(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 December 2010 (29.12.2010)

PCT

(10) International Publication Number
WO 2010/148537 A1

(51) International Patent Classification:
A47F 3/04 (2006.01)

(21) International Application Number:
PCT/CN2009/000708

(22) International Filing Date:
25 June 2009 (25.06.2009)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **CARRIER CORPORATION** [US/US]; ONE CARRIER PLACE, Farmington, CT 06034 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **GU, Zhong** [CN/CN]; #17-401, #888 Jin Xiu Road, Pudong, Shanghai 201206 (CN). **WAN, Feng** [CN/CN]; No. 1485, Jinqiao Road, Pudong, Shanghai 201206 (CN).

(74) Agent: **CHINA PATENT AGENT (H. K.) LTD.**; 22/F Great Eagle Centre, 23 Harbour Road, Wanchai, Hong Kong (CN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,

[Continued on next page]

WO 2010/148537 A1

(54) Title: REFRIGERATED MERCHANDISER

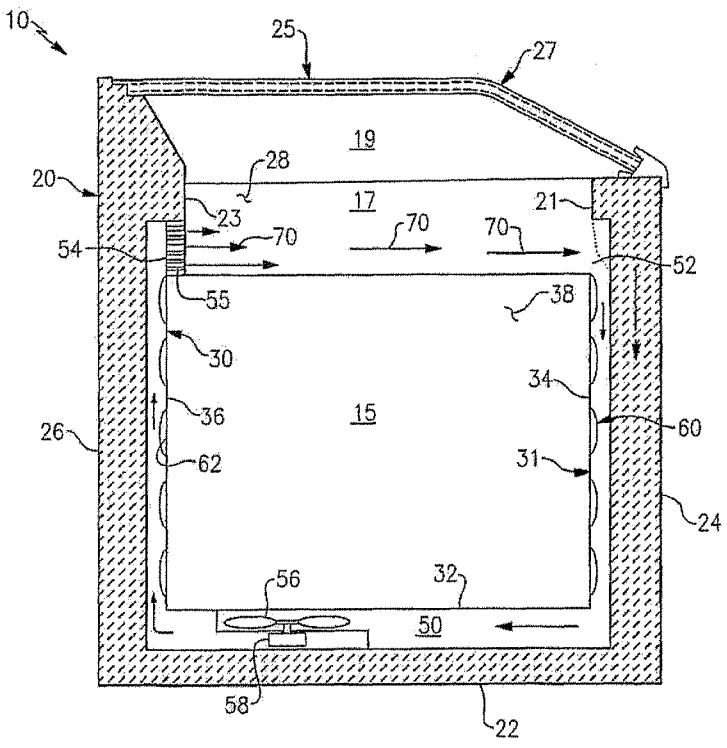

FIG.1

(57) Abstract: A refrigerated merchandiser includes an outer cabinet (20) defining an interior volume having a top access opening (17), and a liner assembly (30) disposed within the interior volume of the outer cabinet (20) and defining a product display space (15) having an open top. The liner assembly (30) includes an evaporator (60) contacting an inner liner (31) and bounding an air circulation duct (50) through which air circulating from the product display space (15) passes. Refrigerant circulating through the evaporator (60) cools both the inner liner (31) and the circulating air. The circulating air passes across the open top of the product display space (15) to form an air curtain (70).

MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

Refrigerated Merchandiser

Field of the Invention

[0001] This invention relates generally to refrigerated merchandisers and, more particularly, to island type chest freezers.

Background of the Invention

[0002] Refrigerated merchandisers, also commonly referred to as refrigerated display cases and refrigerated display cabinets, are well-known in the food merchandising industry for displaying to potential customers food products that must be maintained in a temperature-controlled environment to prevent spoilage or deterioration of quality or edibility. For fresh foods, the product stored in the interior product display space of the refrigerated display case is generally maintained at a temperature in the range of about 33 degrees F to about 40 degrees F (about 0.5°C to about 4°C), depending upon the particular food product. For frozen foods, the product stored in the interior product display space of the refrigerated display case is generally maintained at a temperature in the range of about 0 degrees F to about 32 degrees F (about -18°C to about 0°C) or lower depending upon the particular food product.

