(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 4 407 257 A1

(12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
31.07.2024 Bulletin 2024/31

(21) Application number: **22887271.9**

(22) Date of filing: **14.06.2022**

(51) International Patent Classification (IPC):
F25C 1/08 *(2006.01)* ***F25B 39/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25B 39/02; F25C 1/08

(86) International application number:
PCT/KR2022/008368

(87) International publication number:
WO 2023/075065 (04.05.2023 Gazette 2023/18)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **29.10.2021 KR 20210146979**

(71) Applicant: **Coway Co., Ltd.**
Gongju-si, Chungcheongnam-do 32508 (KR)

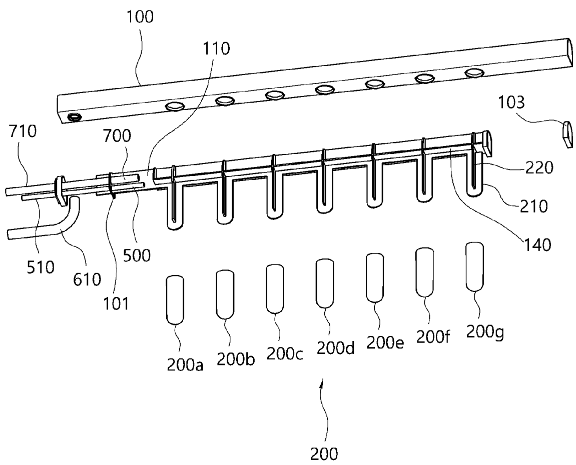
(72) Inventors:
- **KIM, Jae Man**
  Gongju-si, Chungcheongnam-do 32508 (KR)
- **KIM, Gyeong Jong**
  Gongju-si, Chungcheongnam-do 32508 (KR)
- **LEE, Gyeong Min**
  Gongju-si, Chungcheongnam-do 32508 (KR)
- **LEE, Kwon Jae**
  Gongju-si, Chungcheongnam-do 32508 (KR)

(74) Representative: **BCKIP Part mbB**
Siegfriedstraße 8
80803 München (DE)

(54) ICE-MAKING EVAPORATOR

(57) An ice-making evaporator is provided. The ice-making evaporator according to an exemplary embodiment of the present invention may include a first evaporator body that extends from one side to the other side; a first body space partition wall that divides the inside of the first evaporator body into a first body space and a second body space; a refrigerant inlet that is provided in the first evaporator body; a refrigerant outlet that is provided in the first evaporator body; a first protrusion member that is formed to extend in one direction from the first evaporator body; and a first protrusion space partition wall that divides the inside of the first protrusion member.

【FIG. 2】



EP 4 407 257 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2021-0146979, filed on October 29, 2021, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to an ice-making evaporator, and more particularly, to an ice-making evaporator that not only can equalize the size of a plurality of ice pieces produced by forming a refrigerant flow path to circulate the refrigerant inside the ice-making evaporator, but also can increase the number of ice pieces that can be produced at one time by extending the evaporator body.

BACKGROUND

[0003] Ice-making evaporators are used to make ice, and various methods have been developed to effectively produce ice. Recently, a method has been used in which ice is produced on the outer circumferential surface of the protrusion member by providing an evaporator body in which a refrigerant flows, and a protrusion member connected to the evaporator body, and by immersing the protrusion member in water contained in the water receiver or by spraying water to the protrusion member while flowing the refrigerant at a temperature lower than the freezing point into the protrusion member.

[0004] In such a conventional ice-making evaporator, the refrigerant flowed through the protrusion member only once in one direction, and as a result, ice was not generated relatively quickly in the protrusion member, so the ice-making efficiency was not high. In addition, there has been a problem in that the size of ice generated in the protrusion member varies depending on the position of the evaporator body to which the protrusion member is connected. Looking at this in detail through the related art, it is as follows.

[0005] Coway Co., Ltd.'s Korean Patent Laid-Open Publication No. 10-2021-0003525 discloses a conventional ice-making evaporator and a method of manufacturing an ice-making evaporator. This ice-making evaporator discloses an evaporation tube extending in length through which refrigerant flows and an immersion member protruding from the evaporation tube. In this case, the invention disclosed in the Korean Patent Laid-Open Publication No. 10-2021-0003525 divides the interior of the immersion member into four spaces so that the refrigerant circulates through each space of the immersion member, making the size of ice formed in multiple immersion members even. However, since the cross-sectional area of the space where the refrigerant moves is different and thus the flow rate of the refrigerant is different in each space, there is a limit to evenly forming the size of ice, and when the refrigerant flows, heat is introduced from the top, thereby reducing cooling efficiency.

[0006] Korean Patent Registration No. 10-1092627 of applicant Lee In discloses a conventional evaporator for an ice maker. The evaporator for an ice maker includes a first refrigerant pipe and a second refrigerant pipe, thereby increasing ice production through a plurality of protruded cooling pipes formed in each refrigerant pipe. However, the invention disclosed in the Korean Patent Registration No. 10-1092627 has a problem in that the flow paths are branched and merged inside the first refrigerant pipe and the second refrigerant pipe, thereby not only hindering the flow of the refrigerant and lowering the cooling efficiency, but also the size of the ice formed in the plurality of protruded cooling pipes is difficult to be evenly formed.

[0007] Esso Co., Ltd.'s Korean Patent Laid-Open Publication No. 10-2018-0009521 discloses a conventional evaporator for ice making. This evaporator for ice-making has increased efficiency in producing ice by circulating the inside of the ice making protrusion without branching the flow paths formed inside the upper and lower tubes formed in bending. However, the invention disclosed in the Korean Patent Laid-Open Publication No. 10-2018-0009521 has a problem in that the flow path is formed only in one direction inside the ice making protrusion, and the ice is formed smaller toward the flow path, and the cross-sectional area of the space where the refrigerant moves is different, thereby reducing cooling efficiency by varying the flow speed of the refrigerant in each space.

SUMMARY OF THE INVENTION

Technical Problem

[0008] In order to solve the above problems, the present invention is directed to providing an ice-making evaporator capable of producing ice with a uniform size for each first protrusion member by providing a first refrigerant flow path that sequentially passes through a plurality of first protrusion members and a second refrigerant flow path that passes through a plurality of first protrusion members in reverse order.

[0009] The present invention is directed to providing an ice-making evaporator capable of minimizing the size of the evaporator body by forming the first refrigerant flow path and the second refrigerant flow path in parallel.

[0010] The present invention is directed to providing an ice-making evaporator capable of minimizing the size of the evaporator body by arranging a plurality of first protrusion members in a row at predetermined intervals.

[0011] The present invention is directed to providing an ice-making evaporator capable of minimizing a change in flow speed when a refrigerant flows by optimizing a cross-sectional area of a flow path through which a refrigerant flows.

[0012] The present invention is directed to providing an ice-making evaporator capable of maintaining the flow speed of the refrigerant by matching the refrigerant injection direction and the refrigerant flow direction by arranging the refrigerant inlet in the longitudinal direction of a first body space.

[0013] The present invention is directed to providing an ice-making evaporator capable of minimizing the size of the evaporator by injecting heat gas into a flow path through which a refrigerant flows through a heat gas inlet.

[0014] The present invention is directed to providing an ice-making evaporator that allows heat gas that does not interfere with the flow relatively to move smoothly through a flow path through which the refrigerant flows by placing the heat gas inlet on one side of the refrigerant inlet and having a heat gas guide wall.

[0015] The present invention is directed to providing an ice-making evaporator capable of forming a smooth flow of refrigerant by forming a first through hole inside a first protrusion member to be adjacent to the inside of the first protrusion member, the first through hole connecting a first inflow space and a first outflow space.

[0016] The present invention is directed to providing an ice-making evaporator capable of forming a smooth flow of refrigerant by optimizing the size of a first refrigerant circulation hole connecting a first refrigerant flow path and a second refrigerant flow path.

[0017] The present invention is directed to providing an ice-making evaporator capable of preventing external heat from flowing into a first evaporator body and reducing cooling efficiency by having an insulating space inside the first evaporator body.

[0018] The present invention is directed to providing an ice-making evaporator capable of increasing the amount of ice produced at a time by providing a second evaporator body and a second protrusion member corresponding to the first evaporator body and the first protrusion member.

[0019] The present invention is directed to providing an ice-making evaporator capable of forming a smooth flow of refrigerant by optimizing the area of a flow path formed inside a connection member connecting the first evaporator body and the second evaporator body.

[0020] The problems of the present invention are not limited to those mentioned above, and other problems not mentioned will be clearly understood by those of ordinary skill in the art from the following description.

