DESCRIPTION

REFRIGERATOR

Technical Field

The present invention relates to a refrigerator including a temperature sensor for controlling the temperature of the refrigerator.

Background Art

A refrigerator including a temperature detector for detecting the temperature of the refrigerator for operating and stopping the compressor is hitherto known, for example, as disclosed in Japanese Patent Laid-open Publication 03-225177. A sectional view of essential parts of a conventional refrigerator is shown in Fig. 3. A magnified sectional view of the essential parts of the refrigerator shown in Fig. 3 is given in Fig. 4. In Fig. 3 and Fig. 4, the refrigerator comprises a main body 101, a food freezer compartment 102 installed in the main body 101, a cooler 103 installed in an inner part of the food freezer compartment 102, a blower 104 for blowing cold air, a duct 105 for distributing the cold air, a temperature sensor 107 for controlling the temperature of the food freezer compartment 102, a thermo-case 106 accommodatingthe temperature sensor 107. An opening 105a for sending cold air into the

thermo-cas 106 is formed in the duct 105. A convection port 108 for convection of the cold air released from the duct 105 in the thermo-case 106 is formed in the thermo-case 106. A cold air suction port 109 for sending the cold air in the food freezer compartment 102 into the cooler 103 is formed in the bottom of the food freezer compartment 102. A partition wall 110 is installed in the bottom of the food freezer compartment 102, and this partition wall 110 is formed of an insulating material 111. A suction wind channel 112 is installed as being covered with the insulating material 111. The cold air released from the suction port 109 passes through the suction wind channel 112, and communicates with the lower end of the cooler 103. At the lower end of the cooler 103, a defrosting heater 113, and a drain 114 for removing defrosting water of the cooler 103 and dew in the suction wind channel 112 are provided.

In this constitution, the cold air cooled in the cooler 103 is sent into the duct 105 by the blower 104. The cold air discharged from the opening 105a of the duct 105 passes sequentially through the convection port 108 of the thermo-case 106, suction port 109, and suction wind channel 112, and returns to the cooler 108.

In such constitution, if water spilled near the thermo-case 106, the spilt water was not discharged, but was frozen. The frozen water reached up to the temperature sensor 107 to

freeze the temperature sensor 107, which caused malfunction of the temperature sensor. Besides, when the food was placed on the convection port 108 of the thermo-case 106, the convection of the cold air was blocked, and therefore if the food freezer compartment 102 reached a specified temperature, the temperature sensor 107 failed to function normally, and, as a result, the food freezer compartment 102 overcooled below the specified temperature, and the wasteful electric charge increased.

It is hence an object of the invention to provide a refrigerator capable of preventing malfunction of temperature sensor if water spills near the thermo-case, and capable of controlling the temperature of the food freezer compartment to a specified temperature if convection of cold air is blocked due to food placed on the convection port of the thermo-case.

Disclosure of the Invention

The refrigerator of the invention comprises a compartment for containing food, a cooler for cooling air, being installed at the inner side of the compartment, a duct for distributing the cold air, being installed at the front side of the cooler in the compartment, a thermo-case installed at a specified position in the compartment, a temperature sensor for controlling the temperature in the compartment, being installed in the thermo-case, a cold air circulation route communicating with the compartment, being installed through the cooler, at

the lower side of the thermo-case, a penetration route installed by penetrating through the bottom of the thermo-case and the cold air circulation route, and a drain communicating with the cold air circulation route, being located at the lower side of the penetration route. When water invades the thermo-case, the water is discharged from the drain through the circulation route. Moreover, the cold air passes through the penetration route, and circulates through the compartment, cold air circulation route, and cooler.

In this constitution, preferably, the compartment is a food freezer compartment for storing the food in frozen state. Preferably, the constitution further comprises a blower for circulating cold air cooled by the cooler, disposed adjacently to the cooler. Preferably, the compartment is a food freezer compartment, and a fresh food storage compartment is further disposed adjacently to the food freezer compartment. Preferably, the duct includes a first opening and a second opening, the first opening communicates with the thermo-case, and the second opening communicates with the compartment. Preferably, the thermo-case is installed in the bottom of the compartment. Preferably, the penetration route is installed at the lower side of the compartment. Preferably, the penetration route is installed as being covered with the insulating material.

In this constitution, if water spills near the thermo-

case, or if water invades into the thermo-case, the water is discharged without being frozen. Or if the food is placed on the convection port of the thermo-case, convection of the cold air in the thermo-case is assured, so that the temperature of the circulating cold air can be controlled to a desired temperature.

