A refrigeration appliance has a storage compartment and a door-opening aid for facilitating the opening of a door of the storage compartment. The storage compartment is controlled by a pressure sensor exposed to air pressure prevailing in the storage compartment. The pressure sensor is a differential pressure sensor which is also exposed to outside pressure prevailing in the surroundings of the refrigeration appliance.
REFRIGERATION APPLIANCE COMPRISING A DOOR-OPENING AID

[0001] The present invention relates to a refrigeration appliance with a storage chamber and a door-opening aid to facilitate the opening of a door of the storage chamber, which is controlled by a pressure sensor exposed to the air pressure prevailing in the storage chamber. A refrigeration appliance of this type is known from DE 10 2006 061 083 A1. The door-opening aid of this known refrigeration appliance comprises an actuator which, when the pressure sensor detects a reduced pressure in the storage chamber caused by a user pulling on the door, is extended in order to stretch a sealing profile of the door from its contact surface on a frame of the carcass and so to induce a pressure equalization between storage chamber and the surrounding area.

[0002] The force with which a user should be able to activate the door-opening aid should lie in the order of magnitude of several N. Distributed over the surface of a typical refrigerator door, this force corresponds to a pressure fluctuation of a few Pa. Using the atmospheric pressure of approximately $10^5$ Pa as background knowledge, it is difficult to detect such a small fluctuation in a reliable manner.

[0003] The object of the present invention is to specify a refrigeration appliance with a door-opening aid, which enables a reliable detection of the pressure fluctuations in the storage chamber caused by a user.

[0004] This object is achieved in that, in the case of a refrigeration appliance with a storage chamber and a door-opening aid, which is controlled by a pressure sensor exposed to the air pressure prevailing in the storage chamber, the pressure sensor is a differential pressure sensor which is furthermore exposed to the outside pressure prevailing in the surrounding area of the refrigeration appliance. The differential pressure sensor enables a detection of the pressure fluctuations which is essentially free of background knowledge and, on the basis thereof, a reliable controlling of the door-opening aid.

[0005] A refrigeration appliance is understood to refer in particular to a domestic refrigeration appliance, in other words a refrigeration appliance which is used for domestic management in households or possibly also in the catering industry, and in particular which is used to store food and/or beverages in quantities typical for households at certain temperatures, such as a refrigerator, an upright freezer, a combination fridge-freezer or a wine storage cabinet for example.

[0006] Preferably, the pressure sensor is disposed outside of an insulating layer surrounding the storage chamber and communicates with the storage chamber via a pipeline extending through the insulating layer.

[0007] Furthermore, the pressure sensor can communicate with the interior via a reinforcement part which is inset in an opening of a wall of an inner container delimiting the storage chamber.

[0008] A reinforcement part of this type preferably has a flexible skirt which abuts a side of the wall of the inner container facing away from the storage chamber, encircling the opening, in order to exclude the passage of insulating material through the opening.

[0009] The reinforcement part can have a housing engaging through the opening into the storage chamber, wherein a wall of the housing has at least one catch tappet engaging on the edge of the opening, in order to fix the reinforcement part to the opening and, if necessary, to hold the flexible skirt pressed against the wall.

[0010] The housing should have at least one air passage. Preferably it has two air passages, in order to not only enable a pressure equalization with the storage chamber, but also to facilitate the air circulation between the interior of the housing and the storage chamber.

[0011] In particular, this benefits the accuracy of a temperature sensor which can be accommodated in the reinforcement part.

[0012] The reinforcement part can also have a pipe connection nozzle to which a pipe leading through the insulating layer to the pressure sensor can be connected.

[0013] Preferably, this pipe connection nozzle is orientated in parallel with the wall of the inner container, so that the pipe also runs in parallel to the wall for at least a part of its length. A pipe which crossed the insulating material layer on a path which is too short is not expedient, as it would act as a thermal bridge between the storage chamber and the surrounding area.

[0014] Further features and advantages of the invention will emerge from the description of exemplary embodiments provided below, with reference to the attached figures.

[0015] In the Figures:

[0016] FIG. 1 shows a perspective view of a domestic refrigeration appliance according to the invention;

[0017] FIG. 2 shows a detail of a wall of the refrigeration appliance from FIG. 1, partly in a perspective view, partly in a cross-sectional view.

[0018] FIG. 1 shows a schematic perspective view of a domestic refrigeration appliance with a door-opening aid in accordance with the present invention. A standing type refrigerator is shown, although it should be clear to the person skilled in the art on the basis of the following description that the invention can also simply be applied to other types of refrigeration appliances.

[0019] A thermally-insulating housing of the refrigerator comprises a carcass 1 and a door 2 hinged thereto, which is shown here in a partly open position, so that a storage chamber 3 can also be seen in the interior of the carcass 1. In a manner customary to those skilled in the art, the door 2 has a magnetic seal 4 on its inner side facing towards the carcass 1 which, in the closed position of the door 2, abuts a front frame 5 of the carcass 1 extending around the storage chamber 3.

[0020] An electronic circuit board 6, on which various circuits for controlling the operation of the refrigerator and for the visualization of its operating state are disposed, is accommodated here in a recess of an insulating foamed material layer filling the walls of the carcass 1 behind an operating and display panel 7. In the freestanding appliance shown here, the operating and display panel 7 is in the front edge of a worktop 8 forming the top side of the carcass 1, while in other types of appliance it could be located in the frame 5, preferably in a region of the frame 5 which, when the door 2 is closed, is not covered thereby and is thus easily accessible and well visible for the user.