[0003] One type of refrigerated display cabinet in commercial use, generally in supermarkets and grocery stores, is commonly referred to as an island-type display chest. Display chests of this type have an interior display space accessed through on open top. The display chest has four side walls and a bottom wall cooperatively forming a rectilinear box-like chest. The chest may have an open-top or a hinged top door that may be made, at least in part, of glass or other transparent material that permits potential customers to view the product displayed within the interior display space.

[0004] In open-top refrigerated display cabinets of this type, the interior display space is defined by a liner having an open top, four side walls and a bottom wall. The liner is disposed within the box-like chest with the bottom wall of the liner parallel to and spaced from, typically by a few inches, the bottom wall of the chest and with the front and rear sidewalls of the liner parallel to and spaced from,

typically by a few inches, the front side and back side wall, respectively, of the chest. In this construction, a continuous gap is formed between the liner and the chest walls which extends along the front side wall, the bottom wall and the back side wall. In this space, an evaporator coil and a motor driven evaporator fan are disposed in operative association.

[0005] The evaporator fan operates to draw air from the display space through an inlet at the top of the front side wall downwardly through the gap between the liner and the front side wall, thence through the gap between the liner and the bottom wall, thence upwardly through the gap between the liner and the back side wall, and returned to the display space through an outlet at the top of the back side wall. In traversing the gap, the air passes through the evaporator coil in heat exchange relationship with refrigerant circulating through the tubes of the evaporator coil whereby the air is chilled. Typically, the refrigerant is supplied from an external refrigeration system located elsewhere on the store premises. The chilled air discharging from the outlet at the top of the back side wall passes across the open-top of the chest, thereby forming a layer of relatively cold air, termed an air curtain, over the product display space that isolates the open product display space from the warm environment of the store. Open-top refrigerated display chests utilizing air curtains are shown, for example, in U.S. Pat. Nos. 4,265,092; 4,314,457 and 7,497,770. In this design, the liner itself is not chilled by direct conduction from the refrigerant, but only by convective heat exchange with the chilled air flowing along the surface of the liner.

[0006] In certain applications, for example when displaying of frozen foods, an open-top chest with air curtain will consume a high amount of energy and require an expensive finned tube coil to provide sufficient cooling of the circulating air to maintain the product within the display space in a frozen state. To conserve energy in freezer applications, it has become customary to provide a hinged door or sliding door covering the open-top access to the product display space of the chest freezer. In freezer applications, The door, either in whole or in part, is formed of glass or other transparent material to permit a potential purchaser to view the product within the interior display space. To access the product for purchase, the purchaser need only open the door and reach into the product display space. Commonly, in freezer

applications, the interior product space is cooled by refrigerant circulating through a tube coil wrapped around the side walls of the liner defining the interior display space. The tube coil is typically embedded in the inner surface of the insulated side walls of the chest freezer bounding the liner. The refrigerant may be supplied from an external refrigeration system located elsewhere on the store premises or from a self-contained refrigeration unit disposed beneath the display chest. A refrigerated display cabinet of this type is shown, for example, in U.S. Pat. No. 4,753,084. In this type of design, the air within the interior product display space is cooled indirectly from contact with the chilled liner, which is chilled by conduction from the refrigerant circulating through the tube coil surrounding the liner. Consequently, the air temperature may vary with location within the product display space, with the coldest air being found along the liner side walls, with the air being warmer in the central upper region of the product display space. Additional designs of glass-top refrigerated merchandisers of the chest type are shown, for example, in U.S. Pat. Nos. 3,729,243 and 4,602,827.