Brief Description of the Drawings

Fig. 1 is a magnified sectional view of essential parts of a refrigerator in an embodiment of the invention.

Fig. 2 is a sectional view of essential parts of a refrigerator in an embodiment of the invention.

Fig. 3 is a sectional view of essential parts of a conventional refrigerator.

Fig. 4 is a magnified sectional view of essential parts of the conventional refrigerator shown in Fig. 3.

Best Mode for Carrying Out the Invention

Embodiments of the refrigerator of the invention are described below.

A magnified sectional view of essential parts of a refrigerator in an embodiment of the invention is shown in Fig. 1. A sectional view of essential parts of a refrigerator in an embodiment of the invention is shown in Fig. 2.

In Fig. 1 and Fig. 2, the refrigerator comprises a main

body 1, a food freezer compartment 2 installed in the main body, a cooler 3 installed inside of the food freezer compartment 2, a blower 4 for blowing cold air, a duct 5 installed at the front side of the cooler 3, a thermo-case 6 installed at the bottom of the food freezer compartment 2, and a temperature sensor 7 installed in the thermo-case 6. The food freezer compartment 2 is a compartment for cooling and storing the food. The cooler 3 cools the air to generate cold air. The duct 5 functions to distribute and send the cold air into the food freezer compartment 2 and thermo-case 6. The temperature sensor 7 detects the temperature of the circulating cold air and controls the temperature of the food freezer compartment 2. The duct 5 has a first opening 5a and a second opening 5b, the first opening 5a sends cold air to the thermo-case 6, and the second opening 5b sends cold air to the food freezer compartment 2. A convection port 8 for convection of the cold air released from the first opening 5a in the thermo-case 6 is formed in the thermo-case 6. A cold air circulation port 9 for convection of cold air in the food freezer compartment 2 and sending into the cooler 3 is formed at the bottom of the food freezer compartment 2. A partition wall 10 is installed at the bottom of the food freezer compartment 2, and this partition wall 10 is formed of an insulating material 11. A cold air circulation route 12 is installed to penetrate through the food freezer compartment 2 and communicate with the cooler 3 from

the lower side of the thermo-case 6. The cold air circulation route 12 is installed as being covered with the insulating material 11. A penetration port 16 is formed in the bottom of the thermo-case, and a penetration route 15 is installed by penetrating through the penetration port 16 and cold air circulation route 12. At the lowerend of the cooler 3, a defrosting heater 13 and a drain 14 are installed. The drain 14 discharges the water generated from the frost depositing on the cooler 3 and water generated from the dew in the cold air circulation route 12 to outside. A door 18 is installed at the front side of the food freezer compartment 2.

The cold air cooled in the cooler 3 is sent into the duct 5 by the blower 4. The cold air discharged from the first opening 5a of the duct 5 passes sequentially through the convection port 8 of the thermo-case 6, circulation port 9, and cold air circulation route 12, and returns to the cooler 8. Moreover, the cold air in the thermo-case 6 sequentially passes through the penetration route 15 and cold air circulation route 12, and returns to the cooler 8. That is, the cold air in the thermo-case 6 has two passages, the passage through the circulation port 9 and the passage through the circulation route 15. On the other hand, the cold air discharged from the second opening 5b of the duct 5 flows by convection in the food freezer compartment 2, passes sequentially through the circulation port 9 and cold air circulation route 12, and returns to

the cooler 3. The cold air returning to the cooler 3 is distributed into the first opening 5a and second opening 5b of the duct 5, and is respectively sent into the thermo-case 6 and food freezer compartment 2. As the temperature of the cold air in the thermo-case 6 is measured by the temperature sensor 7, the cooler 3 is controlled, and the temperature of the cold air cooled by the cooler 3 is controlled accordingly. In this way, the temperature of the cold air circulating in the food freezer compartment 2 is controlled.

In this constitution, the water invading into the thermo-case 6 is guided into the cold air circulation route 12 through the penetration route 15, and is discharged outside through the drain 14. Therefore, it prevents the defect of freezing of water invading into the thermo-case 6. Hence, freezing of the temperature sensor 7 is prevented, so that malfunction of the temperature sensor may be avoided. Or, if the food is placed on the convection port 8 of the thermo-case 6, the cold air in the thermo-case 6 can pass through the penetration route 15, and circulate sequentially through the cold air circulation route 12, cooler 3 and food freezing compartment 2. Thus, malfunction of the temperature sensor is prevented, and the temperature in the food freezer compartment 2 can be controlled normally.