Technical Solution

[0021] In order to solve such problems, an ice-making evaporator according to an aspect of the present invention may include a first evaporator body that extends from one side to the other side; a first body space partition wall that divides the inside of the first evaporator body into a first body space and a second body space formed parallel to the extension direction of the first evaporator body; a refrigerant inlet provided at one end of the first evaporator body to inject refrigerant into the first body space; a refrigerant outlet provided at one end of the first evaporator body to discharge the refrigerant discharged from the second body space to the outside; a plurality of first protrusion members that is formed to extend to one side from the first evaporator body; a first protrusion space partition wall that divides the inside of the first protrusion member into a first protrusion space and a second protrusion space; a first refrigerant flow path formed to allow the refrigerant to move from one end to the other end through the first body space and pass through the first protrusion space of the plurality of first protrusion members; and a second refrigerant flow path formed to have the other end connected to the other end of the first refrigerant flow path and to allow the refrigerant to move from the other end to one end thereof through the second body space and pass through the second protrusion space of the plurality of first protrusion members.

[0022] In this case, the first refrigerant flow path and the second refrigerant flow path may be formed side by side in a lateral direction, and the first protrusion members may be arranged in a row at predetermined intervals in the longitudinal direction of the first evaporator body.

[0023] In this case, the ratio of the length of the width to the height of the first body space and the second body space may be 3:1 to 1.5.

[0024] In this case, the ratio of the distance between the first protrusion member adjacent to the other end surface of the first evaporator body and said other end surface and the length of the width of the first protrusion member may be 1:0.9 to 1.1.

[0025] In this case, the first protrusion member may have a circular cross-section perpendicular to the longitudinal direction and one end formed in a hemispherical shape convex outward.

[0026] In this case, the refrigerant inlet may inject the refrigerant in the longitudinal direction of the first body space, and protrude toward the first protrusion space of the first protrusion member adjacent to one end of the first evaporator body.

[0027] In this case, the ice-making evaporator may further include a heat gas inlet that is formed on one side of the refrigerant inlet and injects heat gas into the first body space in the longitudinal direction of the first body space; and a heat gas guide wall formed at one end of the first body space to guide the heat gas injected through the heat gas inlet toward the first protrusion space.

[0028] In this case, the first protrusion space may be divided into a first inflow space and a first outflow space formed in the longitudinal direction of the first protrusion member, and one ends of the first inflow space and the first outflow space may be connected to allow fluid communication; the first refrigerant flow path may sequentially pass through the first inflow space and the first outflow space; the second protrusion space may be divided into a second inflow space and a second outflow space formed in the longitudinal direction of the first protrusion member, and one ends of the second inflow space and the second outflow space may be connected to allow fluid communication; and the second refrigerant flow path may sequentially pass through the second inflow space and the second outflow space.

[0029] In this case, cross-sections perpendicular to the longitudinal direction of the first body space, the second body space, the first inflow space, the first outflow space, the second inflow space, and the second outflow space may be formed to have the same area.

[0030] In this case, the first protrusion space may have a first partition wall that divides the first inflow space and the first outflow space so that cross-sections perpendicular to the longitudinal direction of the first inflow space and the first outflow space are the same; a first through hole may be formed at one end of the first partition wall having an area equal to the area of a cross-section perpendicular to the longitudinal direction of the first inflow space and the first outflow space; the second protrusion space may have a second partition wall that divides the second inflow space and the second outflow space so that cross-sections perpendicular to the longitudinal direction of the second inflow space and the second outflow space are the same; and a second through hole may be formed at one end of the second partition wall having an area equal to the area of a cross-section perpendicular to the longitudinal direction of the second inflow space and the second outflow space.

[0031] In this case, the first through hole and the second through hole may be formed adjacent to one inner end surface of the first protrusion member.

[0032] In this case, a first refrigerant circulation hole may be formed at the other end of the first body space partition wall to connect the other end of the first refrigerant flow path and the second refrigerant flow path.

[0033] In this case, the first refrigerant circulation hole may extend from the inner lower surface to the upper surface of the first evaporator body.

[0034] In this case, the ratio between the area of the first refrigerant circulation hole and the area of the cross-section perpendicular to the longitudinal direction of the first outflow space may be 1.5 to 2:1.

[0035] In this case, the ice-making evaporator may further include a first insulating wall that divides the first evaporator body up and down so that an insulating space is formed in an upper inner portion of the first evaporator body; a first guide wall that extends upward from an upper end of the first partition wall to allow the refrigerant to move from the first body space to the first inflow space; and a second guide wall that extends upward from an upper end of the second partition wall to allow the refrigerant to move from the second inflow space to the second body space, wherein the first insulating wall may extend to the first guide wall and the second guide wall of the first protrusion member adjacent to the rear end surface of the first evaporator body.

[0036] In this case, a discharge space may be formed inside one end of the first evaporator body to enable fluid communication with the second body space, and the refrigerant outlet may be formed through the first evaporator body in the extension direction of the first protrusion member so that the discharge space can communicate fluidly with the outside.

[0037] In this case, the ice-making evaporator may further include a second evaporator body that extends from one side to the other side; a second body space partition wall that divides the inside of the second evaporator body into a third body space and a fourth body space formed parallel to the extension direction of the second evaporator body; a plurality of second protrusion members that is formed to extend to one side from the second evaporator body; a second protrusion space partition wall that divides the inside of the second protrusion member into a third protrusion space and a fourth protrusion space; a third refrigerant flow path formed to allow the refrigerant to move from the other end to one end through the third body space and pass through the third protrusion space of the plurality of second protrusion members; and a fourth refrigerant flow path formed to have one end connected to one end of the third refrigerant flow path and to allow the refrigerant to move from one end to the other end thereof through the fourth body space and pass through the fourth protrusion space of the plurality of second protrusion members, wherein the other end of the third refrigerant flow path may be connected to the other end of the first refrigerant flow path, and the other end of the fourth refrigerant flow path may be connected to the other end of the second refrigerant flow path, so that the other end of the first refrigerant flow path is connected to the other end of the second refrigerant flow path.

[0038] In this case, the ice-making evaporator may further include a hollow connection member extending from the other end of the first evaporator body to the other end of the second evaporator body; and a connection member partition wall that divides the inside of the connection member into a first connection space and a second connection space formed in the extension direction of the connection member, wherein the other end of the third refrigerant flow path may be connected to the other end of the first refrigerant flow path through the first connection space, the other end of the fourth refrigerant flow path may be connected to the other end of the second refrigerant flow path through the second connection space, one end of the connection member partition wall may be coupled to the other end of the first body space partition wall, and the other end of the connection member partition wall may be coupled to the other end of the second body space partition wall.

[0039] In this case, the first body space, the first connection space, and the third body space may have the same cross-sectional area, and the second body space, the second connection space, and the fourth body space may have the same cross-sectional area.

[0040] In this case, the ice-making evaporator may further include a first connection member that extends from one side of the other end of the first evaporator body to one side of the other end of the second evaporator body and has a first connection space formed therein; and a second connection member that extends from the other side of the other end of the first evaporator body to the other side of the other end of the second evaporator body and has a second connection space formed therein, wherein the other end of the third refrigerant flow path may be connected to the other end of the first refrigerant flow path through the first connection space, and the other end of the fourth refrigerant flow path may be connected to the other end of the second refrigerant flow path through the second connection space.

Advantageous Effects

[0041] The ice-making evaporator according to an exemplary embodiment of the present invention can produce ice with a uniform size for each first protrusion member by having the first refrigerant flow path that sequentially passes through a plurality of first protrusion members, and the second refrigerant flow path that passes through a plurality of first protrusion members in reverse order.

[0042] The ice-making evaporator according to an exemplary embodiment of the present invention can minimize the size of the evaporator body by forming the first refrigerant flow path and the second refrigerant flow path in parallel.

[0043] The ice-making evaporator according to an exemplary embodiment of the present invention can minimize the size of the evaporator body by arranging a plurality of first protrusion members in a row at predetermined intervals.

[0044] The ice-making evaporator according to an exemplary embodiment of the present invention can minimize a change in flow speed when a refrigerant flows by optimizing a cross-sectional area of a flow path through which a refrigerant flows.

[0045] The ice-making evaporator according to an exemplary embodiment of the present invention can maintain the flow speed of the refrigerant by matching the refrigerant injection direction and the refrigerant flow direction by arranging the refrigerant inlet in the longitudinal direction of a first body space.

[0046] The ice-making evaporator according to an exemplary embodiment of the present invention can minimize the size of the evaporator by injecting heat gas into a flow path through which a refrigerant flows through a heat gas inlet.