Summary of the Invention

[0007] In an aspect of the invention, a refrigerated chest merchandiser includes an outer cabinet defining an interior volume having a top access opening, and a liner assembly disposed within the interior volume of the outer cabinet and defining a product display space having an open top disposed subadjacent and in spaced relationship with the top access opening of the outer cabinet. The liner assembly includes an inner liner and a refrigerant evaporator. The inner liner has a bottom wall disposed in spaced relationship with and above a bottom wall of the outer cabinet to form a bottom gap, a front wall disposed in spaced relationship with and inward of a front wall of the outer cabinet to form a front gap, and a rear wall disposed in spaced relationship with and inward of a rear wall of the outer cabinet to form a rear gap. The front gap, bottom gap and rear gap connect in flow communication to form a continuous duct. The continuous duct includes an air inlet and an air outlet n flow communication with the continuous duct. In an embodiment, the air inlet is disposed along the front wall of the inner liner and an air outlet from the duct is disposed along the rear wall of the inner liner. The refrigerant evaporator

contacts the inner liner and bounds a portion of the continuous duct, for example the front gap and the rear gap. An air circulator, which in an embodiment may be disposed within the continuous duct, circulates air from the product display space through the air inlet into the continuous duct and discharges the circulating air through the air outlet across the open top of the liner assembly. In an embodiment, the air curtain comprises a multi-layer laminated air curtain.

[0008] The refrigerant evaporator may be bonded to the inner liner. The refrigerant liner may be formed integrally with the inner liner. In an embodiment, the refrigerant evaporator includes a plurality of refrigerant passages disposed in spaced relationship with each set of adjacent refrigerant passages interconnected by a web member. The refrigerant evaporator may be roll formed from a single metal sheet and bonded to a back face of the inner liner. In an embodiment, the inner liner and the refrigerant evaporator are made of the same metal material. In an embodiment, the refrigerated display merchandiser may include a selectively positionable door mounted to the outer cabinet, the door being positionable in a closed position wherein said door covers the access opening and in an open position wherein the access opening is uncovered. The door includes a transparent portion to permit viewing of the product display space. In an embodiment, the door is a glass door.

Brief Description of the Drawings

[0009] For a further understanding of the disclosure, reference will be made to the following detailed description which is to be read in connection with the accompanying drawing, where:

[0010] FIG. 1 is an elevation view, in section, of an exemplary embodiment of a chest-type frozen food merchandiser embodying an aspect of the invention;

[0011] FIG. 2 is a sectioned, side elevation view of an exemplary embodiment of the liner/evaporator assembly of the merchandiser of FIG. 1 taken along line 2-2 of FIG. 3; and

[0012] FIG. 3 is a laid-out plan view of the liner/evaporator assembly of the merchandiser of FIG. 1.

Detailed Description of the Invention

[0013] Referring initially to FIG. 1 of the drawing, there is depicted an exemplary embodiment of a chest-type frozen food merchandiser 10, which will also be referred to herein as a freezer chest. The freezer chest 10 includes an outer cabinet 20 having a top door 25, and a liner assembly 30 that defines an interior product display space 15. The cabinet 20 has a bottom wall 22, a front wall 24, a back wall 26, and two opposed side walls 28 that cooperatively form a rectilinear box-like structure. The door 25, which when closed against the upper perimeter of the outer cabinet 20 covers the access opening 17 of the freezer chest 10, is hinged to the back wall 26 and pivots upwardly and rearwardly away from the front wall 24 when a purchaser opens the door 25 to access product with the interior display space 15. The door 25, either in whole or in part, is formed of glass or other transparent material 27 to permit a potential purchaser to view the product within the interior display space 15. The front wall 24 has an inwardly projecting lip 21 and the rear wall has an inwardly projecting lip 23. The access opening 17 is a rectilinear opening that extends front to back between the lip 21 and the lip 23 and extends laterally between the opposed side walls 28. A dome region 19 is formed above the access opening 17 and the inside surface of the door 25 when the door 25 is in the closed position.

[0014] The liner assembly 30 includes an inner liner 31 and an evaporator 60 that surrounds the inner liner 31. The inner liner 31 has a bottom wall 32, a front wall 34, a back wall 36, and two opposed side walls 38 that cooperatively form a rectilinear box-like structure. The liner 31 is disposed within the interior volume defined by the outer cabinet 20 with the bottom wall 32 of the liner 31 positioned parallel to and in spaced relationship to the bottom wall 22 of the outer cabinet and the open top of the liner 30 subadjacent the access opening 17 in spaced relationship with the lower surfaces of the respective lips 21 and 23 of the front and rear walls of the outer cabinet 20. Additionally, the liner 30 is positioned within the interior volume defined by the outer cabinet 20 with the front wall 34 of the liner 31 positioned parallel to and in spaced relationship to the front wall 24 of the outer cabinet, and with the rear wall 36 of the inner liner 31 positioned parallel to and in spaced relationship to the back wall 26 of the outer cabinet.

