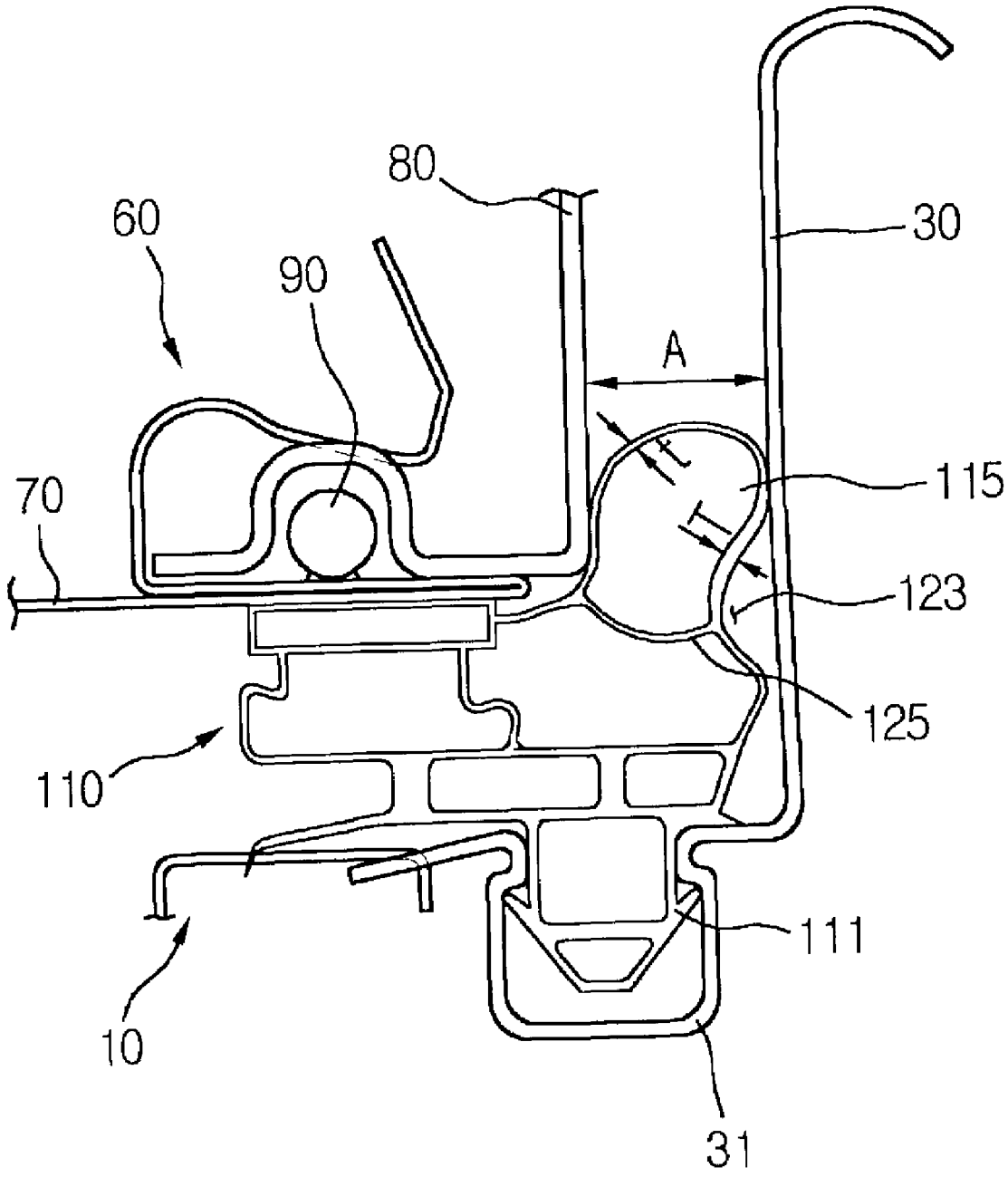


Fig. 6

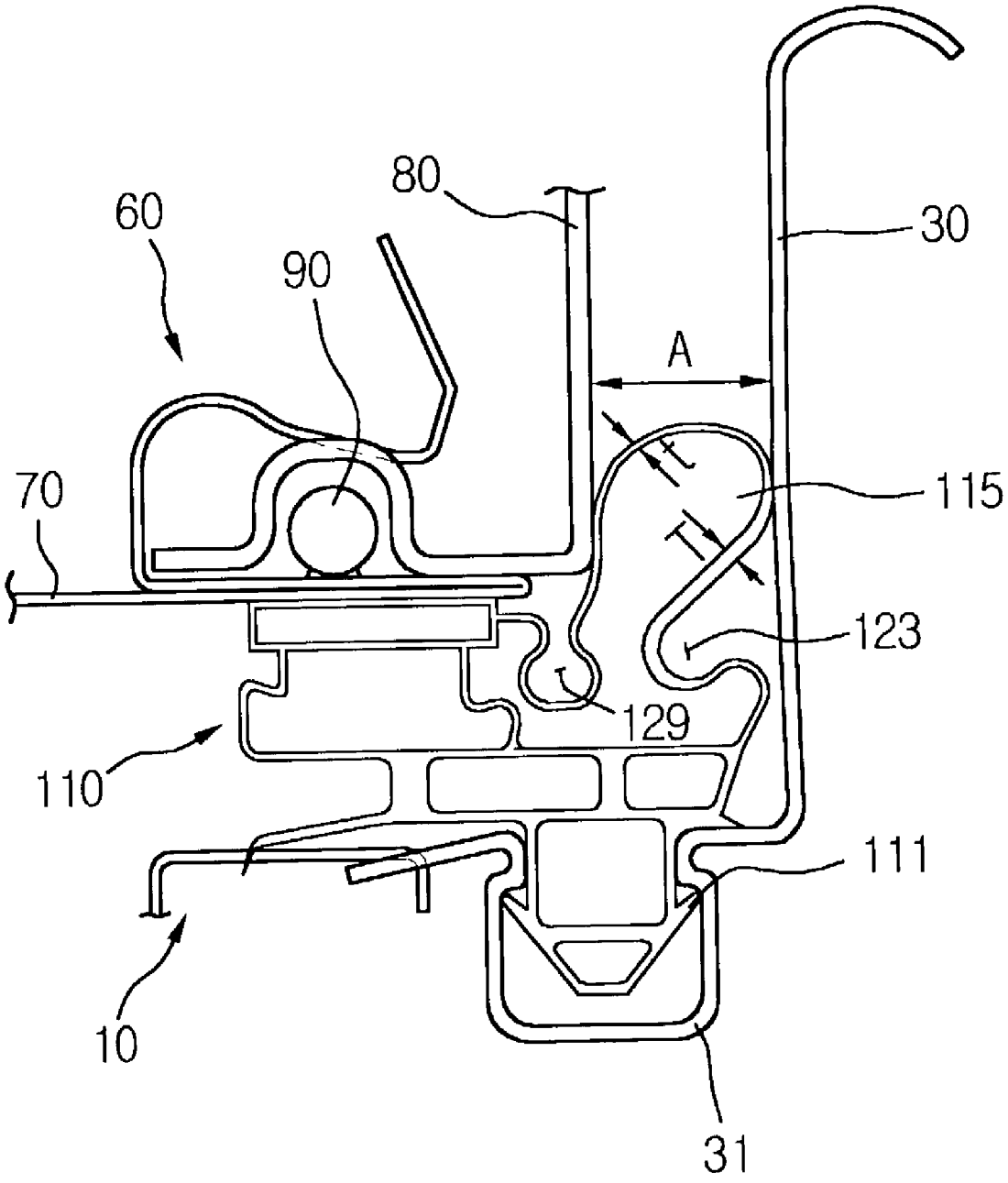


Fig. 7

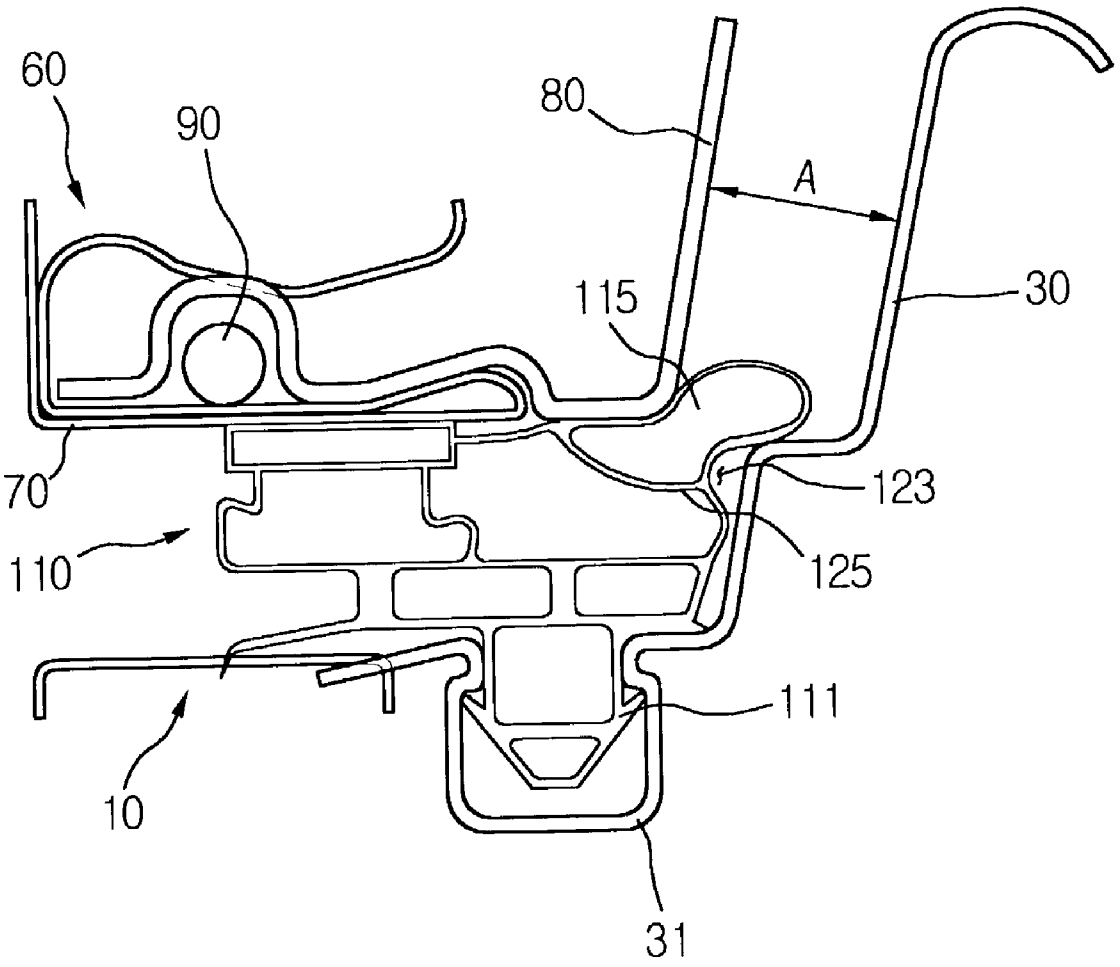


Fig. 8

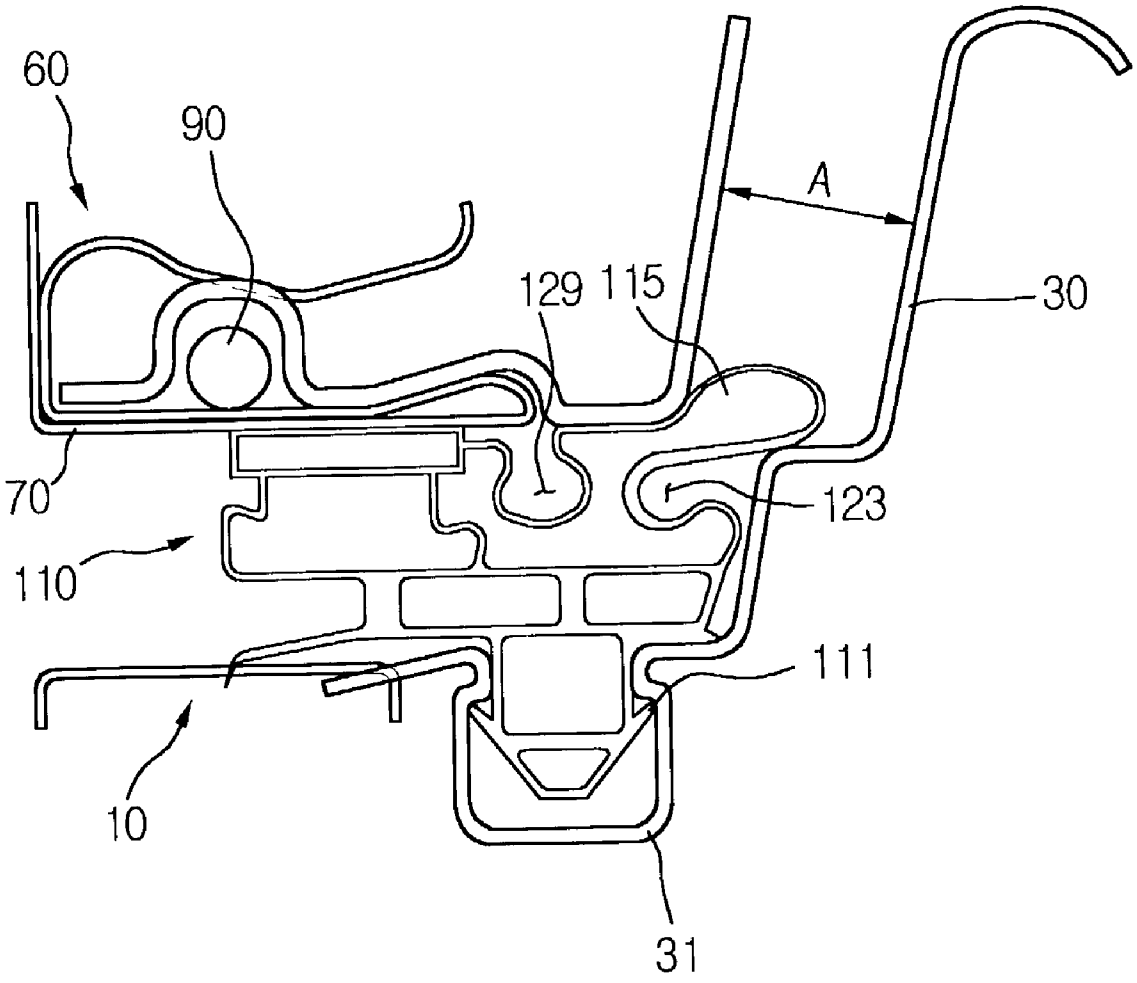


Fig. 9

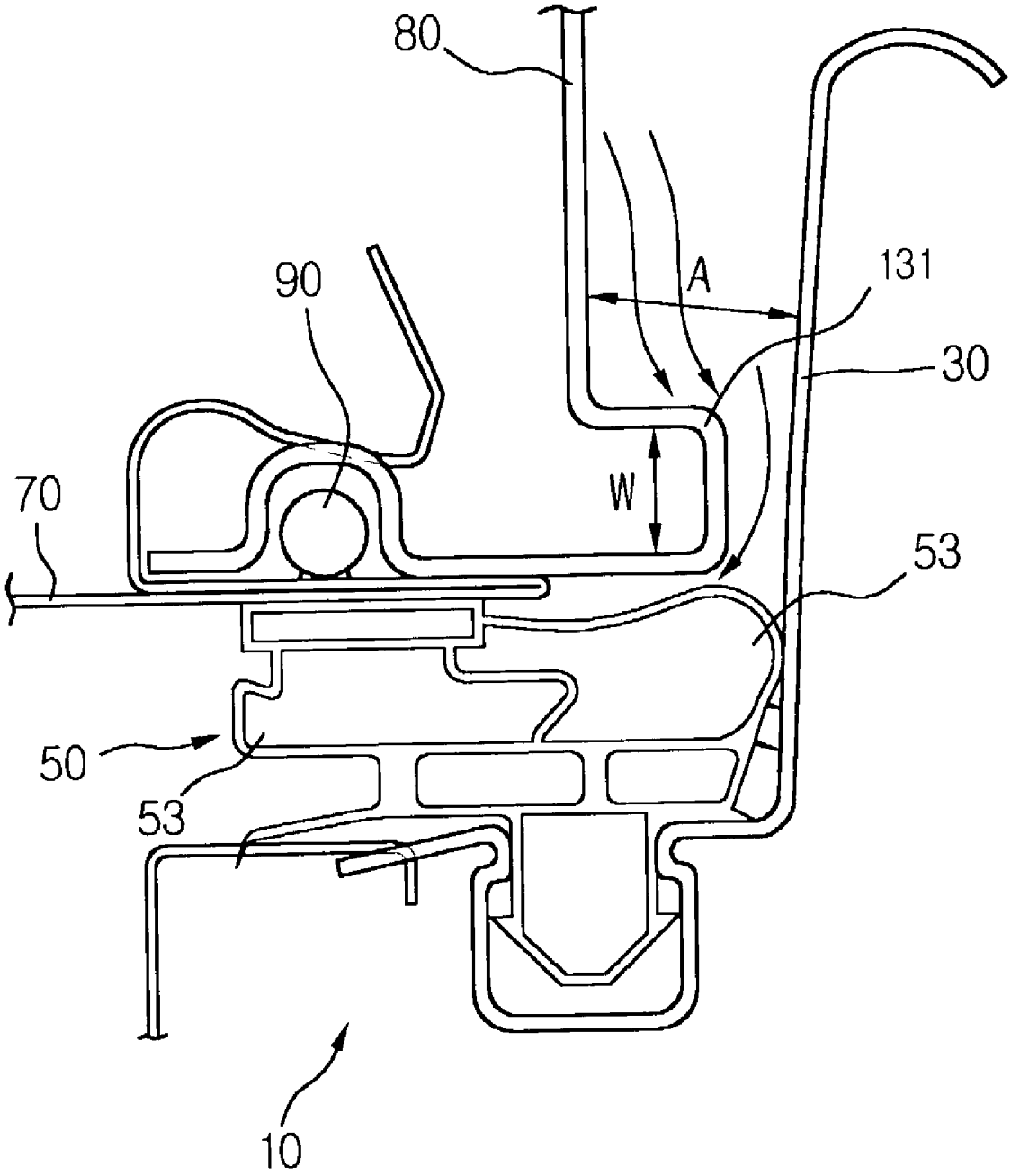


Fig. 10

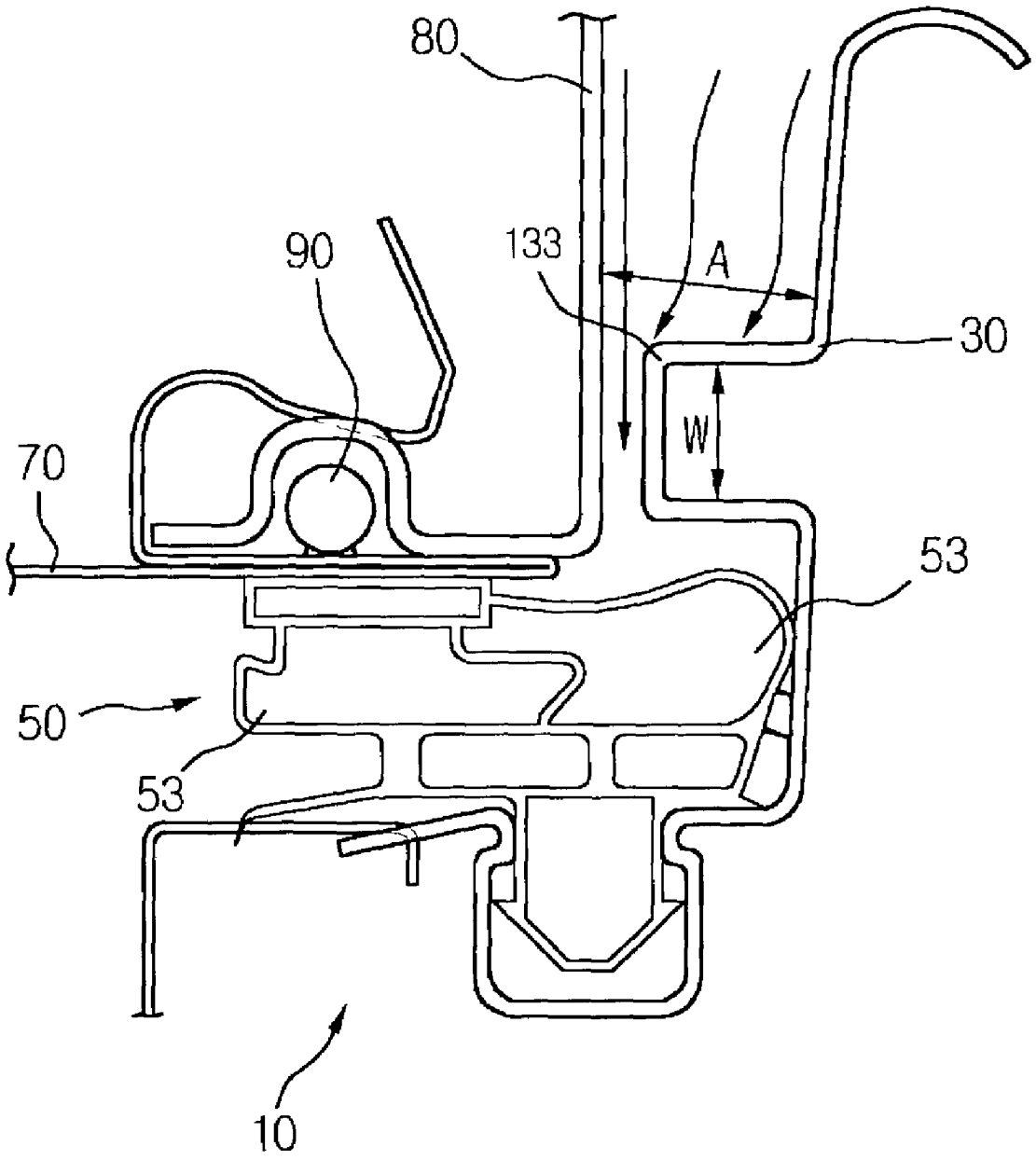


Fig. 11

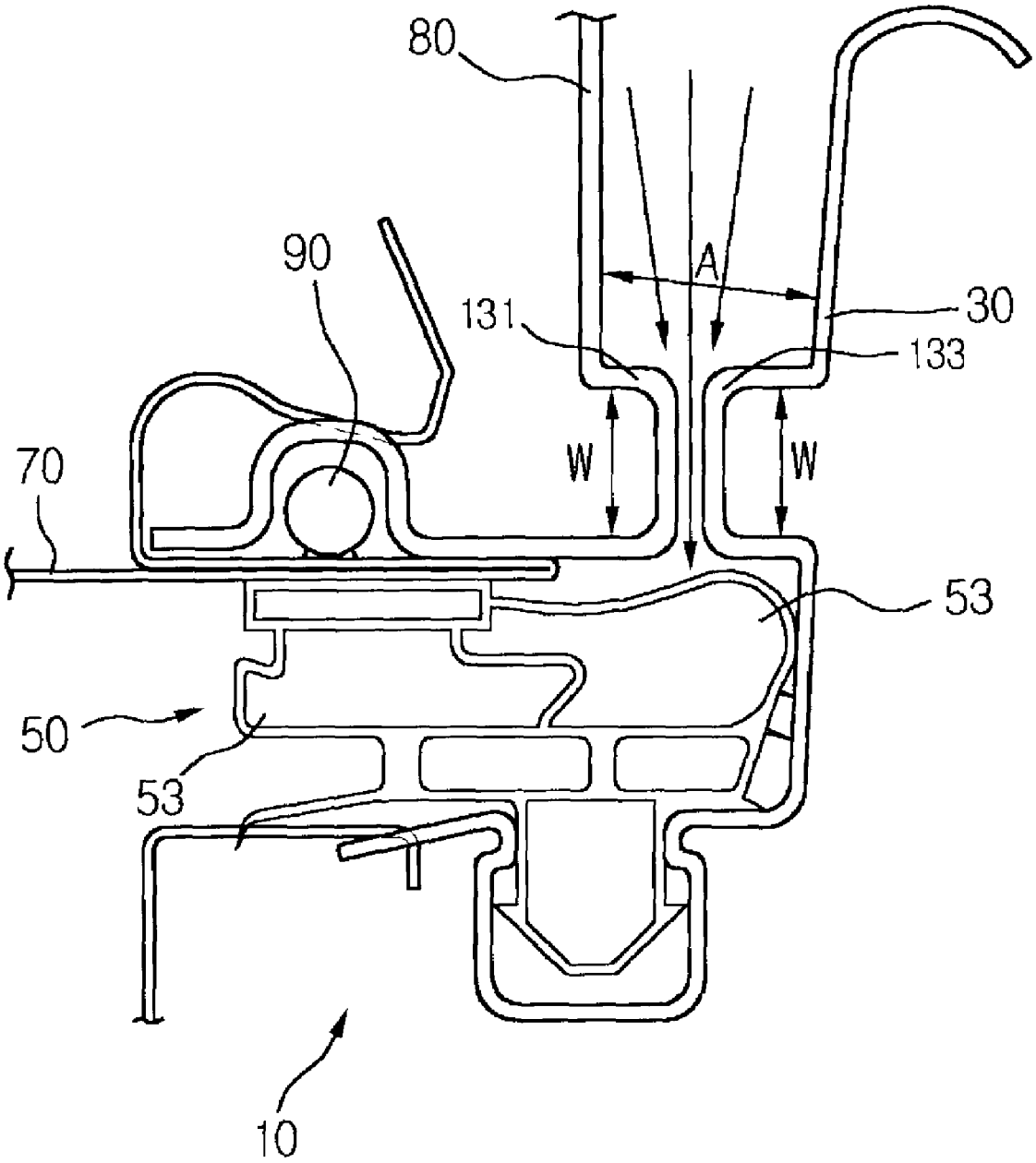


Fig. 12

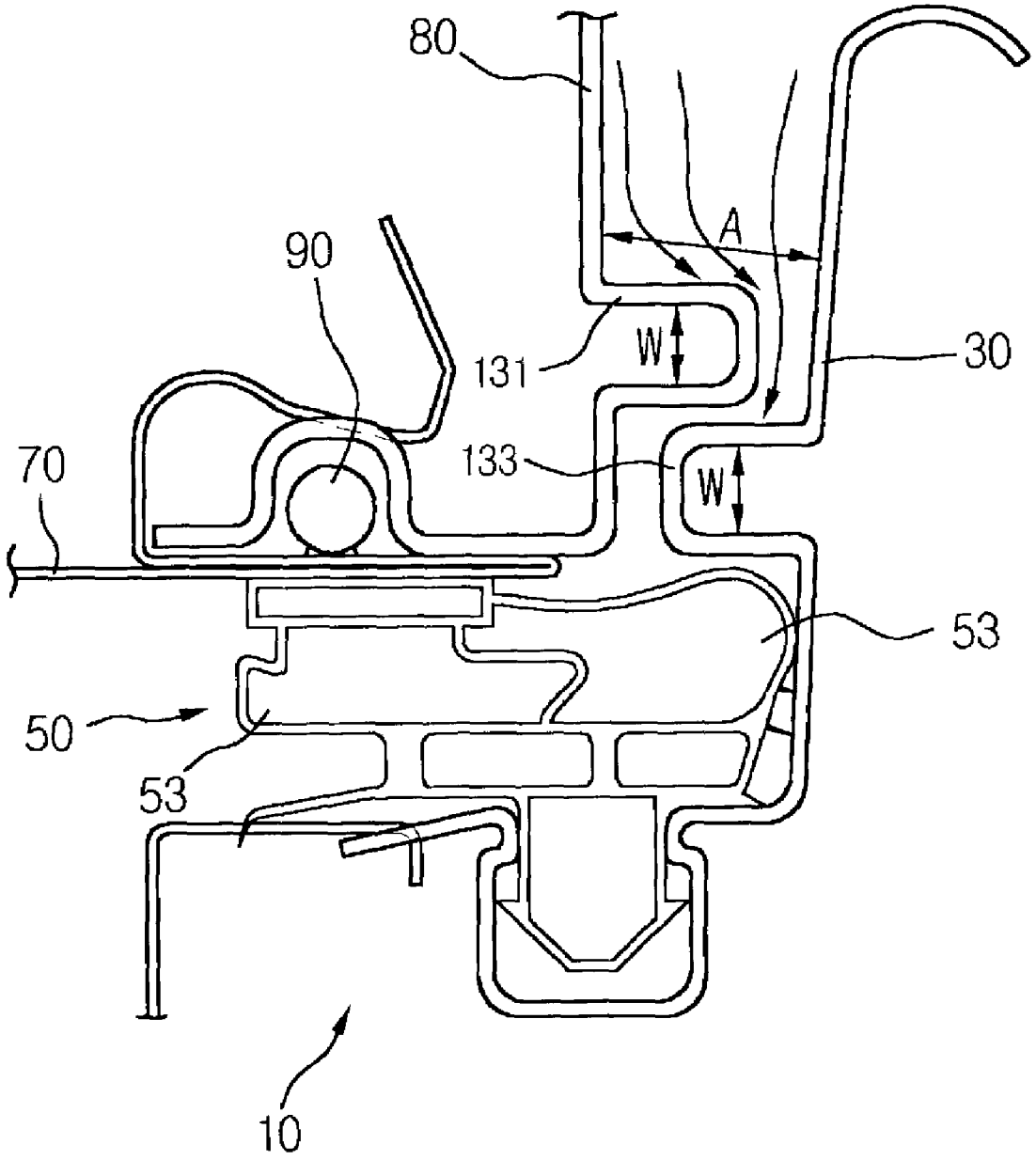


Fig. 13

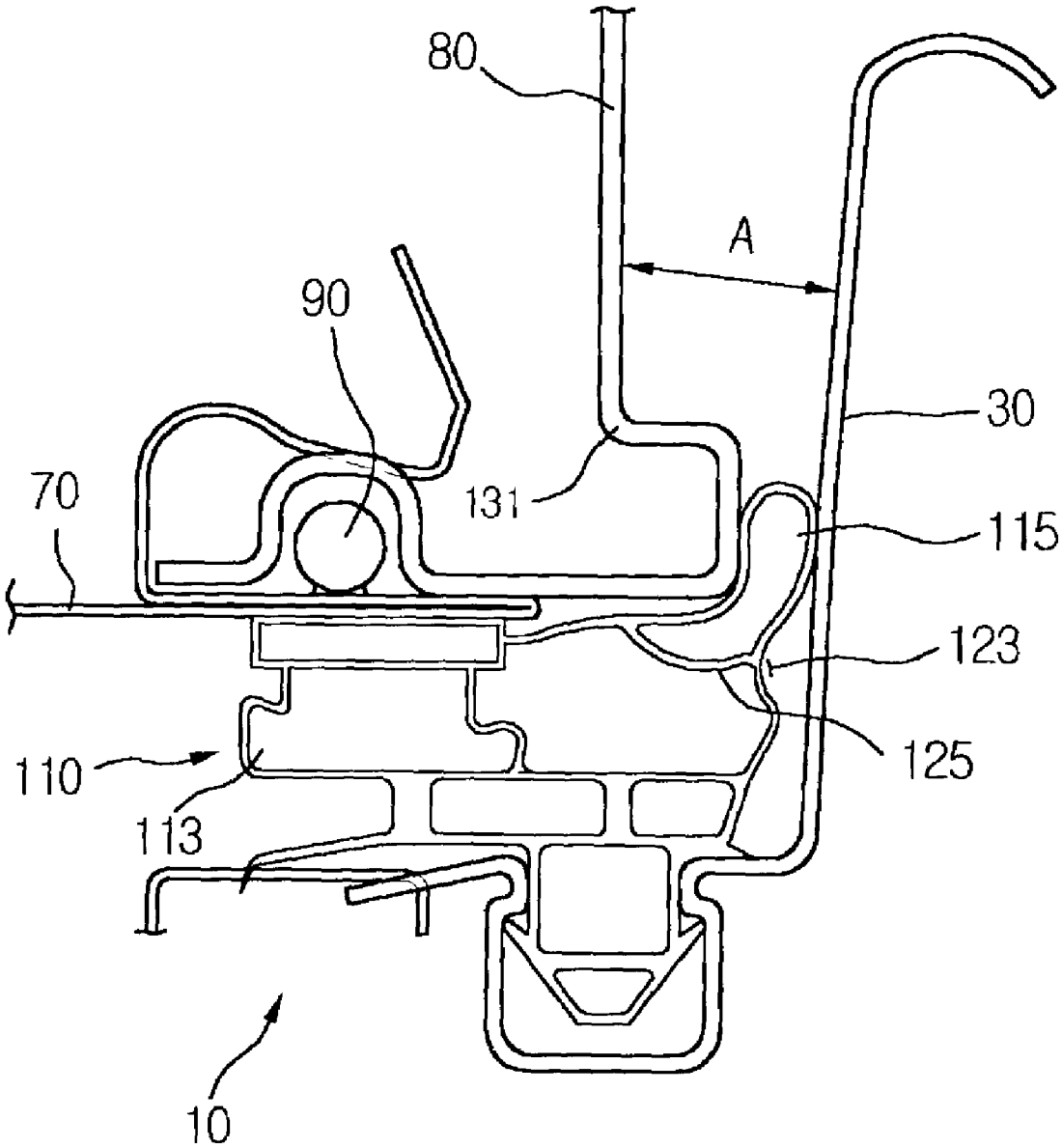
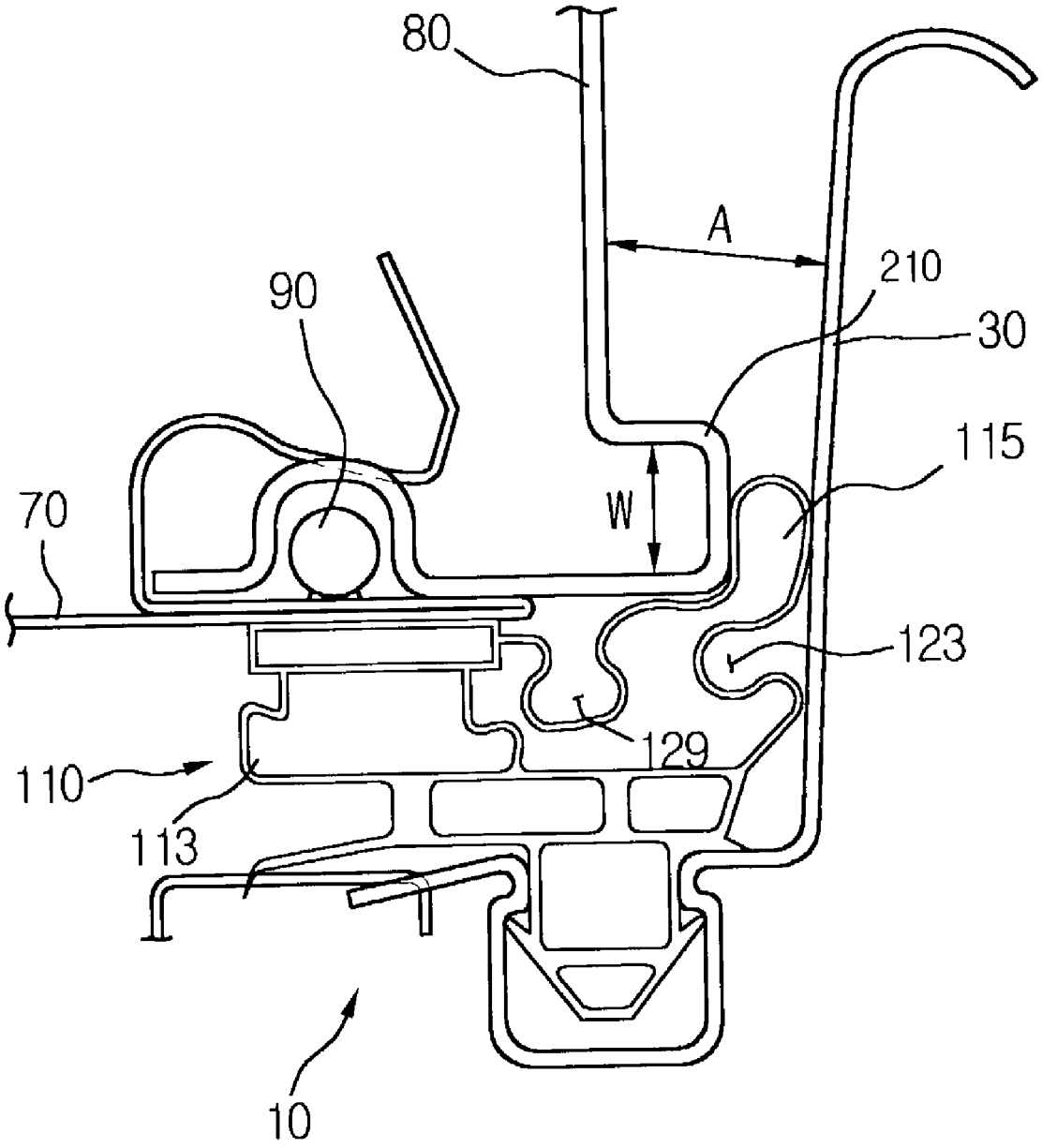


Fig. 14



OBTURATOR FOR REFRIGERATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a refrigerator, and more particularly, to an obturator for a refrigerator for excluding heat or cool air that transfers to and from a refrigerator.

2. Description of the Related Art