[0047] The ice-making evaporator according to an exemplary embodiment of the present invention can allow heat gas that does not interfere with the flow relatively to move smoothly through a flow path through which the refrigerant flows by placing the heat gas inlet on one side of the refrigerant inlet and having a heat gas guide wall.

[0048] The ice-making evaporator according to an exemplary embodiment of the present invention can form a smooth flow of refrigerant by forming a first through hole inside a first protrusion member to be adjacent to the inside of the first protrusion member, the first through hole connecting a first inflow space and a first outflow space.

[0049] The ice-making evaporator according to an exemplary embodiment of the present invention can form a smooth flow of refrigerant by optimizing the size of a first refrigerant circulation hole connecting a first refrigerant flow path and a second refrigerant flow path.

[0050] The ice-making evaporator according to an exemplary embodiment of the present invention can prevent external heat from flowing into a first evaporator body and reducing cooling efficiency by having an insulating space inside the first evaporator body.

[0051] The ice-making evaporator according to an exemplary embodiment of the present invention can increase the amount of ice produced at a time by providing a second evaporator body and a second protrusion member corresponding to the first evaporator body and the first protrusion member.

[0052] The ice-making evaporator according to an exemplary embodiment of the present invention can form a smooth flow of refrigerant by optimizing the area of a flow path formed inside a connection member connecting the first evaporator body and the second evaporator body.

[0053] Advantageous effects of the present invention are not limited to the above-described effects, and should be understood to include all effects that can be inferred from the configuration of the invention described in the description or claims of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0054]

FIG. 1 is a perspective view of an ice-making evaporator according to a first embodiment of the present invention.

FIG. 2 is an exploded perspective view of an ice-making evaporator according to a first embodiment of the present invention.

FIG. 3 is a cross-sectional view of an ice-making evaporator according to a first embodiment of the present invention as viewed from the top.

FIG. 4 is a view illustrating a first refrigerant circulation hole of an ice-making evaporator according to a first embodiment of the present invention.

FIG. 5 is a view illustrating a modified example of a first refrigerant circulation hole of an ice-making evaporator according to a first embodiment of the present invention.

FIG. 6 is an enlarged cross-sectional view illustrating a cross-section along line A-A of FIG. 1.

FIG. 7 is an enlarged cross-sectional view illustrating a cross-section along line B-B of FIG. 1.

FIG. 8 is a view illustrating a first flow path of an ice-making evaporator according to a first embodiment of the present invention.

FIG. 9 is a view illustrating a second flow path of an ice-making evaporator according to a first embodiment of the present invention.

FIG. 10 is a perspective view of an ice-making evaporator according to a second embodiment of the present invention.

FIG. 11 is a cross-sectional view of an ice-making evaporator according to a second embodiment of the present invention as viewed from the top.

FIG. 12 is a perspective view of an ice-making evaporator according to a third embodiment of the present invention.

FIG. 13 is a cross-sectional view of an ice-making evaporator according to a third embodiment of the present invention as viewed from the top.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0055] Hereinafter, exemplary embodiments of the present invention will be described in detail so that those of ordinary skill in the art can readily implement the present invention with reference to the accompanying drawings. The present invention may be embodied in many different forms and is not limited to the embodiments set forth herein. Unless otherwise defined, terms used in the embodiments of the present invention may be interpreted as meanings commonly known to those of ordinary skill in the art.

[0056] In the drawings, parts unrelated to the description are omitted for clarity of description of the present invention. Throughout the specification, like reference numerals denote like elements. In order to clearly express the characteristics of the configuration in the drawing, the thickness or size is exaggerated, and the thickness or size of the configuration shown in the drawing is not actually expressed.

[0057] Hereinafter, in FIG. 1, the description will be made as follows: a direction in which a first protrusion member 200 protrudes from a first evaporator body 100 is defined downward, and a side through which a refrigerant flows into the first evaporator body 100 is defined forward. However, this direction means a relative direction and does not mean the absolute direction in which the ice-making evaporator is disposed.

[0058] The present invention relates to an ice-making evaporator, and more particularly, to an ice-making evaporator that not only can equalize the size of a plurality of ice pieces produced by forming a refrigerant flow path to circulate the refrigerant inside the ice-making evaporator, but also can increase the number of ice pieces that can be produced at one time by extending the evaporator body.

[0059] In particular, the present invention can be installed inside an ice maker or a water purifier equipped with an ice maker in which ice is formed on the outside of the first protrusion member by immersing the first protrusion member in a water receiver containing purified water.

[0060] FIG. 1 is a perspective view of an ice-making evaporator according to a first embodiment of the present invention. FIG. 2 is an exploded perspective view of an ice-making evaporator according to a first embodiment of the present invention. FIG. 3 is a cross-sectional view of an ice-making evaporator according to a first embodiment of the present invention as viewed from the top. FIG. 4 is a view illustrating a first refrigerant circulation hole of an ice-making evaporator according to a first embodiment of the present invention. FIG. 5 is a view illustrating a modified example of a first refrigerant circulation hole of an ice-making evaporator according to a first embodiment of the present invention. FIG. 6 is an enlarged cross-sectional view illustrating a cross-section along line A-A of FIG. 1. FIG. 7 is an enlarged cross-sectional view illustrating a cross-section along line B-B of FIG. 1.

[0061] As shown in FIG. 1, the ice-making evaporator according to the first embodiment of the present invention includes a first evaporator body 100, a first body space partition wall 110, a refrigerant inlet 500, a discharge hole 102, a heat gas inlet 700, a heat gas guide wall 720, a first protrusion member 200, a first protrusion space partition wall 210, and a first insulating wall 140.

[0062] As shown in FIG. 1, the first evaporator body 100 is formed to extend from one side to the other side. A space is formed inside the first evaporator body 100, and as shown in FIG. 3, the inner space of the first evaporator body 100 may be divided into a first body space 112 and a second body space 113 formed side by side to left and right along the extension direction of the first evaporator body 100.

[0063] In this case, as shown in FIGS. 2 and 3, in order to partition the first body space 112 and the second body space 113, a first body space partition wall 110 extending in the extension direction of the first evaporator body 100 and disposed in the up-down direction is disposed inside the first evaporator body 100.

[0064] Each of the first body space 112 and the second body space 113 is formed to have the same area and shape as a cross-section perpendicular to the longitudinal direction. In this case, the refrigerant moves to the first body space 112 and the second body space 113, and the ratio of the length of the width to the height of the first body space 112 and the second body space 113 may be 3:1 to 1.5. That is, the width of the flow path through which the refrigerant moves is formed to be greater than the height. Accordingly, it is possible to prevent a temperature difference between the upper side and lower side of the refrigerant from occurring due to heat flowing from the upper side of the first evaporator body 100 and to smoothly flow the refrigerant into the first protrusion member 200 to be described later without accumulation.

[0065] As shown in FIGS. 3 and 4, a first refrigerant circulation hole 111 is formed at the other end, i.e., a rear end, of the first body space partition wall 110 so that the rear of the first body space 112 and the second body space 113 may fluidly communicate. Therefore, the refrigerant moving along the first body space 112 moves to the second body space 113 through the first refrigerant circulation hole 111. In this case, the area of the first refrigerant circulation hole 111 may be formed to be equal to the area of the cross-section perpendicular to the longitudinal direction of a first outflow space 224. Accordingly, the cross-sectional area of the flow path connecting the first body space 112, the first refrigerant circulation hole 111, and the second body space 113 is maintained constant, so that the refrigerant can move at a constant rate.

[0066] Meanwhile, as shown in FIG. 5, the first refrigerant circulation hole 111' may be formed to extend from the inner lower surface to the upper surface of the first evaporator body 100. Accordingly, the refrigerant is prevented from accumulating on the upper side of the first body space partition wall 110' , and the refrigerant can move more smoothly into the second body space 113.

[0067] In this case, the ratio between the area of the first refrigerant circulation hole 111' and the area of the cross-section perpendicular to the longitudinal direction of the first outflow space 224 may be 1.5 to 2:1. That is, the area of the first refrigerant circulation hole 111' may be formed to be larger than the area of the cross-section perpendicular to the longitudinal direction of the first outflow space 224. Accordingly, it is possible to prevent the flow rate passing through the first refrigerant circulation hole 111' from decreasing as the refrigerant hits the other end surface 103 of the first evaporator body and changes its direction of movement.

[0068] In this case, as shown in FIG. 5, the first refrigerant circulation hole 111' may be formed as close as possible to the other end surface 103 of the first evaporator body. Accordingly, by forming the first refrigerant circulation hole 111' so that there is no protrusion from the other end surface 103 of the first evaporator body, it is possible to induce a smooth refrigerant flow by preventing the flow of the refrigerant changing the direction from the first body space 112 to the second body space 113 from being interrupted as much as possible. In addition, the first refrigerant circulation hole 111' may be formed by adjusting only the extension length of the first body space partition wall 110', thereby simplifying the manufacturing process and reducing manufacturing time.