[0015] The gaps between the front, bottom and rear walls of the liner 31 and the respective front, bottom and rear walls of the outer cabinet 20 form a continuous duct 50. An air inlet 52 is disposed between the upper edge of the front wall 34 of the inner liner 31 of the under surface of the lip 21 extending inwardly from the front wall 24 of the outer cabinet 20. An air outlet 54 is disposed between the upper edge of the rear wall 36 of the inner liner 31 and the under surface of the lip 23 extending inwardly from the rear wall 36 of the inner liner 31. The duct 50 extends as a continuous flow passage from the air inlet 52 to the air outlet 54. An air flow circulator, for example an axial flow fan 56 and associated fan drive motor 58 as depicted in FIG. 1, is disposed within the air flow duct 50 for drawing air from the interior product display space. The opposed side walls 38 of the liner 31 lie adjacent the opposed side walls 28 of the outer cabinet 20.

[0016] Referring now to FIGs. 2-3, the liner assembly 30 includes an evaporator 60 that surrounds the liner 30, contacting the back surfaces of the front wall 34, rear wall 36 and side walls 38 of the inner liner 31 that face, respectively, the front wall 24, the rear wall 26 and the side walls 28 of the outer cabinet 20. The evaporator 60 may be bonded to those back surfaces of the front wall 34, back wall 36 and side walls 38 of liner 30. In the exemplary embodiment depicted in FIGs. 1-3, the evaporator 60 comprises a plurality of refrigerant flow passages 62 disposed at spaced intervals with neighboring passages 62 connected by a flat web member 64 extending therebetween. The evaporator 60 may be roll formed from a single metal sheet which is bonded, by any suitable means, during manufacture to the back surfaces of the front wall 34, rear wall 36 and side walls 38 of the inner liner 31. Constructed in this manner, the refrigerant passages 62 and the web members 64 are integrally formed and the evaporator and inner liner are integrally formed. The evaporator 60 and the inner liner 31 may be made of the same metal material, for example copper sheet, stainless steel sheet, or other sheet material of compatible and bondable metals having acceptable thermal conductivity.

[0017] The portions of the evaporator 60 bounding the front wall 34 and the back wall 36 of the liner 30 also bound upon the duct 50 formed between the liner 30 and the outer cabinet 20. Therefore, the air drawn from the interior product display space 15 passes over those portions of the evaporator 60 as it flows through

the duct 50. Refrigerant supplied from a refrigeration system (not shown) located elsewhere within the store is circulated through the refrigerant passages 62 of the evaporator 60. The refrigerant passing through the refrigerant passages 62 cools not only the four walls 34, 36, 38 of the inner liner 31 by conductive heat exchange, but also cools the air circulating through duct 50 and flowing over the surface of portions of the evaporator 60 bounding the duct 50 through convective heat exchange. Utilizing the refrigerant passing through the refrigerant passages 62 for directly cooling not only the inner liner 31, but also the circulating air passing through duct 50 allows for improved compressor efficiency and a more uniform air temperature distribution through the interior product display space 15.

[0018] When the door 25 is in the closed position over the top of the outer cabinet 20, an air tight seal is formed between the rim of the door and the upper surface of the outer cabinet 20. Thus, the cold air temperature environment within the interior product display space is maintained. However, when the door 25 is in the open position, such as when a purchaser reaches into the freezer chest 10 to access product housed within the product display space 15, warm ambient temperature air from the store environment may infiltrate through the access opening into the product display space 15 and cold air may spill out of the product display space 15 into the store environment. The displacement of cold air with warm air from the store environment causes a reduction in air temperature within the product display space 15, particularly within the upper central region of the product display space 15, and results in an uneven air temperature distribution within the product display space 15. Additionally, the infiltration of the warm air into the product display space 15 increases the cooling demand imposed upon the refrigeration system, thereby increasing energy consumption.

