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(54) REFRIGERATOR WITH A DEVICE FOR AN EASY OPENING OF THE DOOR

(57) A refrigerator (10) comprises a cabinet and a door (12) in which an ice dispenser (22) is placed, such dispenser including a user interface for driving a damper device configured to put the inside of the cabinet into communication with the outside when delivery of ice is requested by the user. A manually operated device on the user interface is configured to open the damper device in order to equalize pressure inside and outside the cabinet for an easy opening of the door.

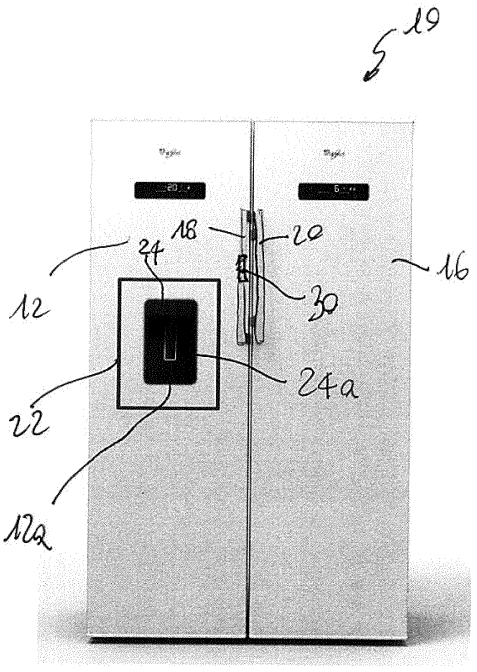

Fig. 1

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Description

[0001] The present invention relates to a refrigerator comprising a cabinet and a door in which a water and/or ice dispenser is present, such water and/or ice dispenser including a user interface for driving a damper device configured to allow communication between the cabinet and outside when delivery of water and/or ice is requested.

[0002] With the term "refrigerator" is here intended any refrigeration appliance, including vertical freezers and so called combined products in which a fresh food compartment and a freezer compartment are present. With the term "damper device" we mean any valve or damper system which allows the distribution of ice from the inside of the cabinet to the outside.

[0003] In refrigeration appliances, particularly in freezers, once the door is closed the pressure inside the compartment decreases mainly due to the combined effect of vapor condensation and to the reduction of air volume with temperature decrease, and the final effect is that the force required to open the door is very high (even 100 N or more).

[0004] One solution of this problem is simply to wait until the internal pressure nearly equalizes with the external one (as some manufacturers recommend in their instructions for use, this time being of the order of 20 to 40 seconds. Another solution known in the market is the use of the so called "easy opening" handles. These are handles designed with moving parts using the lever principle to increase the force applied by the customer in using the handle. For an immediate reopening this solution is not very effective, since the force that the user has to exert is still very high or outside the capabilities of a normal person.

[0005] A third solution is to apply to the product a passive valve, usually in the form of a conduit with a moving flap that is normally closed but opens once there is a low pressure inside the product, allowing a pressure equalization between inside and outside. These solutions can be effective for high levels of low pressures but for moderate ones usually there is not enough force to open the moving part, therefore the effect may be not even perceived by the user. Another drawback of this known solution is that warm and humid air can be sucked inside the product during normal operation due to a less than perfect sealing of the moving element.

[0006] It is an object of the present invention to solve the above technical problems by making easier (nearly effortless) to re-open doors in refrigerators with an ice dispenser.

[0007] According to the invention, this object is reached thanks to the features listed in the appended claims.

[0008] Products with ice dispenser have a powered damper that closes/opens the passage between the ice storage and the external of the product. This movement is controlled by the control board (control process unit). According to one of the main features of the inventions, by detecting the handle usage (via a mechanical switch, a proximity sensor or the like) it is implemented a logic that opens slightly the ice damper (it does not have to carry out the full cycle open/close) when the user is interacting with the handle. Such slight opening of the damper equalizes the pressures between outside and inside in very short time (1- 2 seconds max so the user perceives it as immediate) and makes the door opening nearly effortless (the only force needed is the one to overcome the gasket's magnet). The end result is that with the solution according to the invention it is obtained an actively controlled pressure equalization by using a valve already present in the appliance. According to another feature of the invention, the central process unit of the appliance detects and records also the door opening, so that it is possible to fine tune the working of the damper so that, for example, it will not open (or open only minimally) if the previous door opening was carried out a predetermined time before, so that pressures are expected to be already equalized.