[0069] As shown in FIGS. 1 and 2, the refrigerant inlet 500 is disposed at one end of the first evaporator body 100, that is, in the front. The refrigerant is injected from the refrigerant inlet 500 to the front of the first body space 112. In this case, in order to facilitate the movement of the refrigerant, the refrigerant inlet 500 is disposed in the longitudinal direction of the first body space 112 to inject the refrigerant in the longitudinal direction of the first body space 112.

[0070] In this case, as shown in FIG. 2, the refrigerant inlet 500 may be formed to protrude from one end surface 101 of the first evaporator body toward the first body space 112. In more detail, the refrigerant inlet 500 may have an end formed to protrude toward a first protrusion space 222 of the first protrusion member 200 to be described later. Accordingly, the refrigerant injected from the refrigerant inlet 500 is directly introduced into the first protrusion member 200 to be described later, so that the refrigerant may be smoothly circulated.

[0071] As shown in FIGS. 3 and 6, in order for the refrigerant injected through the refrigerant inlet 500 to be discharged to the outside through the first body space 112 and the second body space 113, a discharge hole 102 is formed at one end, that is, a front end of the first evaporator body 100. In more detail, it is formed on one end surface 101 of the first evaporator body so that the second body space 113 and the outside may be fluidly communicated.

[0072] In this case, the refrigerant inlet 500 and the discharge hole 102 may be formed side by side, and to facilitate injection and discharge of the refrigerant, the refrigerant inlet 500 may be formed at the first body space 112 and the discharge hole 102 may be formed at the second body space 113.

[0073] Meanwhile, referring to FIGS. 2 and 3, the ice-making evaporator according to an exemplary embodiment of the present invention may further include a discharge space 620 and a refrigerant outlet 600.

[0074] The first evaporator body 100 may further extend toward the front side, and the discharge space 620 may be formed inside the extended first evaporator body 100. The discharge space 620 is connected to the second body space 113 through the discharge hole 102 to enable fluid communication. That is, the discharge space 620, the first body space 112, and the second body space 113 are partitioned by the one end surface 101 of the first evaporator body, and the refrigerant discharged through the discharge hole 102 is moved to the discharge space 620.

[0075] In this case, the refrigerant outlet 600 is formed through the front end of the first evaporator body 100 in which the discharge space 620 is formed to allow fluid communication with the outside in a downward direction, that is, in a direction in which the first protrusion member 200 to be described later extends. A refrigerant discharge pipe 610 may be connected to the refrigerant outlet 600.

[0076] Meanwhile, referring to FIGS. 2 and 3, the heat gas inlet 700 for injecting heat gas into the first body space 112 is formed at one side of the refrigerant inlet 500. The heat gas injected through the heat gas inlet 700 moves along the first body space 112 and the second body space 113 through which the refrigerant moves, and after ice is formed in the first protrusion member 200 to be described later, the heat gas separates the ice attached to the first protrusion member 200 from the first protrusion member 200 by applying heat to the first protrusion member 200. In this way, the first evaporator body 100 may be minimized by sharing the movement path between the refrigerant and the heat gas.

[0077] In this case, since the flow of the heat gas is not affected by the structure relative to the refrigerant, as shown in FIGS. 2 and 6, it may be formed above the refrigerant inlet 500.

[0078] However, as shown in FIG. 8, the heat gas guide wall 720 may be formed inside the first evaporator body 100 so that the heat gas may be smoothly injected into the first body space 112 during the process of injecting the heat gas. The heat gas guide wall 720 extends and protrudes downward from the inner upper surface of the first evaporator body 100. In this case, it may be formed to guide the heat gas injected through the heat gas inlet 700 toward the first protrusion space 222. In addition, the heat gas guide wall 720 may be formed to be inclined to prevent the heat gas from stagnating.

[0079] As shown in FIG. 8, the heat gas guide wall 720 may be formed to extend from the first insulating wall 140 to be described later. Accordingly, the heat gas guide wall 720 not only prevents heat gas and refrigerant from moving to a first insulating space 141 formed by the first insulating wall 140 to be described later, but also makes it easier to manufacture the heat gas guide wall 720.

[0080] Meanwhile, referring to FIGS. 1 and 2, the first protrusion member 200 is formed to extend downward from the first evaporator body 100. In this case, a plurality of first protrusion members 200 may be formed, and may be arranged in a row at predetermined intervals in the longitudinal direction of the first evaporator body 100.

[0081] The first protrusion member 200 is formed in a cylindrical shape, and as shown in FIG. 2, may be formed in a cylindrical shape such that the cross-section perpendicular to the longitudinal direction is formed in a circular shape.

[0082] In addition, the lower end of the first protrusion member 200 may be formed in a hemispherical shape convex outward. As the lower end is formed in a hemispherical shape, it is possible to facilitate flow by reducing the stagnation of the fluid in the corner space in the process of changing the direction to allow refrigerant or heat gas introduced into the inside of the first protrusion member 200 to flow out from the first protrusion member 200.

[0083] In this case, the distance between the other end surface 103 of the first evaporator body and the closest first protrusion member 200 may be formed to be similar to the length of the width of the first protrusion member 200, for example, the diameter of the cylindrical first protrusion member 200. In more detail, the length ratio of the distance between the other end surface 103 of the first evaporator body and the closest first protrusion member 200 to the width of the first protrusion member 200 may be 1:0.9 to 1.1. Accordingly, the refrigerant may more smoothly move from the first body space 112 to the second body space 113 through the first refrigerant circulation hole 111.

[0084] Referring to FIGS. 3 and 7, a space is formed inside the first protrusion member 200, and the first protrusion space partition wall 210 is formed inside the first protrusion member 200 to divide the inner space of the first protrusion member 200 into the first protrusion space 222 and the second protrusion space 232. In this case, as shown in FIG. 7, the first protrusion space partition wall 210 may be formed integrally with the first body space partition wall 110 to extend into the first protrusion member 200. Accordingly, the first protrusion space 222 is connected to the first body space 112 and the second protrusion space 232 is connected to the second body space 113.

[0085] Referring to FIGS. 3 and 7, the first protrusion space 222 is divided into a first inflow space 223 in front and a first outflow space 224 in rear. To this end, a first partition wall 220 protrudes from the first protrusion space partition wall 210. The first partition wall 220 extends along the extension direction of the first protrusion member 200, and a first through hole 221 is formed at a lower end portion thereof so that the first inflow space 223 and the first outflow space 224 may fluidly communicate therewith.

[0086] As shown in FIG. 7, the first through hole 221 may be formed adjacent to one inner end surface of the first protrusion member 200. Accordingly, while the refrigerant moves from the first inflow space 223 to the first outflow space 224 through the first through hole 221, it can move smoothly along one inner end surface of the first protrusion member 200.

[0087] In this case, the first partition wall 220 is formed such that cross-sections perpendicular to the longitudinal direction of the first inflow space 223 and the first outflow space 224 are the same. Accordingly, the movement speed of the refrigerant is maintained constant in the process of the refrigerant flowing into the first inflow space 223 from the first body space 112, moving to the first outflow space 224 through the first through hole 221, and flowing out of the first outflow space 224 to the first body space 112. In particular, the area of the first through hole 221 is formed to be equal to the area of the cross-section perpendicular to the longitudinal direction of the first inflow space 223 and the first outflow space 224.

[0088] Meanwhile, a first guide wall 120 is formed at the upper end of the first partition wall 220. The first guide wall 120 guides the refrigerant moving along the first body space 112 so that all of the refrigerant passes through the first inflow space 223 and the first outflow space 224 without being branched. To this end, the first guide wall 120 may extend upward from the upper end of the first partition wall 220 to the inner surface of the first evaporator body 100, or may extend upward to the first insulating wall 140 to be described later.

[0089] Accordingly, the refrigerant is not separated into a refrigerant passing through each of the first protrusion members 200 and a refrigerant not passing through each of the first protrusion members 200, thereby facilitating the flow of the refrigerant and making the cooling efficiency of each of the first protrusion members 200 constant by clarifying the temperature distribution of the refrigerant.

[0090] Referring to FIGS. 3 and 7, the second protrusion space 232 is divided into a second inflow space 233 in rear and a second outflow space 234 in front. To this end, a second partition wall 230 protrudes from the first protrusion space partition wall 210 on the opposite side of the first partition wall 220. The second partition wall 230 extends along the extension direction of the first protrusion member 200, and a second through hole 231 is formed at a lower end portion thereof so that the second inflow space 233 and the second outflow space 234 may fluidly communicate therewith.