Generally, a refrigerator discharges cool air generated by a freezing cycle comprising a compressor, a condenser, an expansion value, an evaporator, thereby lowering temperature for freezing or chilling foods. A refrigerator is equipped with a door gasket at a door liner, i.e., an inner edge of a refrigerator door for excluding heat flow into a refrigerator from outside as well as preventing cool air discharged to a refrigerator from leaking out to the outside.

FIG. **1** is a view showing a door of a conventional refrigerator. Referring to FIG. **1**, a refrigerator door **10** is comprised of an outer door **20** made of iron plate, a door liner **30** for combining with the outer door **20** using ABS resin of predetermined shape manufactured by vacuum molding process, an urethane foaming member **40** manufactured by foam molding process, mounted between the outer door **20** and the door liner **30** for insulation. Here, in one side of the door liner **30** a door gasket for isolating an interior of a refrigerator from the outside, is mounted.

FIG. **2** is a view showing the door gasket mounted on a door liner of mullion part partitioning a freezer and a cool chamber in a conventional refrigerator door. Referring to FIG. **2**, the conventional door gasket **50** is comprised of a sticking part **52** for sticking on an outer case **70** of a main body in a refrigerator with the help of magnetic force generated by installed magnet **51** within it; an air bag **53** formed at the bottom of the sticking part **52** as one body together with the sticking part and divided into many regions by partitions for making, at the bottom of the sticking part, predetermined