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(54) REFRIGERATION DISPLAY CABINET

(57) The present invention proposes a refrigeration display cabinet, comprising: a cabinet; a display rack fixed inside the cabinet; an air channel arranged at least partially surrounding the display rack; a partition mounted in the air channel to separate the air channel into an inner air channel and an outer air channel, wherein the partition is provided with an opening for connecting the inner air channel and the outer air channel; an evaporator arranged in the inner air channel, wherein the side of the evaporator is located at or near the opening; and a damper assembly fixed at the opening of the partition, wherein the damper assembly is capable of opening or closing the opening. The refrigeration display cabinet according to the present invention can defrost the evaporator simultaneously from the bottom and side thereof during the defrosting mode, thus improving defrosting efficiency.

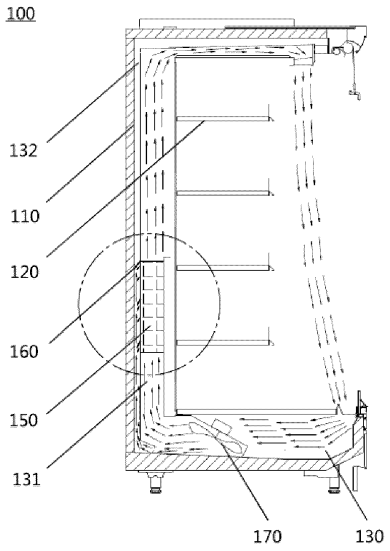

Figure 3

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the technical field of refrigeration equipment, in particular to a refrigeration display cabinet.

BACKGROUND OF THE INVENTION

[0002] As an important carrier for food sales, refrigeration display cabinets mainly appear as containers in the market and are the essential facilities for large shopping malls, supermarkets, and the catering industry. They can store and display dairy products, beverages, fruits, meat products, etc. at different temperatures.

[0003] The structure of an existing refrigeration display cabinet is shown in FIGS. 1 and 2. The body of a refrigeration display cabinet 10 is a cabinet 11, which is configured with an air channel 12, a fan 13, and an evaporator 14. A partition 15 separates the air channel 12 into an inner air channel 12a and an outer air channel 12b. The fan 13 is arranged at or near the bottom of the partition 15 to blow air into the air channel 12, and the evaporator 14 is arranged in the inner air channel 12a. When external air enters the air channel 12 of the cabinet 11, it is divided into two streams of airflow through the partition 15, i.e., one stream of airflow flow through the evaporator 14 in the inner air channel 12a and becomes a low-temperature airflow through heat exchange to cool the goods on a display rack 16; another stream of airflow flows in the outer air channel 12b to protect the air curtain of the inner air channel 12a from being exposed to the environment, thereby achieving the goal of energy conservation. The two streams of airflow leave from the holes on the air outlet plate of the air channel 12 and blow downwards, and then return to the cabinet 11 from the return air inlet, thus forming an "air curtain" surrounding the display rack 16. The directions of airflow are shown by the arrows in FIG. 1.

[0004] However, during the operation of the refrigeration display cabinet 10, the evaporator 14 in the inner air channel 12a is prone to frost formation. Due to the presence of frost, the airflow entering the evaporator 14 is reduced, which affects the refrigeration effect and can easily cause temperature-sensitive products to spoil, causing losses to merchants and potentially leading to customers purchasing spoiled products. Therefore, it is necessary to further improve the refrigeration display cabinets.

SUMMARY OF THE INVENTION

[0005] In view of the above, the present invention provides a refrigeration display cabinet, so as to solve or at least alleviate one or more of the aforementioned problems and problems in other aspects existing in the prior art, or to provide an alternative technical solution for the prior art.

[0006] According to the invention there is provided a refrigeration display cabinet, comprising:

a cabinet;

a display rack, fixed inside the cabinet;

an air channel, arranged at least partially surrounding the display rack;

a partition, mounted in the air channel to separate the air channel into an inner air channel and an outer air channel, wherein the partition is provided with an opening for connecting the inner air channel and the outer air channel;

an evaporator, arranged in the inner air channel, where a side of the evaporator is located at or near the opening; and

a damper assembly, fixed at the opening of the partition, wherein the damper assembly is capable of opening or closing the opening.