[0091] In this case, the second partition wall 230 is formed such that cross-sections perpendicular to the longitudinal direction of the second inflow space 233 and the second outflow space 234 are the same. Accordingly, the movement speed of the refrigerant is maintained constant in the process of the refrigerant flowing into the second inflow space 233 from the second body space 113, moving to the second outflow space 234 through the second through hole 231, and flowing out of the second outflow space 234 to the second body space 113. In particular, the area of the second through hole 231 is formed to be equal to the area of the cross-section perpendicular to the longitudinal direction of the second inflow space 233 and the second outflow space 234.

[0092] Meanwhile, a second guide wall 130 is formed at the upper end of the second partition wall 230. The second guide wall 130 guides the refrigerant moving along the second body space 113 so that all of the refrigerant passes through the second inflow space 233 and the second outflow space 234 without being branched. To this end, the second guide wall 130 may extend upward from the upper end of the second partition wall 230 to the inner surface of the first evaporator body 100, or may extend upward to the first insulating wall 140 to be described later.

[0093] Accordingly, the refrigerant is not separated into a refrigerant passing through each of the second protrusion members 400 and a refrigerant not passing through each of the second protrusion members 400, thereby facilitating the flow of the refrigerant and making the cooling efficiency of each of the second protrusion members 400 constant by clarifying the temperature distribution of the refrigerant.

[0094] As shown in FIG. 7, the second through hole 231 may be formed adjacent to one inner end surface of the first protrusion member 200. Accordingly, while the refrigerant moves from the second inflow space 233 to the second outflow space 234 through the second through hole 231, it can move smoothly along one inner end surface of the first protrusion member 200.

[0095] Meanwhile, as shown in FIG. 7, the first insulating wall 140 divides the first body space 112 upward and downward. As shown in FIG. 4, as the first insulating wall 140 is provided, a first insulating space 141 is formed above the first body space 112 and the second body space 113 as an inner upper portion of the first evaporator body 100. The first insulating space 141 serves to prevent external heat from flowing into the refrigerant passing through the first body space 112 and the second body space 113. Accordingly, it is possible to increase the ice making efficiency.

[0096] When the first insulating wall 140 is formed, the first guide wall 120 extending from the first partition wall 220 extends to the first insulating wall 140, and the second guide wall 130 extending from the second partition wall 230 extends to the first insulating wall 140. In addition, the heat gas guide wall 720 may be integrally formed with the first insulating wall 140. Therefore, it is possible to prevent heat gas or refrigerant from flowing into the first insulating space 141.

[0097] FIG. 8 is a view illustrating a first flow path of an ice-making evaporator according to a first embodiment of the present invention. FIG. 9 is a view illustrating a second flow path of an ice-making evaporator according to a first embodiment of the present invention.

[0098] A first refrigerant flow path 114 and a second refrigerant flow path 115 passing through the first evaporator body 100 and the plurality of first protrusion members 200 are formed in the ice-making evaporator according to the first embodiment of the present invention.

[0099] As shown in FIG. 8, the first refrigerant flow path 114 is a path through which the refrigerant injected through the refrigerant inlet 500 moves, and is formed to sequentially pass through the first body space 112, the first inflow space 223, the first outflow space 224, and the first body space 112. In this case, since a plurality of first protrusion members 200 are formed, the first refrigerant flow path passes through both the first inflow space 223 and the first outflow space 224 formed in each of the first protrusion members 200.

[0100] The first refrigerant flow path 114 is not branched as a single path, and is redirected from the first body space 112 to the first inflow space 223 along the front surfaces of the first guide wall 120 and the first partition wall 220, passes through the first through hole 221 and is redirected to the first outflow space 224, and again leads to the first body space 112 along the rear surfaces of the first partition wall 220 and the first guide wall 120.

[0101] In this case, the cross-sections perpendicular to the longitudinal direction of the first body space 112, the first inflow space 223, and the first outflow space 224 through which the first refrigerant flow path 114 passes may be formed to have the same area. Accordingly, the flow velocity of the refrigerant moving along the first refrigerant flow path 114 is prevented from being changed by the cross-sectional area, thereby allowing the refrigerant to move smoothly along the first refrigerant flow path 114.

[0102] The first refrigerant flow path 114 extends to the rear end of the first body space 112 of the first evaporator body 100, and the second refrigerant flow path 115, which will be described later, is connected to the rear end of the first refrigerant flow path 114 through the first refrigerant circulation hole 111.

[0103] As shown in FIG. 9, the second refrigerant flow path 115 is a path through which the refrigerant introduced through the first refrigerant circulation hole 111 moves, and is formed to sequentially pass through the second body space 113, the second inflow space 233, the second outflow space 234, and the second body space 113. In this case, since a plurality of first protrusion members 200 are formed, the second refrigerant flow path passes through both the second inflow space 233 and the second outflow space 234 formed in each of the first protrusion members 200.

[0104] The second refrigerant flow path 115 is not branched as a single path, and is redirected from the second body space 113 to the second inflow space 233 along the rear surfaces of the second guide wall 130 and the second partition wall 230, passes through the second through hole 231 and is redirected to the second outflow space 234, and again leads to the second body space 113 along the front surfaces of the second partition wall 230 and the second guide wall 130.

[0105] In this case, the cross-sections perpendicular to the longitudinal direction of the second body space 113, the second inflow space 233, and the second outflow space 234 through which the second refrigerant flow path 115 passes may be formed to have the same area. Accordingly, the flow velocity of the refrigerant moving along the second refrigerant flow path 115 is prevented from being changed by the cross-sectional area, thereby allowing the refrigerant to move smoothly along the second refrigerant flow path 115.

[0106] The second refrigerant flow path 115 extending forward of the second body space 113 leads to the discharge hole 102, and the refrigerant moved along the second refrigerant flow path 115 is discharged to the outside through the discharge hole 102 from the first evaporator body 100.

[0107] As the refrigerant passes through the plurality of first protrusion members 200, it absorbs heat and its temperature gradually increases. In this case, as described above, since the first refrigerant flow path 114 and the second refrigerant flow path 115 are formed, the lowest temperature refrigerant passes through the first inflow space 223 and the second-lowest temperature refrigerant passes through the first outflow space 224 based on the first protrusion member 200 disposed in front. Conversely, the second-highest temperature refrigerant passes through the second inflow space 233, and the highest temperature refrigerant passes through the second outflow space 234.

[0108] In the same way, the average temperature of the refrigerant passing through each of the first protrusion members 200 is maintained the same. Accordingly, the size of the ice generated by each of the first protrusion members 200 is the same.

[0109] FIG. 10 is a perspective view of an ice-making evaporator according to a second embodiment of the present invention. FIG. 11 is a cross-sectional view of an ice-making evaporator according to a second embodiment of the present invention as viewed from the top.

[0110] As shown in FIGS. 10 and 11, the ice-making evaporator according to the second embodiment of the present invention includes a first evaporator body 100, a first body space partition wall 110, a refrigerant inlet 500, a discharge hole 102, a heat gas inlet 700, a heat gas guide wall 720, a first protrusion member 200, a first protrusion space partition wall 210, and a first insulating wall 140, and to increase the number of ice generated at a time than in the first embodiment, further includes a second evaporator body 300, a second body space partition wall 310, a second protrusion member 400, a second protrusion space partition wall 410, a second insulating wall 340, a third partition wall 420, and a fourth partition wall 430. In this case, a description of a configuration overlapping the first embodiment of the present invention will be omitted and will be described focusing on differences from the first embodiment.

[0111] The second evaporator body 300, the second body space partition wall 310, the second protrusion member 400, the second protrusion space partition wall 410, the second insulating wall 340, the third partition wall 420, and the fourth partition wall 430 respectively correspond to the first evaporator body 100, the first body space partition wall 110, the first protrusion member 200, the first protrusion space partition wall 210, the first insulating wall 140, the first partition wall 220, and the second partition wall 230 described above, and have the same shape and function.

[0112] In addition, the third body space 312 and the fourth body space 313 formed by the second body space partition wall 310 correspond to the first body space 112 and the second body space 113, respectively, and the third inflow space 423 and the third outflow space 424 formed in the second protrusion member 400 by the third partition wall 420 and the fourth inflow space 433 and the fourth outflow space 434 formed in the second protrusion member 400 by the fourth partition wall 430 correspond to the first inflow space 223 and the first outflow space 224, and the second inflow space 233 and the second outflow space 234, respectively. As shown in FIG. 11, each corresponding component has only a difference in an arranged position and has the same shape or function.