[0021] A door-opening aid 9 is mounted to the electronic circuit board 6, in the case considered here to the underside thereof. It comprises an electronic actuator 11 and a slider 10 which can be extended under the control of the actuator 11 from an opening of the frame 5. FIG. 1 shows this slider 10 in an extended position projecting beyond the frame 5 in which, if the door 2 is in a closed position, the slider 10 would withdraw the magnetic seal 4 thereof from the frame 5 locally and thus enable a pressure equalization between the storage chamber 3 and the surrounding area.
The actuator 11 is controlled by a differential pressure sensor 12 which is likewise disposed on the electronic circuit board 6. Since the recess in the insulating material, in which the electronic circuit board 6 is accommodated, communicates with the surrounding area via various joints, one of two pressure terminals of the differential pressure sensor 12 can lead directly into the recess, in order to detect the ambient pressure. A second terminal of the differential pressure sensor 12 is connected to a reinforcement part 14 via a pipeline 13 extending through the insulating material of the carcass 1, said reinforcement part 14 being mounted in a side wall of the carcass 1 reaching into the storage chamber 3.

This side wall of the carcass 1 conventionally comprises a deep-drawn inner container 15 made of plastic, which forms the frame 5 as well as essentially flat wall surfaces delimiting the storage chamber 3 on five sides. An opening 17 is cut out in one of these wall surfaces 16, as shown in FIG. 2, in which the reinforcement part 14 is mounted. The reinforcement part comprises an inner housing part 18, which projects through the opening 17 into the storage chamber 3, an outer housing part 19, which is disposed on the side of the wall surface 16 facing towards the insulating layer 20 made of foam material, and a flexible skirt 21, which is clamped between the housing parts 18, 19 plugged into one another and which shields the inner housing part 18 and if necessary a gap present between said housing part 18 and the edge of the opening 17 from the insulating layer 20 by abutting the wall surface 16 encircling the opening 17 along a dotted line 22.

In two horizontal walls 23 of the inner housing part 18, elastically deformable catch tappets 24 can be seen which are deflected through the opening 17 into the housing part 18 when the inner housing part 18 is inserted through, and return into their original position in an elastic manner once the opening 17 has been passed through, in order to latch the reinforcement part 14 in the opening 17.

Two air passage openings 25 of the inner housing part 18 secure a free exchange of air with the storage chamber 3, so that the temperature detected by a temperature sensor accommodated in the reinforcement part 14 and controlling a compressor of the refrigerator matches the temperature in the interior of the storage chamber 3 well. A support 26 for the temperature sensor (not shown in the Figure) with an elongated cylindrical shape is formed on the outer housing part 19.

Starting from a rear side of the outer housing part 19, a pipe 27 extends into the insulating layer 20. The pipe 27 describes a bending, so that a pipe connection nozzle 28 on the end of the pipe 27, widened to receive an end of the pipeline 13, is oriented in parallel with the wall surface 16 and the pipeline 13 inserted therein extends in parallel to the wall surface 16 up to the ceiling height of the carcass 1.

REFERENCE CHARACTERS

1. carcass
2. door
3. storage chamber
4. magnetic seal
5. frame
6. electronic circuit board
7. operating/display panel
8. worktop
9. door-opening aid
10. slider
11. actuator
12. differential pressure sensor
13. pipeline
14. reinforcing part
15. inner container
16. wall surface
17. opening
18. inner housing part
19. outer housing part
20. insulating layer
21. skirt
22. line
23. wall
24. catch tappet
25. air passage opening
26. support
27. pipe
28. pipe connection nozzle

11. A refrigeration appliance, comprising:
a storage chamber with a storage chamber door, and an inner container delimiting an interior of said storage chamber, said inner container having a wall surface formed with an opening;
a reinforcement part inset into said opening of said wall surface of said inner container and containing a temperature sensor;
da door-opening aid for facilitating an opening of said door of said storage chamber;
a differential pressure sensor for controlling said door-opening aid communicating with an interior of said storage chamber via said reinforcement part, said differential pressure sensor being exposed to an air pressure prevailing in the interior of said storage chamber and to an outside pressure prevailing in a surrounding area of the refrigeration appliance.

12. The refrigeration appliance according to claim 11, which further comprises an insulating layer surrounding said storage chamber, wherein said pressure sensor is disposed outside of said insulating layer and communicates with said storage chamber via a pipeline extending through said insulating layer.

13. The refrigeration appliance according to claim 11, wherein said reinforcement part includes a flexible skirt which abuts a side of said wall surface of the inner container facing away from said storage chamber, encircling the opening.

14. The refrigeration appliance according to claim 13, wherein said reinforcement part comprises an outer housing part and an inner housing part, which are plugged into one another and clamp said skirt therebetween.

15. The refrigeration appliance according to claim 11, wherein said reinforcement part has a housing portion engaging through said opening into said storage chamber, and wherein a wall of said housing portion is formed with at least one catch tappet engaging on an edge of said opening.

16. The refrigeration appliance according to claim 15, wherein said housing portion is formed with at least one air passage opening.

17. The refrigeration appliance according to claim 16, wherein said housing portion is formed with at least two air passage openings.

18. The refrigeration appliance according to claim 11, wherein said reinforcement part has a pipe connection nozzle.
19. The refrigeration appliance according to claim 18, wherein said pipe connection nozzle is oriented parallel to said wall surface of said inner container.