[0007] Optionally, the damper assembly comprises a plurality of wind deflectors, wherein the plurality of wind deflectors are rotatably fixed at the opening, and the plurality of wind deflectors synchronously open or close the opening by means of a linkage mechanism.

[0008] Optionally, the plurality of wind deflectors comprise a first wind deflector, a second wind deflector, and a third wind deflector, wherein the first wind deflector is arranged at or near the top of the evaporator, the second wind deflector is arranged in or near the middle of the evaporator, and the third wind deflector is arranged at or near the bottom of the evaporator.

[0009] Optionally, the length of the second wind deflector is the same as that of the third wind deflector, and the lengths of the second wind deflector and the third wind deflector are less than the length of the first wind deflector

[0010] Optionally, the widths of the first wind deflector, the second wind deflector, and the third wind deflector are the same as the width of the outer air channel in the horizontal direction.

[0011] Optionally, the length of the first wind deflector is less than the length of the outer air channel in the horizontal direction

[0012] Optionally, the first wind deflector, the second wind deflector, and the third wind deflector are made of metal or plastic.

[0013] Optionally, the shape of the opening is consistent with the shape of the side of the evaporator.

[0014] Optionally, the first wind deflector, the second wind deflector, and the third wind deflector are controlled by a stepper motor controller.

[0015] Optionally, the damper assembly is fixed at the

opening of the partition by bolts.

[0016] Optionally, the refrigeration display cabinet further comprises a fan arranged at or near the bottom of the partition.

[0017] It can be appreciated that the refrigeration display cabinet of the present invention adopts a design of air intake simultaneously from the side and bottom of the evaporator, which makes the direct air intake area of the evaporator larger during the defrosting mode, thus greatly improving the heat exchange efficiency and achieving better defrosting effect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The technical solution of the present invention will be described in further detail below in conjunction with the accompanying drawings and embodiments. However, it should be noted that these drawings are only designed for explanatory purposes and are intended to conceptually illustrate the structure described herein, without the need to be drawn proportionally.

FIG. 1 illustrates a cross-sectional view of a refrigeration display cabinet in the prior art;

FIG. 2 illustrates a partially enlarged schematic diagram of the refrigeration display cabinet in FIG. 1;

FIG. 3 illustrates, as an example, a cross-sectional view of a refrigeration display cabinet according to the present invention; and

FIG. 4 illustrates, as an example, a partially enlarged schematic diagram of the refrigeration display cabinet in FIG. 3.

DETAILED DESCRIPTION OF EMBODIMENT(S) OF THE INVENTION

[0019] The content of the present invention and the differences between the present invention and the prior art can be understood by referring to the accompanying drawings and the text. The technical solution of the present invention will be described in further detail below through the accompanying drawings and by enumerating some optional embodiments of the present invention. The same or similar reference numerals in the drawings represent the same or similar components.

[0020] It should be noted that any technical features or solutions in the embodiments are one or several of multiple optional technical features or technical solutions. For brevity, it is neither possible to exhaustively enumerate herein all alternative technical features and technical solutions of the present invention, nor is it possible to emphasize that the implementation mode of each technical feature is one of the optional multiple implementation modes. Therefore, those skilled in the art should be aware that any technical means provided by the present invention can be substituted, or any two or more technical means or technical features provided by the present invention can be combined with each other to obtain a new technical solution.

[0021] Any technical feature or technical solution within the embodiments does not limit the scope of protection of the present invention. The scope of protection of the present invention should include any alternative technical solutions that those skilled in the art can think of without creative labor, as well as any new technical solutions obtained by those skilled in the art by combining any two or more technical means or technical features provided by the present invention.

[0022] Those skilled in the art are aware that refrigeration display cabinets are widely used to display goods that require refrigeration, mainly for achieving refrigerated storage of goods and displaying some goods that require low-temperature storage to consumers. In order to facilitate customer selection, refrigeration display cabinets are usually open, using air curtains to separate the food from the outside environment to reduce the entry of hot air.