[0019] To reduce both the infiltration of warm air into the product display space 15 and the loss of cold air through spillage into the store, the air circulating through the duct 50 is discharged through the air outlet 54 with sufficient momentum to ensure that at least a portion of the discharged air passes across the open top of the product display area 15 and into the air inlet 52 thereby forming a curtain 70 of chilled air over the open top of the product display space 15 irrespective of whether the door 15 is closed or open. When the door 15 is open, this

cold air curtain effectively stops spillage of cold air out of the product display space 15. Further, at least part, if not all, of any warm infiltrating through the access opening 17 is entrained into the cold air curtain and passed directly into the duct 50 rather than passing directly into the product display space 15.

[0020] Thus, the air curtain 70 serves to preserve the cold air temperature within the product display space 15 and to also preserve a more uniform air temperature distribution throughout the interior product display space. In an embodiment of the freezer chest 10, the air outlet 54 is provided with vanes such that the air discharging through the air outlet 54 is discharged as a plurality of vertically layered streams to form a laminated air curtain 70 as illustrated in FIG. 1. The establishment of a laminated air curtain tends to further reduce the amount of warm store air that might penetrate through the air curtain 70 into the product display space 15.

[0021] The use of the air curtain 70 between the access opening 17 and the product display space 15 augments the use of the liner assembly 30 embodying the evaporator 60 for cooling both the inner liner and the circulating air to reduce cooling load demand on the associated refrigeration system, provides a more uniform temperature distribution throughout the interior product display space 15, and provides additional air "insulation" during periods when the door 25 is opened. Tests have shown that air temperatures within the product display space 15 of a freezer chest in accord with the exemplary embodiment depicted in FIG. 1 may be maintained within a range of as little as 2 degrees Celsius (3.6 degrees Fahrenheit) from location to location within the interior product display space 15. Additionally, "sweating" resulting from moisture condensing on the inside surface of the glass 27 may also be reduced as the presence of the air curtain 70 over the top of the interior product display space tends to reduce the temperature difference across the glass that results from the difference in air temperature between the store environment and the air temperature within the dome region 19 above the access opening 17.

[0022] The terminology used herein is for the purpose of description, not limitation. Specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as basis for teaching one skilled in the art to employ the present invention. While the present invention has been particularly

shown and described with reference to the exemplary embodiments as illustrated in the drawing, it will be recognized by those skilled in the art that various modifications may be made without departing from the spirit and scope of the invention. Those skilled in the art will also recognize the equivalents that may be substituted for elements described with reference to the exemplary embodiments disclosed herein without departing from the scope of the present invention.

[0023] Therefore, it is intended that the present disclosure not be limited to the particular embodiment(s) disclosed as, but that the disclosure will include all embodiments falling within the scope of the appended claims.

We Claim:

1. A refrigerated chest merchandiser comprising:

an outer cabinet defining an interior volume, the outer cabinet having a bottom wall, a front wall, a rear wall, and a top access opening;

a liner assembly disposed within the interior volume of the outer cabinet and defining a product display space having an open top disposed in association with the top access opening of the outer cabinet, the liner assembly including an inner liner and a refrigerant evaporator, the inner liner having a bottom wall disposed in spaced relationship with and above the bottom wall of the outer cabinet to form a bottom gap, a front wall disposed in spaced relationship with and inward of the front wall of the outer cabinet to form a front gap, and a rear wall disposed in spaced relationship with and inward of the rear wall of the outer cabinet to form a rear gap, the front gap, bottom gap and rear gap connected in flow communication to form a continuous duct, the refrigerant evaporator in contact with the inner liner and bounding at least a portion of the continuous duct;

an air inlet in air flow communication with the continuous duct;

an air outlet in air flow communication with the continuous duct; and

an air circulator disposed within the continuous duct for circulating air from the product display space through the air inlet into the continuous duct and discharging the circulating air through the air outlet across the open top of the liner assembly.