[0113] In this case, in the second embodiment of the present invention, the first refrigerant circulation hole 111 is not formed in the first body space partition wall 110, and the second refrigerant circulation hole 311 corresponding to the first refrigerant circulation hole 111 is formed in front of the second body space partition wall 310. Accordingly, the second refrigerant circulation hole 311 connects the front end of the third body space 312 and the fourth body space 313.

[0114] A third refrigerant flow path 314 and a fourth refrigerant flow path 315 passing through the second evaporator body 300 and the plurality of second protrusion members 400 are formed in the ice-making evaporator according to the second embodiment of the present invention.

[0115] The third refrigerant flow path 314 of the ice-making evaporator according to the second embodiment of the present invention is a path through which the refrigerant moves, and is formed to sequentially pass through the third body space 312, the third inflow space 423, the third outflow space 424, and the third body space 312. In this case, since a plurality of second protrusion members 400 are formed, the third refrigerant flow path passes through both the third inflow space 423 and the third outflow space 424 formed in each of the second protrusion members 400.

[0116] In this case, the rear end of the third refrigerant flow path 314 is connected to the rear end of the first refrigerant flow path 114, and the refrigerant moved along the first refrigerant flow path 114 moves from the rear to the front along the third refrigerant flow path 314.

[0117] The fourth refrigerant flow path 315 of the ice-making evaporator according to the second embodiment of the present invention is a path through which the refrigerant moves, and is formed to sequentially pass through the fourth body space 313, the fourth inflow space 433, the fourth outflow space 434, and the fourth body space 313. In this case, since a plurality of second protrusion members 400 are formed, the fourth refrigerant flow path passes through both the fourth inflow space 433 and the fourth outflow space 434 formed in each of the second protrusion members 400.

[0118] In this case, a front end of the fourth refrigerant flow path 315 is connected to the third refrigerant flow path 314 through the second refrigerant circulation hole 311, and a rear end of the fourth refrigerant flow path 315 is connected to a rear end of the second refrigerant flow path 115. Therefore, the refrigerant introduced into the fourth refrigerant flow path 315 through the second refrigerant circulation hole 311 moves along the fourth refrigerant flow path 315 from the front to the rear and then moves forward along the second refrigerant flow path 115 to be discharged through the refrigerant outlet 600.

[0119] In this case, the ice-making evaporator according to the second embodiment of the present invention connects the rear end of the first refrigerant flow path 114 and the rear end of the third refrigerant flow path 314, and further includes a connection member 800 to connect the rear end of the second refrigerant flow path 115 and the rear end of the fourth refrigerant flow path 315.

[0120] As shown in FIGS. 10 and 11, the connection member 800 is formed in a hollow pipe shape. There is no limitation on the shape of the cross-section of the connection member 800, and may be formed in a circular shape, as shown in FIG. 10.

[0121] One end of the connection member 800 is coupled to the other end surface 103 of the first evaporator body, and the other end of the connection member 800 is coupled to the other end surface 303 of the second evaporator body.

[0122] In this case, as shown in FIG. 10, a connection member partition wall 810 is formed inside the connection member 800. Accordingly, the internal space of the connection member 800 is divided into a first connection space 811 and a second connection space 812 by the connection member partition wall 810.

[0123] In this case, one end of the connection member partition wall 810 is connected to the first body space partition wall 110, and the other end of the connection member partition wall 810 is connected to the second body space partition wall 310. The other end of the first refrigerant flow path 114 and the other end of the third refrigerant flow path 314 are connected through the first connection space 811.

[0124] In this case, the first body space 112, the first connection space 811, and the third body space 312 may have the same cross-sectional area. Accordingly, the refrigerant may smoothly move through the first body space 112, the first connection space 811, and the third body space 312.

[0125] The other end of the second refrigerant flow path 115 and the other end of the fourth refrigerant flow path 315 are connected through the second connection space 812. Likewise, the second body space 113, the second connection space 812, and the fourth body space 313 may also have the same cross-sectional area.

[0126] Meanwhile, as shown in FIGS. 10 and 11, the first evaporator body 100 and the second evaporator body 300 may be disposed in parallel in a direction perpendicular to the extension direction. Accordingly, the connection member 800 may be formed bent.

[0127] FIG. 12 is a perspective view of an ice-making evaporator according to a third embodiment of the present invention. FIG. 13 is a cross-sectional view of an ice-making evaporator according to a third embodiment of the present invention as viewed from the top. In the third embodiment of the present invention, a first connection member 820 and a second connection member 830, which are different from the second embodiment of the present invention, will be mainly described, and content overlapping with the second embodiment will be omitted.

[0128] As shown in FIGS. 12 and 13, the ice-making evaporator according to the third embodiment of the present invention may include a first connection member 820 and a second connection member 830 instead of the connection member 800 in the second embodiment of the present invention.

[0129] The first connection member 820 is formed in a hollow pipe shape extending from the rear end, which is the other end of the first evaporator body 100 to the rear end, which is the other end of the second evaporator body 300. The cross-section of the first connection member 820 may be formed in a circular shape, but is not limited thereto.

[0130] As shown in FIG. 12, the first connection member 820 may have one end coupled to the other end surface 103 of the first evaporator body, and the other end coupled to the other end surface 303 of the second evaporator body.

[0131] A first connection space 821 is formed inside the first connection member 820. The other end of the first refrigerant flow path 114 and the other end of the third refrigerant flow path 314 are connected through the first connection space 821.

[0132] In this case, the first body space 112, the first connection space 821, and the third body space 312 may have the same cross-sectional area. Accordingly, the refrigerant may smoothly move through the first body space 112, the first connection space 821, and the third body space 312.

[0133] The second connection member 830 is also formed in a hollow pipe shape extending from the rear end, which is the other end of the first evaporator body 100 to the rear end, which is the other end of the second evaporator body 300, and may be formed to have a circular cross-section like the cross-section of the first connection member 820.

[0134] In this case, there is no limitation on a position where both ends of the second connection member 830 are coupled. For example, as shown in FIG. 12, one end of the second connection member 830 may be coupled to the side surface of the second body space 113 of the first evaporator body 100, and the other end of the second connection member 830 may be coupled to the side surface of the fourth body space 313 of the second evaporator body 300. In this case, there is an advantage in that the material cost may be reduced by minimizing the length of the second connection member 830.

[0135] In this case, a second connection space 822 is formed inside the second connection member 830. The other end of the second refrigerant flow path 115 and the other end of the fourth refrigerant flow path 315 are connected through the second connection space 822.

[0136] In this case, the second body space 113, the second connection space 822, and the fourth body space 313 may have the same cross-sectional area. Accordingly, the refrigerant may smoothly move through the second body space 113, the second connection space 822, and the fourth body space 313.

[0137] Although the ice-making evaporator according to various embodiments of the present invention has been described above, it will be clearly understood by those of ordinary skill in the art that the ice-making evaporator according to the present embodiment may not be installed only inside the ice maker, but may also be installed in a refrigerator or the like requiring installation to make ice.

[0138] As described above, preferred embodiments according to the present invention have been examined, and it is obvious to those skilled in the art that the present invention can be embodied in other specific forms without departing from the spirit or scope of the present invention in addition to the above-described embodiments. Therefore, the above-described embodiments are to be construed as illustrative rather than restrictive, and accordingly, the present invention is not limited to the above description and may be modified within the scope of the appended claims and their equivalents.

Claims

1. An ice-making evaporator, comprising:

a first evaporator body that extends from one side to the other side;
a first body space partition wall that divides the inside of the first evaporator body into a first body space and a second body space formed parallel to the extension direction of the first evaporator body;
a refrigerant inlet provided at one end of the first evaporator body to inject refrigerant into the first body space;
a refrigerant outlet provided at one end of the first evaporator body to discharge the refrigerant discharged from the second body space to the outside;
a plurality of first protrusion members that is formed to extend to one side from the first evaporator body;
a first protrusion space partition wall that divides the inside of the first protrusion member into a first protrusion space and a second protrusion space;
a first refrigerant flow path formed to allow the refrigerant to move from one end to the other end through the first body space and pass through the first protrusion space of the plurality of first protrusion members; and
a second refrigerant flow path formed to have the other end connected to the other end of the first refrigerant flow path and to allow the refrigerant to move from the other end to one end thereof through the second body space and pass through the second protrusion space of the plurality of first protrusion members.

2. The ice-making evaporator of claim 1,

wherein the first refrigerant flow path and the second refrigerant flow path are formed side by side in a lateral direction, and
the first protrusion members are arranged in a row at predetermined intervals in the longitudinal direction of the first evaporator body.