[0023] FIG. 3 schematically illustrates the structure of an embodiment of a refrigeration display cabinet according to the present invention in general. As can be clearly seen in FIGS. 3 and 4, a refrigeration display cabinet 100 is composed of a cabinet 110, a display rack 120, an air channel 130, a partition 140, an evaporator 150, and a damper assembly 160, among other parts. The display rack 120 is fixed inside the cabinet 110 for storing and displaying various commodities such as dairy products, beverages, fruits, meat products, etc., and the air channel 130 is arranged at least partially surrounding the display rack 120. The partition 140 is mounted in the air channel 130 to separate the air channel 130 into an inner air channel 131 and an outer air channel 132, wherein the inner air channel 131 is closer to the display rack 120 relative to the outer air channel 132. In order to feed external air into the cabinet 110, the refrigeration display cabinet 100 may further comprise a fan 170, which is provided at or near the bottom of the partition 140. In addition, the partition 140 is also provided with an opening for connecting the inner air channel 131 and the outer air channel 132. As shown in FIG. 4, the evaporator 150 is arranged in the inner air channel 131, and the side of the evaporator 150 is located at or near the opening. Furthermore, the damper assembly 160 can be fixed to the opening of the partition 140 by bolts or other means, wherein the damper assembly 160 can open or close the opening. Therefore, during the defrosting mode of the refrigeration display cabinet, air can not only enter from the bottom of the evaporator but also from the side of the evaporator. By increasing the air intake area, the heat transfer efficiency can be significantly improved, thereby accelerating the defrosting process.

[0024] The working principle of the refrigeration display cabinet according to the present invention during the refrigeration mode and the defrosting mode will be de-

scribed below in conjunction with FIGS. 3 and 4.

[0025] During the refrigeration mode, when the external air enters the air channel 130 of the refrigeration display cabinet 100, it is divided into two streams of airflow through the partition 140, i.e., one stream of airflow flows through the evaporator 150 in the inner air channel 131, and forms a refrigeration airflow through heat exchange to cool the goods on the display rack 120; another stream of airflow flows in the outer air channel 132 to protect the air curtain on the inner side of the inner air channel 131 from being exposed to the environment, thereby achieving the goal of energy conservation. Two streams of airflow leave from the holes on the air outlet plate of the air channel 130 and blow downwards, returning to the cabinet 110 from the return air inlet. It can thus be seen that in the refrigeration display cabinet 100, the air forms an "air curtain" surrounding the display rack 120.

[0026] During the defrosting mode, when the external air enters the air channel 130 of the cabinet 110, it is divided into two streams of airflow through the partition 140, i.e., one stream of airflow flows through the evaporator 150 in the inner air channel 131 to defrost from the bottom of the evaporator 150; at the same time, the damper assembly 160 opens the opening, allowing another stream of airflow to flow into the side of the evaporator 150 through the opening in the outer air channel 132, so as to defrost from the side of the evaporator 150. Two streams of airflow converge at the evaporator 150 to form one stream of airflow, which leaves from the holes on the air outlet plate of the air channel 130 and blows downwards, and then returns to the cabinet 110 from the return air inlet. The directions of the airflow during defrosting are shown by the arrows in FIG. 3.

[0027] In conjunction with the above embodiments, in other optional embodiments, the damper assembly 160 comprises a plurality of wind deflectors, which are rotatably fixed at the opening, and the plurality of wind deflectors can synchronously open or close the opening by means of a linkage mechanism (not shown). By adopting a multi-stage damper design, air can be gradually introduced from the side of the evaporator to improve the heat exchange efficiency of the evaporator 150. Specifically, the plurality of wind deflectors comprise a first wind deflector 161, a second wind deflector 162, and a third wind deflector 163, wherein the first wind deflector 161 can be arranged at or near the top of the evaporator 150, the second wind deflector 162 can be arranged in or near the middle of the evaporator 150, and the third wind deflector 163 can be arranged at or near the bottom of the evaporator 150, as shown in FIG. 4. In addition, the length of the second wind deflector 162 is the same as that of the third wind deflector 163, and the length of the second wind deflector 162 and that of the third wind deflector 163 are less than the length of the first wind deflector 161, so that air is introduced from the side of the evaporator from bottom to top during the defrosting mode. Furthermore, the length of the first wind deflector 161 can be designed to be less than the length of the outer air channel 132 in the horizontal direction. When the first wind deflector 161 is rotated to its maximum position, due to the stop of the side wall of the cabinet 110, the first wind deflector 161 forms an inclined angle with respect to the side wall of the cabinet 110. In this case, the second wind deflector 162 and the third wind deflector 163 can rotate to the same inclined position as the first wind deflector 161 (see FIGS. 3 and 4), which is very conducive to guiding the air smoothly into the side of the evaporator 150.