2. The refrigerated merchandiser as recited in claim 1 wherein the refrigerant evaporator is bonded to the inner liner.

3. The refrigerated merchandiser as recited in claim 1 wherein the refrigerant evaporator is formed integrally with the inner liner.

4. The refrigerated merchandiser as recited in claim 1 wherein the refrigerant evaporator comprises a plurality of refrigerant passages disposed in spaced relationship with each set of adjacent refrigerant passages interconnected by a web member.

5. The refrigerated merchandiser as recited in claim 4 wherein the refrigerant evaporator is roll formed from a single metal sheet and bonded to a back face of the inner liner.

6. The refrigerated merchandiser as recited in claim 1 wherein the inner liner and the refrigerant evaporator are made of the same metal material.

7. A refrigerated merchandiser as recited in claim 1 wherein the air curtain comprises a multi-layer laminated air curtain.

8. A refrigerated merchandiser as recited in claim 1 further comprising a selectively positionable door mounted to the outer cabinet, said door positionable in a closed position wherein said door covers the access opening and in an open position wherein the access opening is uncovered.

9. A refrigerated merchandiser as recited in claim 8 wherein said door includes a transparent portion to permit viewing of the product display space.

10. A refrigerated merchandiser as recited in claim 8 wherein said door comprises a glass door.

11. A refrigerated merchandiser as recited in claim1 wherein the refrigerant evaporator bounds the front gap and the rear gap of the continuous duct.

12. A refrigerated merchandiser as recited in claim 1 wherein the air inlet in air flow communication with the continuous duct opens into the continuous duct at an upper region of the continuous duct between the front wall of the inner liner and front wall of the outer cabinet.

13. A refrigerated merchandiser as recited in claim 1 wherein the air outlet in air flow communication with the continuous duct opens into the continuous duct at an upper region of the continuous duct between the rear wall of the inner liner and rear wall of the outer cabinet.

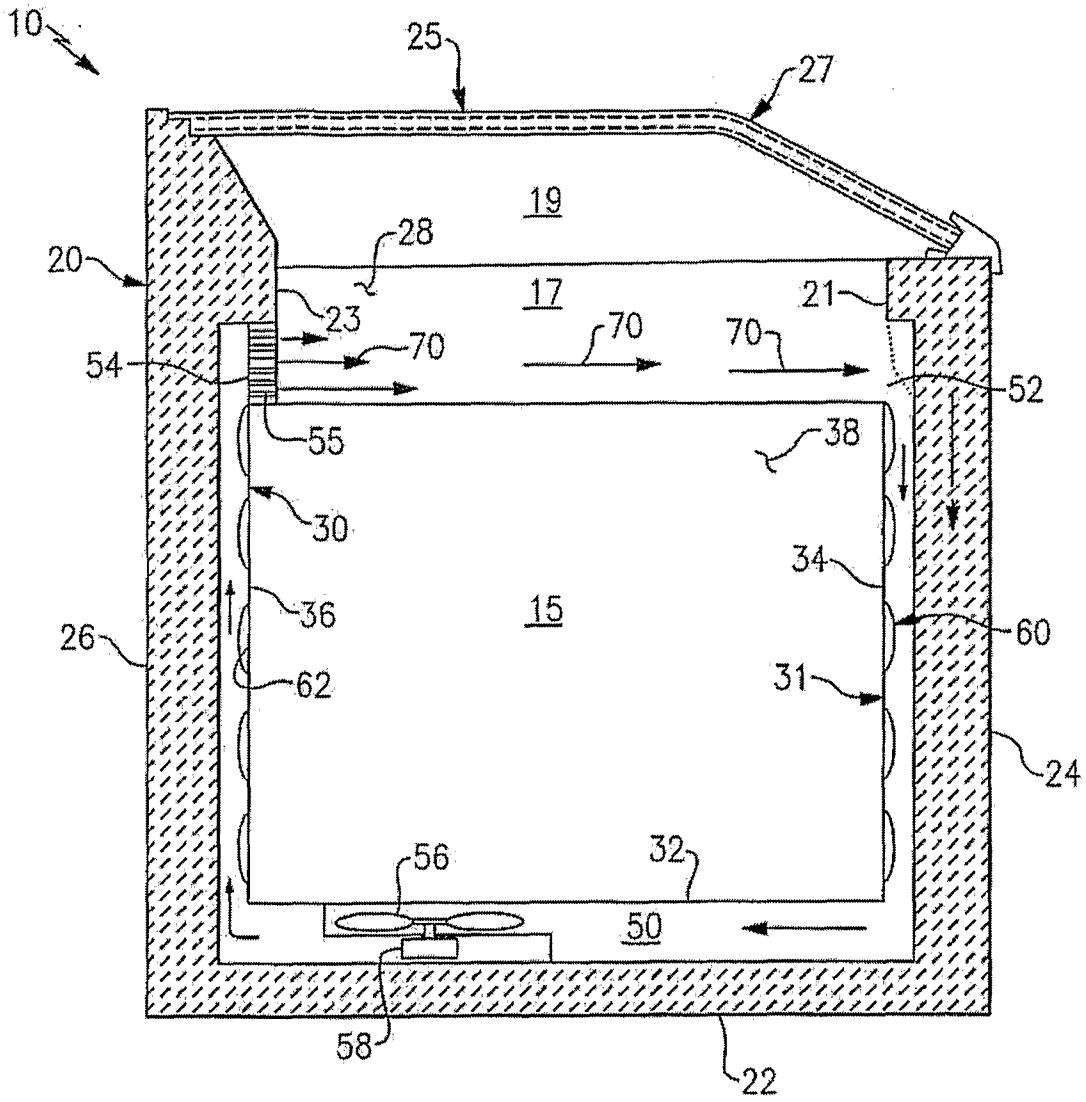
10
25
27
19
28
20
17
21
23
70
70
70
54
52
55
38
30
34
36
15
60
26
62
31
24
56
32
50
58
22