In the invention, a fresh food storage compartment may be also installed at the lower side or upper side of the food

freezer compartment, or the food freezer compartment may be replaced by a fresh food storage compartment.

Industrial Applicability

In the refrigerator of the invention, if water spills near the thermo-case, the spilt water is discharged without being frozen. Therefore, freezing of the temperature sensor installed in the thermo-sensor is prevented, and malfunction of the temperature sensor can be prevented. If food or the like is placed on the convection port of the thermo-case, the convection of cold air in the thermo-case is assured, and the temperature of the circulating cold air can be controlled at a desired temperature. In this way, the operation of the temperature sensor is always kept normal, so that the temperature in the compartment may be accurately controlled.

CLAIMS

1. A refrigerator comprising:

a compartment having a cold air circulation port for containing food,

a cooler for cooling, being installed at the end of said compartment,

a duct for distributing the cold air cooled by said cooler into desired portions of said compartment,

a thermo-case having a penetration port in the bottom, said thermo-case being installed at a specified position in the compartment,

a temperature sensor for controlling the temperature in said compartment, said temperature sensor being installed in said thermo-case,

a cold air circulation route communicating with said cold air circulation port of said compartment, said cold air circulation route being installed through said cooler, at the lower side of said thermo-case, and

a penetration route installed by penetrating through said penetration port of said thermo-case and said cold air circulation route,

wherein said cold air getting into said compartment through said duct is discharged from said cold air circulation port and returns to said cooler through said cold air circulation route, said cold air getting into said thermo-case is

discharged from said penetration port and returns to said cooler through said cold air circulation route, and water, if invading into said thermo-case, is discharged through said penetration route.

2. A refrigerator of claim 1, wherein said compartment is a food freezer compartment for storing said food in frozen state.

3. A refrigerator of claim 1, further comprising a blower for circulating cold air cooled by said cooler, said blower being disposed adjacently to said cooler.

4. A refrigerator of claim 1, wherein said compartment is a food freezer compartment, and a fresh food storage compartment is further disposed adjacently to said food freezer compartment.

5. A refrigerator of claim 1, wherein said duct includes a first opening and a second opening, said first opening communicates with said thermo-case, and said second opening communicates with said compartment, said cold air cooled by said cooler passes through said first opening to get into said thermo-case, and simultaneously passes through said second opening to get into said compartment, and said temperature sensor controls the temperature of said cold air getting into said thermo-case, thereby controlling the temperature of said cold air getting into said compartment.

6. A refrigerator of claim 1, wherein said thermo-case

is installed in the bottom of said compartment.

7. A refrigerator of claim 1, wherein said penetration route is installed at the lower side of said compartment.

8. A refrigerator of claim 1, wherein said penetration route is installed as being covered with said insulating material.

9. A refrigerator of claim 1, further comprising a drain communicating with said cold air circulation route, said drain being located at the lower side than said penetration route, wherein said water in said thermo-case is discharged from said drain through said penetration route.

10. A refrigerator of claim 1, wherein said compartment is a food freezer compartment, said thermo-case is installed in the bottom of said food freezer compartment, a penetration port of said food freezer compartment is formed in said bottom of said food freezer compartment, said thermo-case is installed at the upper side of said penetration port, said cold air circulation route is formed at the lower side of said food freezer compartment, said duct includes a first opening and a second opening, said first opening communicates with said thermo-case, and said second opening communicates with said compartment, and said temperature sensor controls the temperature of said cold air getting into said thermo-case, thereby controlling the temperature of said cold air getting into said food freezer compartment.

11. A refrigerator of claim 10, further comprising a drain communicating with said cold air circulation route, said drain being located at the lower side of said penetration route, wherein said bottom of the food freezer compartment composes a partition wall having an insulating material, said penetration route penetrates through said insulating material, and said water in said thermo-case is discharged from said drain through said penetration route.

12. A refrigerator comprising:

a food freezer compartment,

a cooler installed at the inner side of said food freezer compartment,

a blower for blowing cold air cooled by said cooler,

a duct for distributing said cooled cold air,

a thermo-case installed at the bottom of said food freezer compartment,

a temperature sensor for controlling the temperature of said food freezer compartment, said temperature sensor being installed in said thermo-case,

a cold air circulation route communicating with said food freezer compartment, said cold air circulation route being installed through said cooler at the lower side of said thermo-case, and

a penetration route installed by penetrating through the bottom of said thermo-case and said cold air circulation

route.