[0028] In order to ensure that all the airflow in the outer air channel 132 can enter the evaporator 150 during the defrosting period, the widths of the first wind deflector 161, the second wind deflector 162, and the third wind deflector 163 can be designed to be the same as the width of the outer air channel 132 in the horizontal direction (i.e., perpendicular to the paper direction). It is also readily conceivable to those skilled in the art that the first wind deflector 161, the second wind deflector 162, and the third wind deflector 163 can all be made of materials such as metal or plastic. In addition, the first wind deflector 161, the second wind deflector 162, and the third wind deflector 163 can be controlled by a stepper motor controller (not shown). It should be noted that the stepper motor controller can control the rotation angle and rotation direction of the first wind deflector 161, the second wind deflector 162, and the third wind deflector 163, so that the damper assembly 160 can synchronously open or close the opening as needed.

[0029] As an example, in the refrigeration display cabinet 100 according to the present invention, the shape of the opening is consistent with the shape of the side of the evaporator 150. That is to say, the air intake area on the side of the evaporator 150 is the same as the area of the side of the evaporator 150, so that the entire side of the evaporator 150 directly participates in heat exchange, which is conducive to accelerating the defrosting process of the evaporator 150.

[0030] In summary, the refrigeration display cabinet of the present invention adopts a design of air intake simultaneously from the side and the bottom of the evaporator, which makes the direct air intake area of the evaporator larger during the defrosting mode, thus further improving the heat exchange efficiency and achieving better defrosting effect.

[0031] If terms such as "first" and "second" are used herein to limit components, those skilled in the art should be aware that the use of "first" and "second" is only for the convenience of describing and distinguishing components. Unless otherwise stated, the above terms do not have any special meanings.

[0032] In addition, as to the terms used to indicate positional relationships or shapes in any of the technical solutions disclosed in the present invention, unless otherwise stated, the implications thereof include states or shapes that are approximate, similar, or close to them. Any component provided by the present invention can be

either assembled from multiple individual components or manufactured as a separate component using an integration process.

[0033] If terms such as "center", "longitudinal", "transverse", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside", etc. are used in the depiction of the present invention, the orientations or positional relationships indicated by the above terms are based on the orientations or positional relationships shown in the drawings. These terms are used merely for the convenience of describing the present invention and simplifying the description, rather than indicating or implying that the device, mechanism, component or element referred to must have a specific orientation, be constructed and operated in a specific orientation, so they cannot be understood as forming limitations on the scope of protection of the present invention.

[0034] Last, it should be noted that the above embodiments are only used to illustrate the technical solution of the present invention but not to limit it. Although the present invention has been described in detail with reference to preferred embodiments, those skilled in the art, however, should understand that the specific embodiments of the present invention can still be modified or some technical features can be equivalently substituted. Without departing from the spirit of the technical solution of the present invention, all of these modified embodiments or technical features used for equivalent substitution should fall within the scope of the claimed technical solution of the present invention.

Claims

1. A refrigeration display cabinet, comprising:

a cabinet;
a display rack, fixed inside the cabinet;
an air channel, arranged at least partially surrounding the display rack;
a partition, mounted in the air channel to separate the air channel into an inner air channel and an outer air channel, wherein the partition is provided with an opening for connecting the inner air channel and the outer air channel;
an evaporator, arranged in the inner air channel, wherein a side of the evaporator is located at or near the opening; and
a damper assembly, fixed at the opening of the partition, wherein the damper assembly is capable of opening or closing the opening.