FIG.1

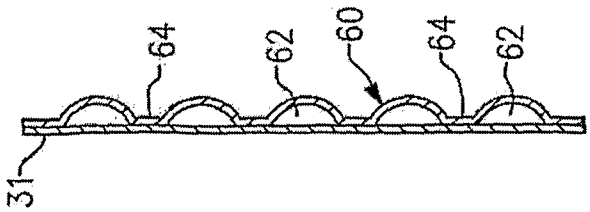

FIG.2

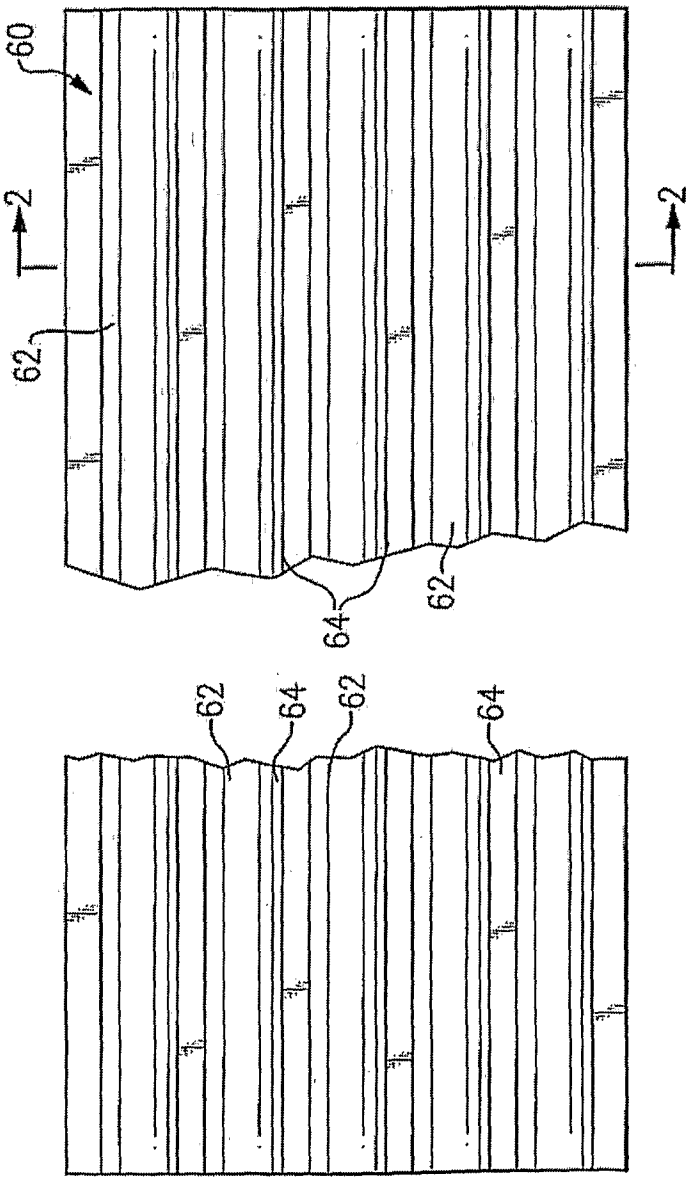

FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/000708

A. CLASSIFICATION OF SUBJECT MATTER

A47F3/04 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:A47F3/04;F25D/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT,WPI,EPODOC:
REFRIGERAT+,EVAPORATOR,REFRIGERANT, DISPLAY, PASSAGE?,METAL,CHEST, LINER

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US4295340A(TYLER REFRIGERATION CORP) 20 Oct.1981(20.10.1981) line 67 of column 4-line 36 of column 6 in the description, figure 1	1-7,12-13
Y	US4295340A(TYLER REFRIGERATION CORP) 20 Oct.1981(20.10.1981) line 67 of column 4-line 36 of column 6 in the description, figure 1	8-11
Y	CN2791561Y(YAN, Anfu) 28 Jun.2006(28.06.2006) line 23 of page 2-line 12 of page 3 in the description, figure 1	8-11
X	US4389852A(TYLER REFRIGERATION CORP) 28 Jun.1983(28.06.1983) lines 7-40 of column 7 in the description, figure 1	1,7

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 Mar.2010(24.03.2010)	**08 Apr. 2010 (08.04.2010)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer DU, Juan Telephone No. (86-10)62085839

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2009/000708