spaces to which air could be instilled so as to alleviate impulse; a combining part **54** of an anchor shape, formed at the bottom of the air bag **53** as one body together with the air bag for fixing in a combining groove **31** of the door liner **30**. Here, the air bag **53** is provided for alleviating impulses generated when the refrigerator door **10** is closed on the refrigerator's main body **60**. Also, the outer case **70**, preferably, may be made of magnetic material so that attractive force is exerted therebetween by the magnet **51**.

When the refrigerator door **10** is closed onto a front surface of the refrigerator's main body **60**, attractive force is exerted between the magnet **51** installed within the sticking part **52** and the outer case **70**, so that the refrigerator door **10** get stuck on the main body **60**, whereby an interior of the refrigerator is isolated from the outside.

In the meantime, when a user draws back the refrigerator door for separating the door **10** from the main body **60**, drawing back force is exerted on the combining part **54** by the door liner **30** combined with the refrigerator door **10**. Here, the tensile force transferred to the combining part **54** is, in sequence, directly delivered to the air bag **53** formed as one body with the combing part and then to the sticking part **52** formed as one body with the air bag. Accordingly, the sticking part **52** stuck on the refrigerator's main body **60** is separated from the outer case **70** of the main body, whereby a gap between the main body and the door of the refrigerator begins to open.