2. The refrigeration display cabinet according to claim 1, wherein the damper assembly comprises a plurality of wind deflectors, where the plurality of wind deflectors are rotatably fixed at the opening, and the plurality of wind deflectors synchronously open or close the opening by means of a linkage mechanism.

3. The refrigeration display cabinet according to claim 2, wherein the plurality of wind deflectors comprise a first wind deflector, a second wind deflector, and a third wind deflector, where the first wind deflector is arranged at or near the top of the evaporator, the second wind deflector is arranged in or near the middle of the evaporator, and the third wind deflector is arranged at or near the bottom of the evaporator.

4. The refrigeration display cabinet according to claim 3, wherein a length of the second wind deflector is the same as that of the third wind deflector, and lengths of the second wind deflector and the third wind deflector are less than a length of the first wind deflector.

5. The refrigeration display cabinet according to claim 3 or 4, wherein widths of the first wind deflector, the second wind deflector, and the third wind deflector are the same as a width of the outer air channel in the horizontal direction.

6. The refrigeration display cabinet according to claim 4, wherein the length of the first wind deflector is less than a length of the outer air channel in the horizontal direction.

7. The refrigeration display cabinet according to claim 3 or 4, wherein the first wind deflector, the second wind deflector, and the third wind deflector are made of metal or plastic.

8. The refrigeration display cabinet according to any of claims 1-3, wherein a shape of the opening is consistent with a shape of the side of the evaporator.

9. The refrigeration display cabinet according to claim 3 or 4, wherein the first wind deflector, the second wind deflector, and the third wind deflector are controlled by a stepper motor controller.

10. The refrigeration display cabinet according to any of claims 1-3, wherein the damper assembly is fixed at the opening of the partition by bolts.

11. The refrigeration display cabinet according to any of claims 1-3, wherein the refrigeration display cabinet further comprises a fan arranged at or near the bottom of the partition.