[0009] Further advantages and features according to the present invention will become clear from the following detailed description, provided as a non limiting example, with reference to the attached drawings in which:

- Figure 1 is a front view of a side by side refrigerator according to the present invention;
- Figure 2 is a perspective view of a detail of figure 1 in an open configuration of the freezer compartment door; and
- Figure 3 is a block diagram showing the connection between different components of the refrigerator according to figure 1.

[0010] With reference to the drawings, a side by side refrigerator 10 comprises a door 12 for the freezer compartment 14 and a door 16 for the fresh food compartment. Both doors comprise handles 18 and 20 respectively. In a known way, the door 12 of the freezer compartment is provided with a recessed housing 12a for a water and ice dispenser 22 and with a user interface 24 particularly dedicated to the functionalities of the water and ice dispenser 22. A paddle or sensor 24a in the recessed housing 12a is part of the user interface 24 and it cooperates with a glass or container (not shown) once it is put in the housing 12a for the activation of a motorized damper 26 (figure 2) provided between an ice bin 28 (associated with an ice maker 28a) and an opening provided in the housing 12a for delivery of ice from the ice bin 28. The same or another paddle or sensor 24a may be used as well for delivery of water or other beverages.

[0011] According to the invention, the handle 18 of the freezer compartment 14 is provided with a proximity sensor or switch 30 which is activated when the user approaches or touches the handle 18 with his/her hand. The sensor or switch 30 is connected to a central process unit 32 which is connected or is part of the user interface

24.

[0012] The central process unit 32 is so designed that, when it receives a signal from the sensor or switch 30, it activates the motorized damper 26 (provided with a stepper motor 26a) so that such damper gets opened and pressure outside and inside the freezer compartment gets balanced, and then it is easier for the user to open the door 12.

[0013] As a further alternative (figure 3), instead of using the proximity sensor or switch 30 on the door handle 18, it is possible to have a dedicated button 34 on the user interface 24 which may be activated by the user when he/she wants to open the door 12 without being annoyed by the difference of pressure between outside and inside the freezer.

[0014] According to another preferred feature of the invention, the central process unit 32 is connected to a sensor (not shown) which provides the unit 32 with a signal referring to the open or closed configuration of the door 12. The central process unit 32 detects and records what was the time elapsed by the last opening of the door, and it can disregard the signal coming from the sensor or switch 30 if there are good chances that the pressure is still equalized after the last opening. According to a further variant, the refrigerator 10 may be provided with a pressure sensor (not shown) inside the compartment 14 which may provide a pressure signal to the unit 32 for a comparison to a threshold value below which it is necessary the activation of the damper 26 for pressure equalization when the door 12 has to be opened.

[0015] It is worth noting that the movement of the damper 26 driven by signals coming from sensor or switch 30 on the handle 18 is much lower than the movement driven from signals from the paddle 24a and user interface 24 when the user requests delivery of ice, therefore reducing intervention time and energy consumption.

[0016] Even if in the above description reference has been made to a motorized damper 26, it is clear that the solution according to the present invention may be used with any kind of valve device which is able to allow or interrupt the delivery of ice (in whatever form) from the ice bin 28 to the ice dispenser 22.

[0017] Tests carried out by the applicant has shown that the average force requested for reopening the freezer door of a commercial side by side refrigerator already provided with a passive valve for already reducing the pressure difference was about 73 N, while for the identical refrigerator provided with the technical solution according to the invention, the force requested was 59 N. Since in the side by side refrigerators the presence of a communication between the freezer compartment and the fresh food compartment reduces already the above opening force, the applicant expects a much higher decrease of the opening force when the solution is applied to a vertical freezer without a fresh food compartment in communication thereto.

[0018] Moreover, the proximity sensor 30 does not need to be put on the handle 18, rather it can be a sensor placed in whatever spot on the door and which detects the user at a threshold approaching distance.

Claims

1. Refrigerator (10) comprising a cabinet and a door (12) in which an ice dispenser (22) is placed, such dispenser (22) including a user interface (24, 24a) for driving a damper device (26) configured to put the inside (14, 28) of the cabinet into communication with the outside when delivery of ice is requested, **characterized in that** it is provided with a manually operated device (30, 34) configured to open said damper device (26) in order to equalize pressure inside and outside the cabinet for an easy opening of the door (12).

2. Refrigerator according to claim 1, wherein the manually operated device is a proximity sensor (30) or a switch placed on a handle (18) of such door (12).

3. Refrigerator according to claim 1, wherein the manually operated device is a dedicated button (34) on the user interface (24).

4. Refrigerator according to any of the preceding claims, wherein it comprises a control unit which is configured to receive signals from a sensor which detects when the door (12) has been opened and to drive the damper device (26) accordingly.