Lots of requirements are needed for the door gasket with consideration of refrigerator's characteristics. Particularly, among those requirements, insulation property which prevents cool air from leaking out to the outside and excludes heat flow from the outside by sealing the refrigerator door and main body closed, is strongly needed.

In the meantime, a lateral face of the refrigerator main body **60** is comprised of the outer case **70** constituting an outer wall of the refrigerator; an inner case **80** constituting an inner wall of the refrigerator; a hot-line **90** which is installed at the rear side of the outer case **70** for preventing dewdrop formation on the refrigerator's wall that would be generated by temperature difference between the inside and the outside of the refrigerator. Here, heat generated from the hot-line **90** may be transferred to the outer case **70** and, at the same time, this heat may flow into the interior of the refrigerator main body through an inner path A of the refrigerator, that is, through a gap between the inner case **80** and the door liner **30** of the refrigerator door.

Such heat transfer lowers cooling performance of the refrigerator itself much more, causing a problem that power dissipation increases accordingly. Also, a conventional door gasket **50** as shown in FIG. **2**, in which the only sticking part **52** maintaining a predetermined width is stuck on the refrigerator main body **60**, prevents outside heat or inside cool air from transferring to and from the refrigerator. Here, after long use of the door gasket, the sticking part **52** get worn out due to frequent opening of the refrigerator door and the sticking part **52** of the door gasket **50** may not be stuck on the outer case **70** of the refrigerator main body when the door **10** is closed on the refrigerator main body **60**. Accordingly, closing is not made properly between the door **10** and the main body **6**, so that the inside cool air may leak out to the outside of the refrigerator or the outside heat may flow into the inside of the refrigerator.

As is mentioned above, a problem is generated that the cooling performance of the refrigerator is lowered considerably in case that cool air leaks out or outside heat flows into the inside of the refrigerator due to incomplete closing between the refrigerator door and main body.

SUMMARY OF THE INVENTION

An object of the invention is to solve at least the above problems and/or disadvantages, and to provide at least the advantages described hereinafter.

Accordingly, one object of the invention is to provide an obturator for the refrigerator with improved insulation performance.

It is another object of the present invention to provide an obturator for the refrigerator for excluding heat penetration into the interior of the refrigerator by transforming an air bag structure in a door gasket.

It is still another object of the present invention to provide an obturator for the refrigerator for minimizing heat penetration into the interior of the refrigerator by forming projecting portion on at least one of door liner in the refrigerator door or an inner case of a refrigerator main body.

These and other objects and advantages of the invention are achieved by providing an obturator for the refrigerator comprising a door gasketinstalled on one side of a refrigerator door, having an air bag which could be transformed and rotated freely so that a gap between an inner case and a door liner is closed; a projecting portion formed on at least one of the inner case or the door liner so that the air bag blocks up the gap easily, is provided.

Preferably, an upper part of the air bag is thick in its thickness compared with its bottom. Also, preferably, a propping wall for maintaining a shape of the air bag, is provided on an inner face of the air bag and a first concave

portion is formed on the one side of the bottom for free transformation and rotation of the air bag, and a second concave portion is formed on one side of an upper part of the air bag for separating the air bag from the sticking part.

The projecting portion may be formed on either a bottom of the inner case or the door liner. Also, the projecting portions may be formed on both the inner case and the door liner with the projecting portions faced opposite each other, and the projecting portions may be formed on above both parts with the projecting portions crossed each other.

According to another aspect of the invention, a door gasket for the refrigerator is provided, mounted on one side of the refrigerator door, and in which the air bag, transformed and rotated freely, is extended long from the lateral portion of the sticking part to the inner face of the refrigerator door, forming one body together with the sticking part. The air bag, preferably, sticks on closely between the inner case and the door liner when the refrigerator is closed.

According to further another aspect of the invention, an obturator for the refrigerator is provided, comprising a projecting portion formed on, at least one of the inner case or the door liner.

According to still another aspect of the invention, a door gasket for the refrigerator is provided, comprising the combining part that is fixed into the combining groove of the door liner; a first air bag that is formed as one body together with the combining part for alleviating impulse exerted upon contact of the refrigerator door and the refrigerator main body; a sticking part that is formed on the first air bag as one body for being stuck on the refrigerator main body by means of the magnet installed within it; a second air bag that is extended long from the lateral portion of the sticking part to the inner face of the refrigerator door, forming one body together with the sticking part, for being transformed and rotated freely.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objects and advantages of the invention may be realized and attained as particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

FIG. **1** illustrates the conventional refrigerator door;

FIG. **2** illustrates a door gasket mounted on the door liner of the mullion part partitioning the freezer and the cool chamber in the refrigerator door;

FIG. **3** illustrates a door gasket of the refrigerator in accordance with a preferred embodiment of the present invention;

FIG. **4** illustrates a door gasket of the refrigerator in accordance with another preferred embodiment of the present invention;

FIG. **5** illustrates an application of the door gasket to the door contact part, i.e., the mullion part consisting of the freezer and the cool chamber in the refrigerator in accordance with a preferred embodiment of the present invention;

FIG. **6** is illustrates an application of a door gasket to the door contact part, i.e., the mullion part consisting of the freezer and the cool chamber in the refrigerator in accordance with another preferred embodiment of the present invention;

FIG. **7** illustrates an application of a door gasket to the outer door contact part, i.e., the case flange part of the refrigerator in accordance with a preferred embodiment of the present invention;

FIG. **8** illustrates an application of a door gasket to the outer door contact part, i.e., the case flange part of the refrigerator in accordance with another preferred embodiment of the present invention;

FIG. **9** illustrates the transformed inner case structure of the refrigerator main body in an obturator for the refrigerator in accordance with another preferred embodiment of the present invention;

FIG. **10** illustrates the transformed door liner structure of the refrigerator door in an obturator for the refrigerator in accordance with another preferred embodiment of the present invention;

FIG. **11** and FIG. **12** illustrate a structure in which both the inner case of the refrigerator main body and the door liner of the refrigerator door are transformed in an obturator for the refrigerator in accordance with another preferred embodiment of the present invention;

FIG. **13** and FIG. **14** illustrate an application of the door gasket to the door contact part, i.e., the mullion part consisting of the freezer and the cool chamber in the refrigerator, and a structure in which the internal path of the refrigerator is transformed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following detailed description will present a preferred embodiment of the invention in reference to the accompanying drawings.

First Embodiment

The first embodiment of the present invention relates to transformation of the air bag of the door gasket mounted and fixed on the refrigerator door, thereby closing the gap between the inside and outside of the refrigerator. FIG. **3** is a drawing illustrating the door gasket of the refrigerator according to a preferred embodiment of the present invention. Referring to FIG. **3**, the door gasket **110** of the present invention is comprised of the combining part **111** inserted and fixed in the combining groove **31** of the door liner **30**; the first air bag **113** formed as one body together with the combining part **111**, for alleviating impulse exerted upon contact of the refrigerator door **10** and the refrigerator main body **60**; the sticking part **119** formed on the first air bag **113** as one body together with it, for being stuck on the refrigerator main body **60** by means of the magnet **117** inserted within it; and the second air bag extended long from the lateral portion of the sticking part **119** to the inner face of the refrigerator door **10**, forming one body together with the sticking part, for being transformed and rotated freely.

The combining part **111** is of anchor shape for easy insertion and the combining part is firmly inserted and fixed in the combining groove **31** of the door liner so that detachment of the combining part **111** is difficult. The first air bag **113** is for alleviating impulse exerted when the refrigerator door is closed on the refrigerator main body **60** and for preventing the refrigerator door from recoiling to an opposite direction due to the impulse, whereby the sticking part **119** within which the magnet **117** is installed, is stuck on the outer case **70** of the refrigerator main body **60**.

The second air bag **115**, which is a core part of the present invention, is extended long to the door liner **30** sides in the refrigerator door **10**. Here, the second air bag **115** has, preferably, the upper part **127** whose thickness T is thin in

its thickness compared with a thickness T of the bottom part **121** of the second air bag. By making the upper part of the second air bag thin in its thickness, the second air bag may be pushed easily by the refrigerator main body **60** upon contact with the main body. Also, by making the bottom of the second air bag thick in its thickness, the second air bag may not be pushed more than a predetermined extent upon contact with the refrigerator main body, maintaining its shape.