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN1895132A(HUSSMANN CORP) 17 Jan. 2007(17.01.2007) last line of page 3-last line of page 9 in the description, figures 1-4	1,7
A	US4949554A(SPECIALITY EQUIP CO) 21 Aug.1990(21.08.1990) the whole document	1-13
A	GB418431A(BRITISH THOMSON HOUSTON CO LTD) 24 Oct.1934(24.10.1934)figure 2	4

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2009/000708

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
US4295340A	20.10.1981	JP55110873A	26.08.1980
		DE3005286A	04.09.1980
		DE3026530A	12.02.1981
		FR2462131A	13.02.1981
		JP56020976A	27.02.1981
		FR2473294A	17.07.1981
		ES8105140A	16.08.1981
		US4314453A	09.02.1982
		US4314457A	09.02.1982
		CA1121169A	06.04.1982
		US4338792A	13.07.1982
		US4341081A	27.07.1982
		US4341082A	27.07.1982
		CA1130592A	31.08.1982
		US4408465A	11.10.1983
		HU182163B	28.12.1983
		US4514988A	07.05.1985
		USRE31909E	11.06.1985
CN2791561Y	28.06.2006	none	
US4389852A	28.06.1983	FR2465446A	27.03.1981
		DE3029903A	02.04.1981
		JP56052015A	09.05.1981
		JP56133569A	19.10.1981
		ES8200221A	16.01.1982
		US4314453A	09.02.1982
		DE3103289A	11.03.1982
		US4325227A	20.04.1982
		CA1132806A	05.10.1982
		CA1139575A	18.01.1983
		HU182155B	28.12.1983
CN1895132A	17.01.2007	EP1743552A	17.01.2007
		US2007012059A	08.01.2007
US4949554A	21.08.1990	none	
GB418431A	24.10.1934	none	