5. Refrigerator according to any of the preceding claims, wherein the damper device is a motorized damper (26).

6. Refrigerator according to claim 5, wherein the damper (26) is driven by a stepper motor (26a).

7. Refrigerator according to any of the preceding claims, wherein a pressure sensor is placed inside the compartment (14) and is configured to provide a signal to be compared to a pressure threshold signal for driving the damper device (26) when the manually operated device (30, 34) is activated and the pressure inside the compartment (14) is below said threshold signal.

8. Refrigerator according to any of the preceding claims, wherein the cabinet defines a freezer compartment (14).

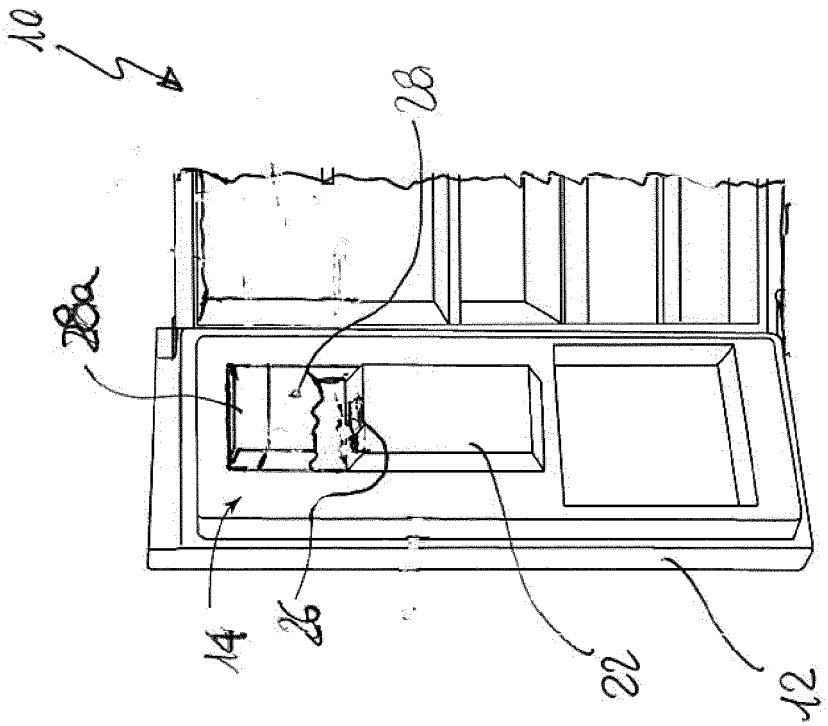

Fig. 2