On one side in the bottom of the second air bag, the first concave portion **123** for free transformation and rotation of the second air bag **115** is formed. Accordingly, the second air bag may be transformed or rotated freely upon contact with the refrigerator main body **60** thanks to the first concave portion **123**. Namely, the second air bag **115** may be bent easily by means of the first concave portion **123**.

On the second air bag, a propping wall **125** for preventing the second air bag from hanging down at ordinary times and maintaining its shape more firmly, may be provided to its inner face.

As the magnet is installed within the sticking part **119**, the refrigerator door **10** is stuck on the refrigerator main body **60**. In case of applying the second air bag **115** of the door gasket **110** described above, there may be generated a problem that when the door is closed, the second air bag is pushed by the inner case, with the sticking part **119** opened accordingly, whereby closing on the main body is not performed well. In order to resolve this problem, the second air bag of the door gasket **110** may be transformed in its structure as shown in FIG. **4**.

FIG. **4** is a drawing illustrating the door gasket of the refrigerator according to another preferred embodiment of the present invention. Referring to FIG. **4**, the second air bag **115** has the second concave portion **129** on one side of its upper portion **127** so that the sticking part **119** may not push the air bag. By the second concave portion **129**, the sticking part **119** is spaced from the second air bag and even in case that the second air bag is pushed, such pushing has no influence on the sticking part **119**. Accordingly, thanks to formation of the second concave portion **129**, the sticking part **119** maintains its sticking on the main body regardless of pushing of the second air bag **115**. In short, the second concave portion **129** is formed for independent transformations of the sticking part **119** and the second air bag **115**.

Application of the door gasket of the refrigerator mentioned above to the refrigerator door will be described herein below with reference to FIG. **5** through FIG. **8**.

FIG. **5** and FIG. **7** are drawings illustrating applications of the door gasket of the refrigerator to the door contact part (mullion part) consisting of the freezer and the cool chamber of the refrigerator, and to the outer door contact part (case-flange part) of the refrigerator, respectively, in accordance with a preferred embodiment of the present invention. Referring to FIG. **5** and FIG. **7**, in case that the refrigerator door **10** on which the door gasket of the refrigerator according to a preferred embodiment of the present invention is mounted and fixed, is closed on the refrigerator main body **60**, the second air bag blocks up the internal path, i.e., the gap between the inner case **80** of the refrigerator main body **60** and the door liner **30** of the refrigerator door **10**. Here, the second air bag **115** is transformed or rotated up and down freely thanks to the first concave portion **123** though the internal path A is different in its structure.

FIG. **6** and FIG. **8** are drawings illustrating application of the door gasket of the refrigerator to the door contact part (mullion part) consisting of the freezer and the cool chamber of the refrigerator, and to the outer door contact part (case flange part) of the refrigerator, respectively, in accordance with another preferred embodiment of the present invention. As is shown in FIG. **6** and FIG. **8**, in case that the refrigerator door **10** is closed, the second air bag blocks up the internal path, i.e., the gap between the inner case **80** of the refrigerator main body **60** and the door liner **30** of the refrigerator door **10**. Also, the second air bag has the second concave portion **129** on one side of its portion, so that a problem that the second air bag is transformed due to the sticking part **119** and the internal path A is not blocked up properly, is prevented in advance though the sticking part **119** is worn out and pushed to the side of the second air bag. Furthermore, thanks to formation of the second concave portion **129** the second air bag may move to right and left freely.

Second Embodiment

The second embodiment of the present invention relates to minimization of the gap between the inner case of the refrigerator main body and the door liner of the refrigerator door and to lengthening of a heat transfer path that passes through a inner case ABS resin and a door liner wall, thereby restraining cool air or heat transfer moving to and from the refrigerator.

As illustrated in FIG. **9**, a structure which narrows the internal path A is achieved by forming the projecting portion **131** projected to a side of the refrigerator door liner, on one side of the inner case **80** of the refrigerator main body **60**. Here, the projecting portion **131** may be formed on anywhere on one side of the inner case.

As illustrated in FIG. **10**, another structure which narrows the internal path A may also be achieved by projecting the door liner **30** of the refrigerator door **10**. Namely, the projecting portion **133** projected to a side of the inner case **80**, is formed on one side of the door liner **30**.

As illustrated in FIG. **11**, further another structure which narrows the internal path A may also be achieved by forming projection portions **131** and **133** such that each projecting portion is projected both from the inner case **80** and the door liner **30**, respectively, with each projecting portion faced opposite each other.

As illustrated in FIG. **12**, still further another structure which narrows the internal path A may also be achieved by forming projection portions **131** and **133** such that each projecting portion is projected both from the inner case **80** and the door liner **30**, respectively, with each projecting portion crossed each other.

As illustrated in FIG. **11** and FIG. **12**, the projecting portions **131** and **133** may be formed so that each projecting portion both from the inner case **80** and the door liner **30** is faced opposite or crossed each other, whereby heat or cool air can be cut off more effectively.

In FIG. **9** through FIG. **12**, the projecting portions **131** and **133** are preferably formed wide in its width W for increasing a heat transfer resistance regarding the heat or the cool air that passes through the internal path A. Also, in FIG. **9** through FIG. **12**, the projecting portions **131** and **133** are preferably formed close to the side of the door liner **30** of the refrigerator door **10** so that the internal path A is formed narrow as much as possible. Of course, the projecting portions **131** and **133** should be formed so that they may not be barred by the door liner **30** when the refrigerator door is closed on the refrigerator main body.

The projecting portions **131** and **133** formed in FIG. **9** through FIG. **12**, can be manufactured simply upon formation of the inner case **80** and the door liner **30** and also they can be formed on an invisible portion. Accordingly, appearance of the refrigerator is not spoiled very much while heat or cool air can be cut off effectively.

Third Embodiment

A third embodiment of the present invention relates to more definite obturation of the inside and outside of the refrigerator by applying the first embodiment and the second embodiment. Namely, the third embodiment blocks up the internal path A using the second air bag of the door gasket, making the internal path narrow using the projecting portion, thereby cutting off heat or cool air completely, improving cooling performance to the maximum extent.

FIG. **13** and FIG. **14** are drawings illustrating a transformed structure for the internal path of the refrigerator with application of the door gasket according to a preferred embodiment of the present invention, to the door contact part (mullion part) consisting of the freezer and the cool chamber of the refrigerator.

As illustrated in FIG. **13** and FIG. **14**, the second air bag **115** is extended long to the side of the door liner **30**; and at the same time, the door gasket **110** on which the first concave portion **123** for free transformation and rotation of the air bag and the second concave portion **129** for separating the sticking part **119** from the second air bag **115** are formed respectively; and the projecting portions **131** and **133** for narrowing the internal path A, are provided together to the door **10** and main body **60** of the refrigerator. Accordingly, a first obturation is made by the second air bag **115** and, simultaneously, a second obturation is made by the projecting portions **131** and **133** for narrowing the internal path, so that complete obturation is accomplished, cooling performance is improved to the maximum extent, and power dissipation is lowered very much accordingly.

Here, in order that the second air bag **115** blocks up the internal path, the projecting portions **131**and **133** are preferably formed on the bottom of the inner case **80** or the door liner **30**, more exactly, on a portion, predetermined part of which is overlapped by the second air bag **115** when the door **10** is closed.

In the foregoing, though the third embodiment is described with a limited application of the door gasket to the mullion part, it is needless to say that the third embodiment can be applied to the case-flange part, i.e., a lateral part consisting of the freezer and the cool chamber.

As is apparent from the above descriptions, according to the obturator for the refrigerator of the present invention, the internal path is blocked up by transformation of the air bag in the door gasket, whereby inflow of heat from the outside or from the hot-line into the inside of the refrigerator and leakage of the inside cool air of the refrigerator out to the outside, are cut off and cooling performance is improved accordingly.

Furthermore, according to the obturator for the refrigerator of the present invention, projecting portion is formed on either the inner case or door liner for narrowing the internal path, whereby the heat transfer resistance regarding the inside cool air or the outside heat of the refrigerator is increased to the maximum extent and cooling performance is improved accordingly.