3. The ice-making evaporator of claim 1, wherein the ratio of the length of the width to the height of the first body space and the second body space is 3:1 to 1.5.

4. The ice-making evaporator of claim 1, wherein the ratio of the distance between the first protrusion member adjacent to the other end surface of the first evaporator body and said other end surface and the length of the width of the first protrusion member is 1:0.9 to 1.1.

5. The ice-making evaporator of claim 1, wherein the first protrusion member has a circular cross-section perpendicular to the longitudinal direction and one end formed in a hemispherical shape convex outward.

6. The ice-making evaporator of claim 1, wherein the refrigerant inlet injects the refrigerant in the longitudinal direction of the first body space, and protrudes toward the first protrusion space of the first protrusion member adjacent to one end of the first evaporator body.

7. The ice-making evaporator of claim 1, further comprising:

a heat gas inlet that is formed on one side of the refrigerant inlet and injects heat gas into the first body space in the longitudinal direction of the first body space; and
a heat gas guide wall formed at one end of the first body space to guide the heat gas injected through the heat gas inlet toward the first protrusion space.

8. The ice-making evaporator of claim 1,

wherein the first protrusion space is divided into a first inflow space and a first outflow space formed in the longitudinal direction of the first protrusion member, and one ends of the first inflow space and the first outflow space are connected to allow fluid communication,
the first refrigerant flow path sequentially passes through the first inflow space and the first outflow space,
the second protrusion space is divided into a second inflow space and a second outflow space formed in the longitudinal direction of the first protrusion member, and one ends of the second inflow space and the second outflow space are connected to allow fluid communication, and
the second refrigerant flow path sequentially passes through the second inflow space and the second outflow space.

9. The ice-making evaporator of claim 8, wherein cross-sections perpendicular to the longitudinal direction of the first body space, the second body space, the first inflow space, the first outflow space, the second inflow space, and the second outflow space are formed to have the same area.

10. The ice-making evaporator of claim 8,

wherein the first protrusion space has a first partition wall that divides the first inflow space and the first outflow space so that cross-sections perpendicular to the longitudinal direction of the first inflow space and the first outflow space are the same,
a first through hole is formed at one end of the first partition wall having an area equal to the area of a cross-section perpendicular to the longitudinal direction of the first inflow space and the first outflow space,
the second protrusion space has a second partition wall that divides the second inflow space and the second outflow space so that cross-sections perpendicular to the longitudinal direction of the second inflow space and the second outflow space are the same, and
a second through hole is formed at one end of the second partition wall having an area equal to the area of a cross-section perpendicular to the longitudinal direction of the second inflow space and the second outflow space.

11. The ice-making evaporator of claim 10, wherein the first through hole and the second through hole are formed adjacent to one inner end surface of the first protrusion member.

12. The ice-making evaporator of claim 8, wherein a first refrigerant circulation hole is formed at the other end of the first body space partition wall to connect the other end of the first refrigerant flow path and the second refrigerant flow path.

13. The ice-making evaporator of claim 12, wherein the first refrigerant circulation hole extends from the inner lower surface to the upper surface of the first evaporator body.

14. The ice-making evaporator of claim 12, wherein the ratio between the area of the first refrigerant circulation hole and the area of the cross-section perpendicular to the longitudinal direction of the first outflow space is 1.5 to 2:1.

15. The ice-making evaporator of claim 10, further comprising:

a first insulating wall that divides the first evaporator body up and down so that an insulating space is formed in an upper inner portion of the first evaporator body;
a first guide wall that extends upward from an upper end of the first partition wall to allow the refrigerant to move from the first body space to the first inflow space; and
a second guide wall that extends upward from an upper end of the second partition wall to allow the refrigerant to move from the second inflow space to the second body space,

wherein the first insulating wall extends to the first guide wall and the second guide wall of the first protrusion member adjacent to the rear end surface of the first evaporator body.

16. The ice-making evaporator of claim 1,

wherein a discharge space is formed inside one end of the first evaporator body to enable fluid communication with the second body space, and

the refrigerant outlet is formed through the first evaporator body in the extension direction of the first protrusion member so that the discharge space can communicate fluidly with the outside.

17. The ice-making evaporator of claim 1, further comprising:

a second evaporator body that extends from one side to the other side;

a second body space partition wall that divides the inside of the second evaporator body into a third body space and a fourth body space formed parallel to the extension direction of the second evaporator body;

a plurality of second protrusion members that is formed to extend to one side from the second evaporator body;

a second protrusion space partition wall that divides the inside of the second protrusion member into a third protrusion space and a fourth protrusion space;

a third refrigerant flow path formed to allow the refrigerant to move from the other end to one end through the third body space and pass through the third protrusion space of the plurality of second protrusion members; and

a fourth refrigerant flow path formed to have one end connected to one end of the third refrigerant flow path and to allow the refrigerant to move from one end to the other end thereof through the fourth body space and pass through the fourth protrusion space of the plurality of second protrusion members,

wherein the other end of the third refrigerant flow path is connected to the other end of the first refrigerant flow path, and the other end of the fourth refrigerant flow path is connected to the other end of the second refrigerant flow path, so that the other end of the first refrigerant flow path is connected to the other end of the second refrigerant flow path.

18. The ice-making evaporator of claim 17, further comprising:

a hollow connection member extending from the other end of the first evaporator body to the other end of the second evaporator body; and

a connection member partition wall that divides the inside of the connection member into a first connection space and a second connection space formed in the extension direction of the connection member,

wherein the other end of the third refrigerant flow path is connected to the other end of the first refrigerant flow path through the first connection space,

the other end of the fourth refrigerant flow path is connected to the other end of the second refrigerant flow path through the second connection space,

one end of the connection member partition wall is coupled to the other end of the first body space partition wall, and

the other end of the connection member partition wall is coupled to the other end of the second body space partition wall.

19. The ice-making evaporator of claim 18,

wherein the first body space, the first connection space, and the third body space have the same cross-sectional area, and

the second body space, the second connection space, and the fourth body space have the same cross-sectional area.

20. The ice-making evaporator of claim 17, further comprising:

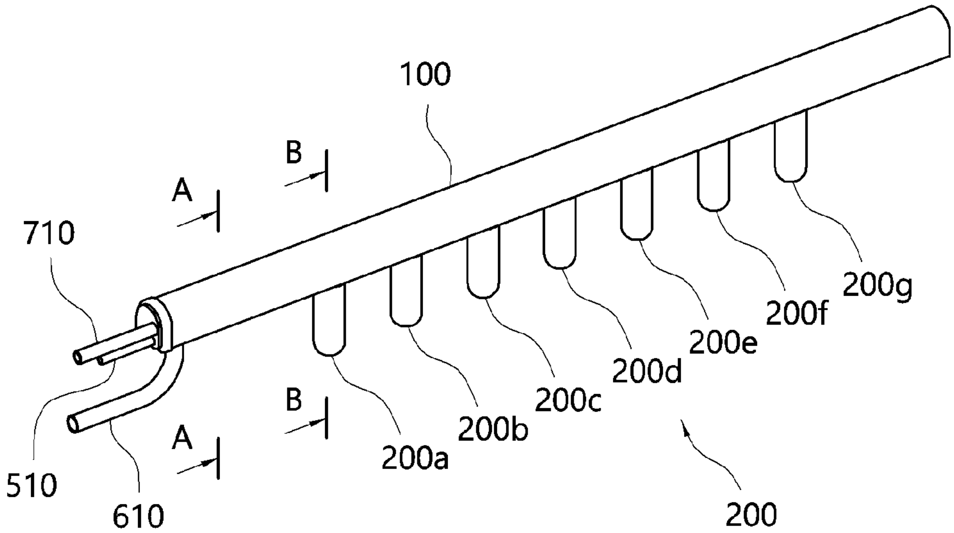
a first connection member that extends from one side of the other end of the first evaporator body to one side of the other end of the second evaporator body and has a first connection space formed therein; and

a second connection member that extends from the other side of the other end of the first evaporator body to the other side of the other end of the second evaporator body and has a second connection space formed therein,