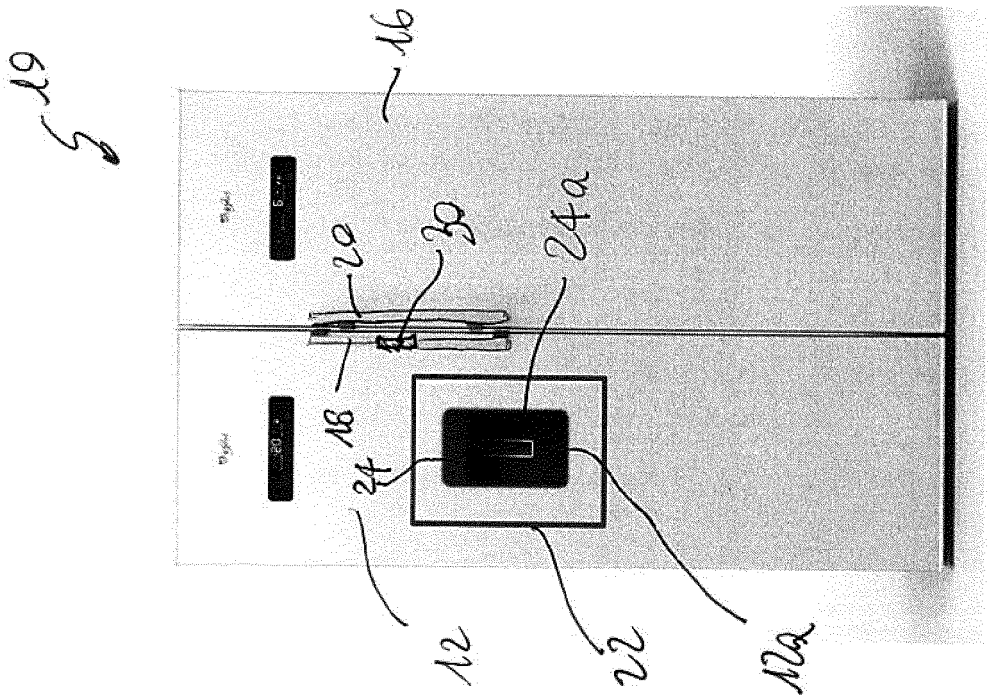

Fig. 1

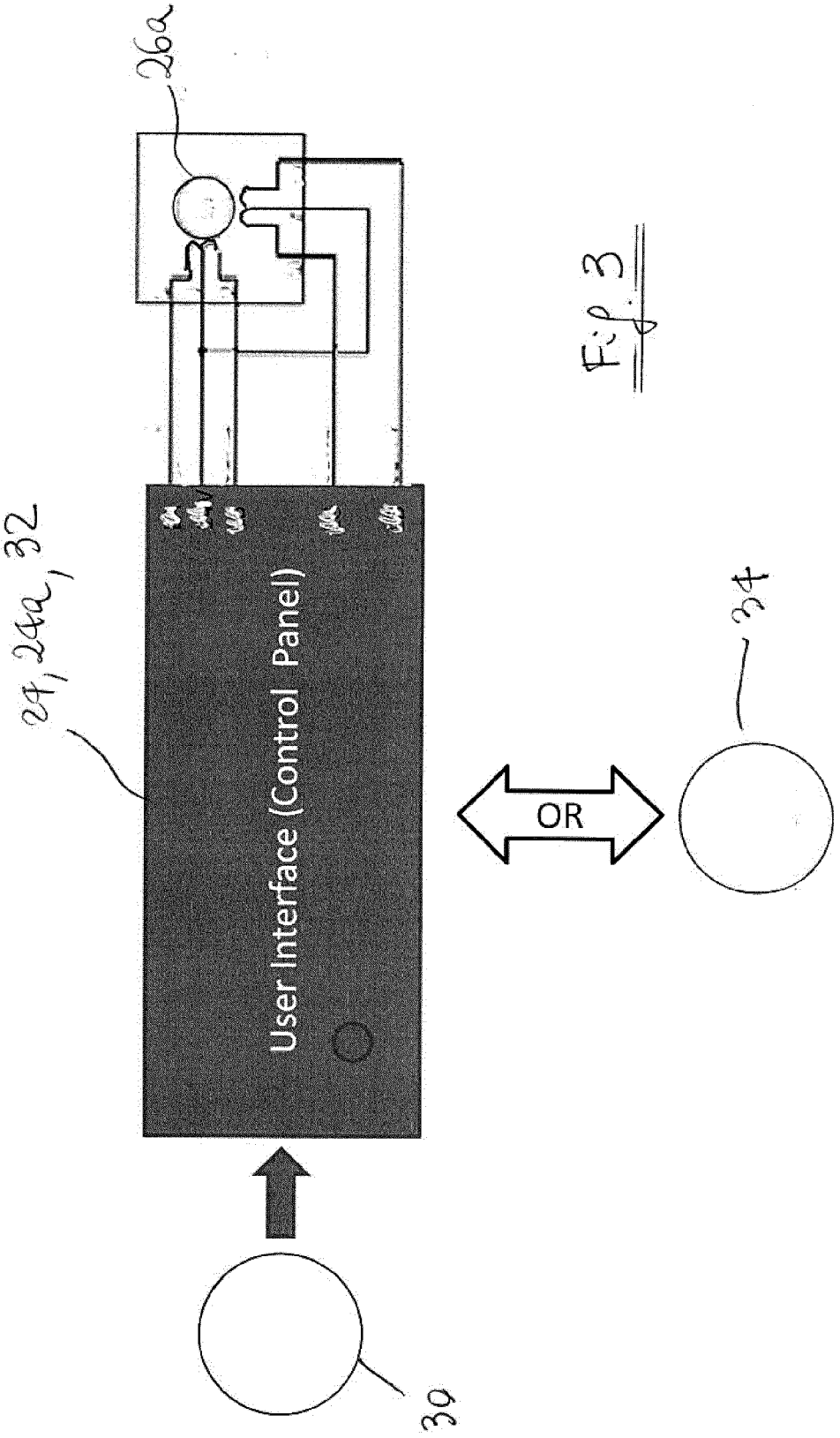

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 7118

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 220 266 A (BENASUTTI LOUIS D [US] ET AL) 2 September 1980 (1980-09-02) * figures 1-9 * * column 4, line 30 - line 35 * -----	1-8	INV. F25D17/04
X	US 3 942 334 A (PINK JOHN J) 9 March 1976 (1976-03-09) * figures 1, 2 * -----	1-8	

TECHNICAL FIELDS SEARCHED (IPC)

F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 March 2016	Dezso, Gabor

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 18 7118

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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01-03-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82