Also, according to the obturator for the refrigerator of the present invention, though the sticking part of the door gasket get old and worn out, the air bag blocks up the internal path of the refrigerator secondly, thereby cutting off the heat transfer generated from the hot-line as well as cutting off completely the heat transfer or cool air transfer to and from the refrigerator, improving insulation performance remarkably and lowering power dissipation of the refrigerator very much accordingly.

Therefore, according to the obturator for the refrigerator of the present invention, as transformations of the air bag in the door gasket and of projecting portion for narrowing the internal path are made simultaneously, completed obturation is achieved, whereby it is expected that cooling performance is improved to the maximum extent while power dissipation is lowered considerably.

The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. The description of the invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.

What is claimed is:

1. An obturator of a refrigerator having a refrigerator main body with an outer case and an inner case constituting an outer wall and an inner wall in the refrigerator, respectively, and a refrigerator door, which is opened and closed on the refrigerator main body and on which a door liner is provided opposite to the inner case, the obturator comprising:

a door gasket for the refrigerator, wherein the door gasket includes a transformable and freely rotatable air bag that is configured to be mounted on one side of the refrigerator door of the refrigerator, wherein the air bag is configured to extend from a lateral portion of a sticking part to an inner face of the refrigerator door, where the airbag and the sticking part form one body, wherein the inner case includes a first surface corresponding to a surface contacting the outer case, and a second surface bent from the first surface, and wherein at least one portion of the air bag is configured to be accommodated in a predetermined gap defined between the second surface and the door liner of the refrigerator door so as to block up the predetermined gap.

2. The obturator of a refrigerator according to claim **1**, wherein the air bag blocks up the predetermined gap between the second surface and the door liner when the refrigerator door is closed.

3. The obturator of a refrigerator according to claim **1**, wherein an upper portion of the air bag is thin in a thickness of the air bag compared with a bottom of the air bag.

4. The obturator of a refrigerator according to claim **1**, wherein a propping wall is equipped for maintaining a shape on an inner face of the air bag.

5. The obturator of a refrigerator according to claim **1**, wherein a concave portion is formed for free transformation and rotation of the air bag on one side of a bottom of the air bag.

6. The obturator of a refrigerator according to claim **1**, wherein a concave portion is formed for separation of the air bag from the sticking part on one side of an upper portion of the air bag.

7. An obturator of a refrigerator having a refrigerator main body with an outer case and an inner case, respectively, constituting an outer wall and an inner wall of the refrigerator main body, and a refrigerator door which is opened and closed on the refrigerator and which has a door liner provided on a mullion part to oppose the inner case, the inner case and the door liner defining a space, the obturator comprising:

a door gasket, comprising:

a first air bag; and

a second air bag, wherein the second air bag is positioned laterally of the first air bag, wherein the inner case includes a first surface corresponding to a surface contacting the outer case, and a second surface bent from the first surface, and wherein the first air bag is configured to contact only the outer

case of the refrigerator main body while the second air bag is configured to contact only the second surface when accommodated in the space, wherein a concave portion is formed on one side of the second air bag which faces the door liner, and wherein only an upper part of the concave portion of the second airbag is accommodated in the space.

8. The obturator of claim **7**, further comprising a sticking part attached to the first air bag so that the sticking part sticks to only the outer case.

9. The obturator of claim **7**, wherein the portion of the bag with the concave portion is thicker than the portion of the bag without the concave portion.

10. An obturator of a refrigerator having a refrigerator main body with an outer case and an inner case, respectively, constituting an outer wall and an inner wall of the refrigerator main body, and a refrigerator door having a door liner on a mullion part opposing the inner case, the inner case and the door liner defining a space, the obturator comprising:

a first air bag; and

a second air bag, wherein the first and second air bags are formed as one body, wherein the inner case includes a first surface corresponding to a surface contacting the outer case, and a second surface bent from the first surface, and wherein a concave portion is formed on one side of the second air bag which faces the door liner, and wherein only an upper part of the concave portion of the second air bag is seated in the space defined between the second surface and the door liner to block the space.

11. The obturator of claim **10**, further comprising a sticking part attached to the first air bag so that the sticking part sticks to only the outer case.

12. The obturator of claim **10**, wherein a portion of the bag with the concave portion is thicker than a portion of the bag without the concave portion.

* * * * *

JS 44 (Rev. 3/99)

CIVIL COVER SHEET

The JS-44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

I. (a) PLAINTIFFS

LG ELECTRONICS U.S.A., INC. and
LG ELECTRONICS, INC.

(b) County of Residence of First Listed Plaintiff *
(EXCEPT IN U.S. PLAINTIFF CASES)

*First listed plaintiff is a Delaware corporation

DEFENDANTS

WHIRLPOOL CORPORATION

County of Residence of First Listed
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE LAND INVOLVED.

(c) Attorney's (Firm Name, Address, and Telephone Number)

Steven J. Balick
ASHBY & GEDDES
500 Delaware Avenue, 8th Floor
Wilmington, DE 19801 (302) 654-1888

Attorneys (If Known)

Unknown

II. BASIS OF JURISDICTION (Place an "X" in One Box Only)

- ☐ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question (U.S. Government Not a Party)
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant)
(For Diversity Cases Only)

	DEF		DEF
Citizen of This State ☐ 1	☐ 1	Incorporated *or* Principal Place of Business In This State ☐ 4	☐ 4
Citizen of Another State ☐ 2	☐ 2	Incorporated *and* Principal Place of Business In Another State ☐ 5	☐ 5
Citizen or Subject of a Foreign Country ☐ 3	☐ 3	Foreign Nation ☐ 6	☐ 6

IV. NATURE OF SUIT (Place an "X" in One Box Only)

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury

PERSONAL INJURY
- ☐ 362 Personal Injury—Med. Malpractice
- ☐ 365 Personal Injury—Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 444 Welfare
- ☐ 440 Other Civil Rights

PRISONER PETITIONS
- ☐ 510 Motions to Vacate Sentence
- Habeas Corpus:
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Condition

FORFEITURE/PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC
- ☐ 630 Liquor Laws
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs.
- ☐ 660 Occupational Safety/Health
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt.Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc. Security Act

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☒ 830 Patent
- ☐ 840 Trademark

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS—Third Party 26 USC 7609

OTHER STATUTES
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates/etc.
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 891 Agricultural Acts
- ☐ 892 Economic Stabilization Act
- ☐ 893 Environmental Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Information Act
- ☐ 900Appeal of Fee Determination Under Equal Access to Justice
- ☐ 950 Constitutionality of State Statutes
- ☐ 890 Other Statutory Actions

V. ORIGIN (PLACE AN "X" IN ONE BOX ONLY)

☒ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from another district (specify) ☐ 6 Multidistrict Litigation ☐ 7 Appeal to District Judge from Magistrate Judgment

VI. CAUSE OF ACTION (Cite the U.S. Civil Statute under which you are filing and write brief statement of cause. Do not cite jurisdictional statutes unless diversity.)

Title 35, U.S. Code -- This is an action under the patent laws of the United States.

VII. REQUESTED IN COMPLAINT: ☐ CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 **DEMAND $** monetary & injunctive relief CHECK YES only if demanded in complaint: **JURY DEMAND:** ☒ Yes ☐ No

VIII. RELATED CASE(S) IF ANY (See instructions): JUDGE _____ DOCKET NUMBER _____

DATE April 24, 2008 SIGNATURE OF ATTORNEY OF RECORD Steven J. Balick

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RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____

AO FORM 85 RECEIPT (REV. 9/04)

United States District Court for the District of Delaware

Civil Action No. 08-234

ACKNOWLEDGMENT OF RECEIPT FOR AO FORM 85

NOTICE OF AVAILABILITY OF A UNITED STATES MAGISTRATE JUDGE TO EXERCISE JURISDICTION

I HEREBY ACKNOWLEDGE RECEIPT OF 3 COPIES OF AO FORM 85.

4-24-08
(Date forms issued)

Shane Handlin
(Signature of Party or their Representative)

Shane Handlin
(Printed name of Party or their Representative)

Note: Completed receipt will be filed in the Civil Action