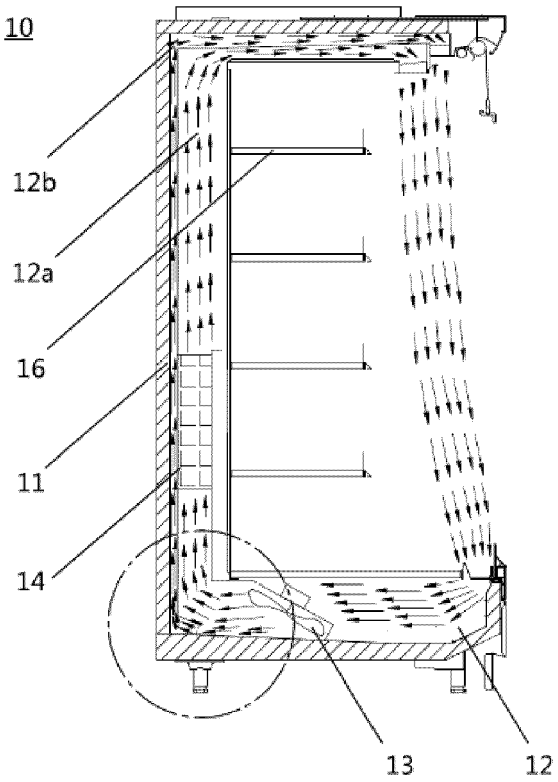

Figure 1

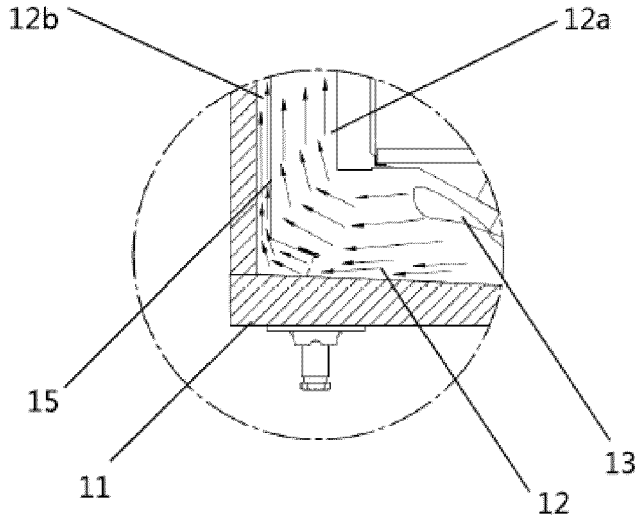

Figure 2

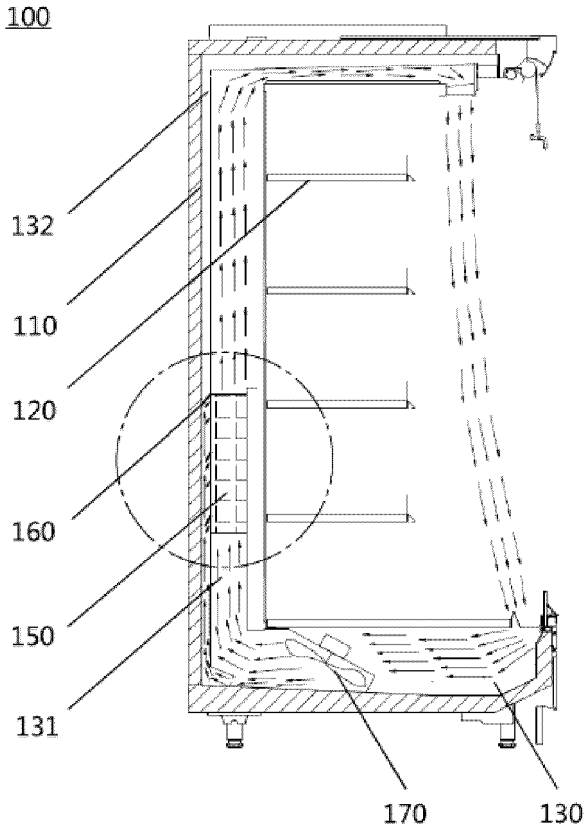

Figure 3

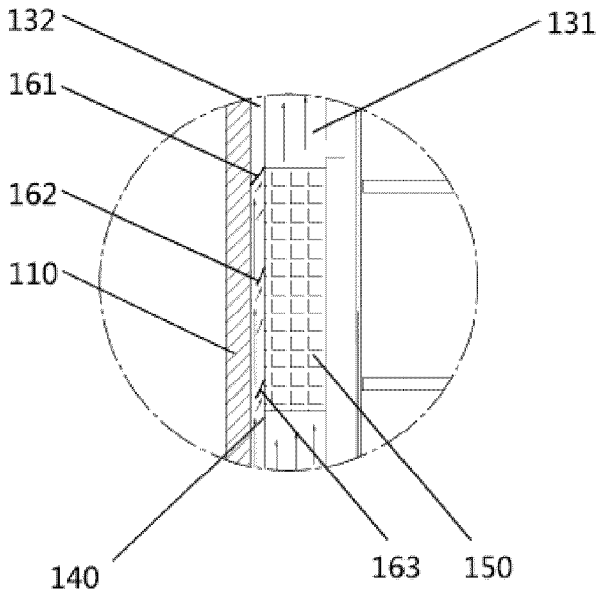

Figure 4

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EUROPEAN SEARCH REPORT

Application Number
EP 24 18 9251

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	JP S63 58082 A (SANYO ELECTRIC CO) 12 March 1988 (1988-03-12) * figures 1-8 *	1,2,8, 10,11	INV. A47F3/04
X	US 3 094 851 A (STERLING BECKWITH) 25 June 1963 (1963-06-25) * figures 1-5 *	1,2,8, 10,11	
X	CA 1 240 165 A (SANYO ELECTRIC CO) 9 August 1988 (1988-08-09) * figures 1-17 *	1,2,8, 10,11	
			TECHNICAL FIELDS SEARCHED (IPC) A47F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 November 2024	Linden, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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04-11-2024

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