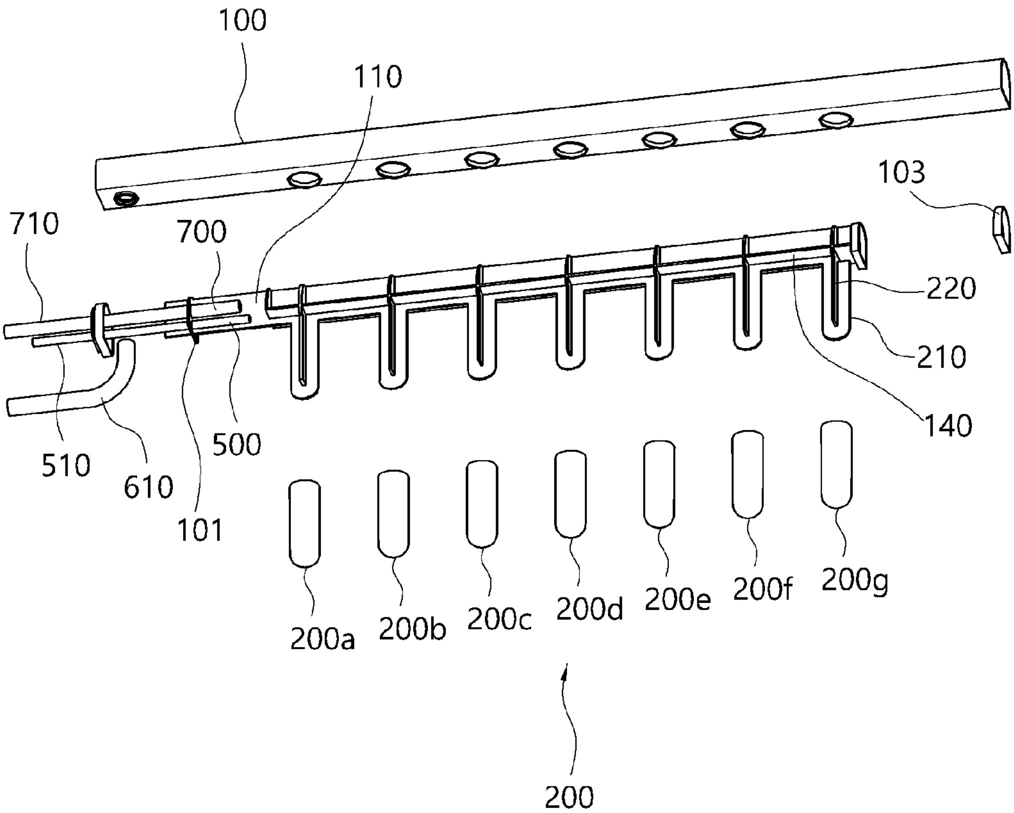
wherein the other end of the third refrigerant flow path is connected to the other end of the first refrigerant flow path through the first connection space, and

the other end of the fourth refrigerant flow path is connected to the other end of the second refrigerant flow path through the second connection space.

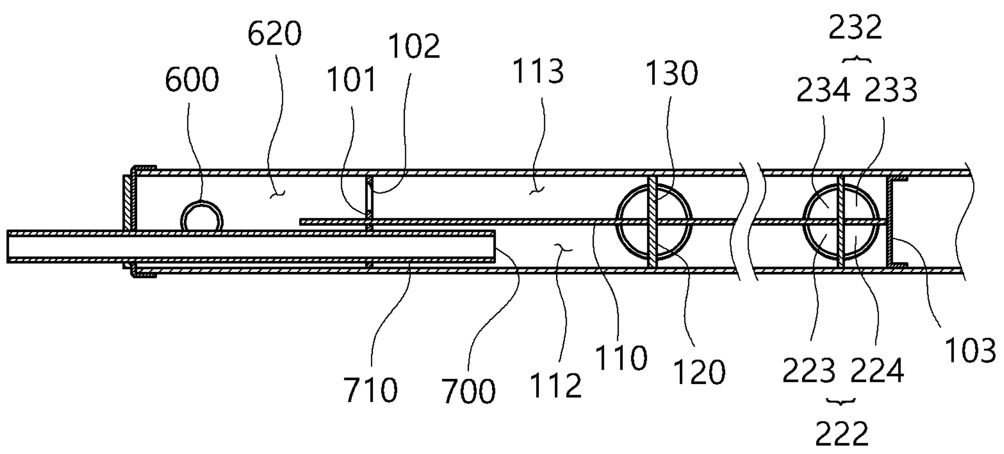
【FIG. 1】


100
B
A
710
200g
200f
200e
200d
200c
200b
B
200a
A
510
610
200

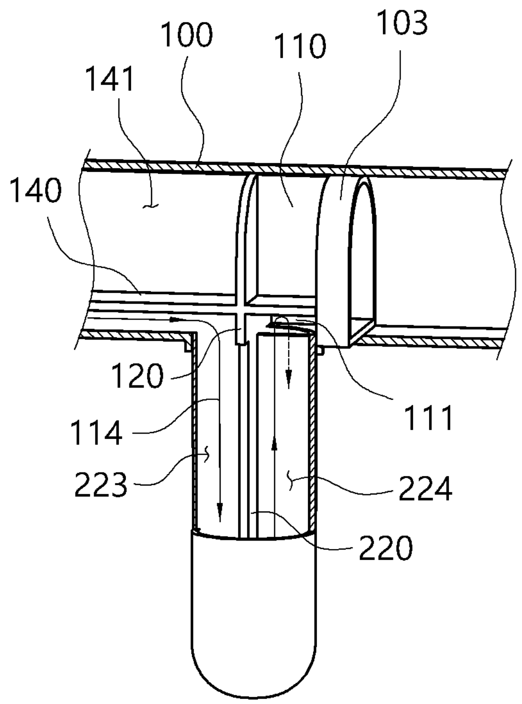
【FIG. 2】


100
110
103
710
700
220
210
140
510
610
500
101
200a
200b
200c
200d
200e
200f
200g
200

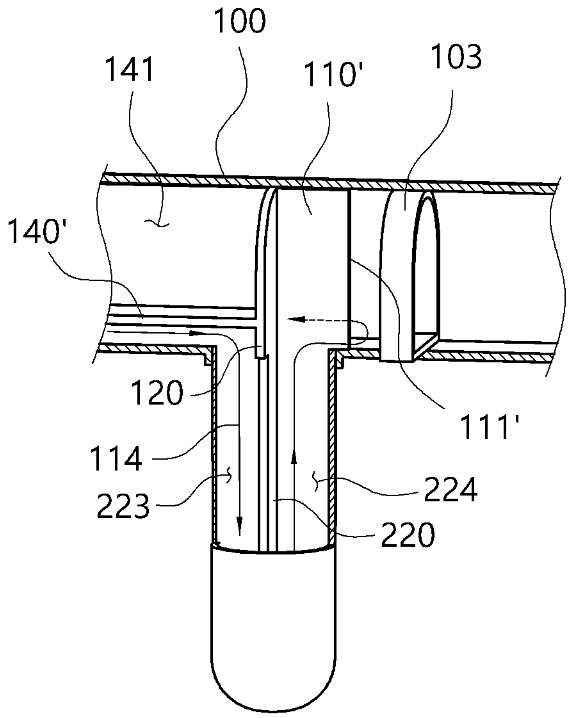
【FIG. 3】


232
620
102
600
101
113
130
234 233
710
700
112
110
120
223 224
222
103

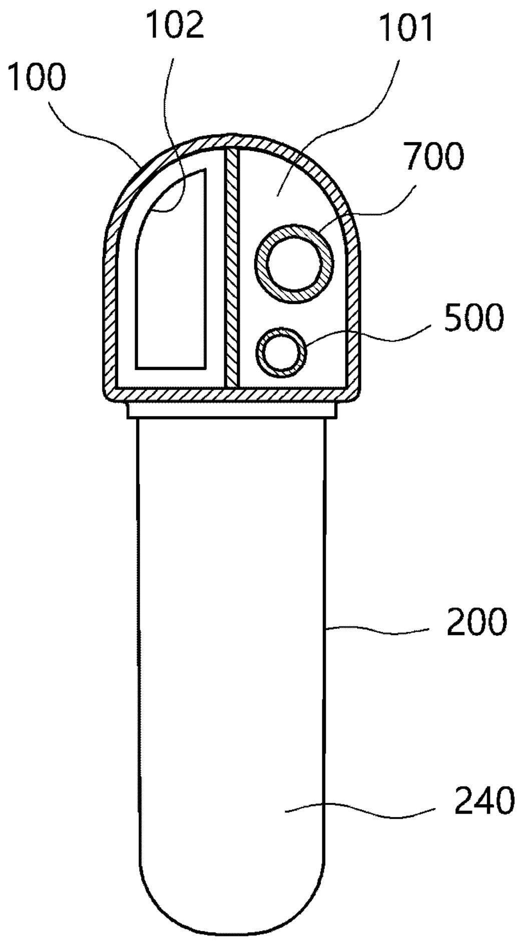
【FIG. 4】


100
110
103
141
140
120
114
223
111
224
220

【FIG. 5】

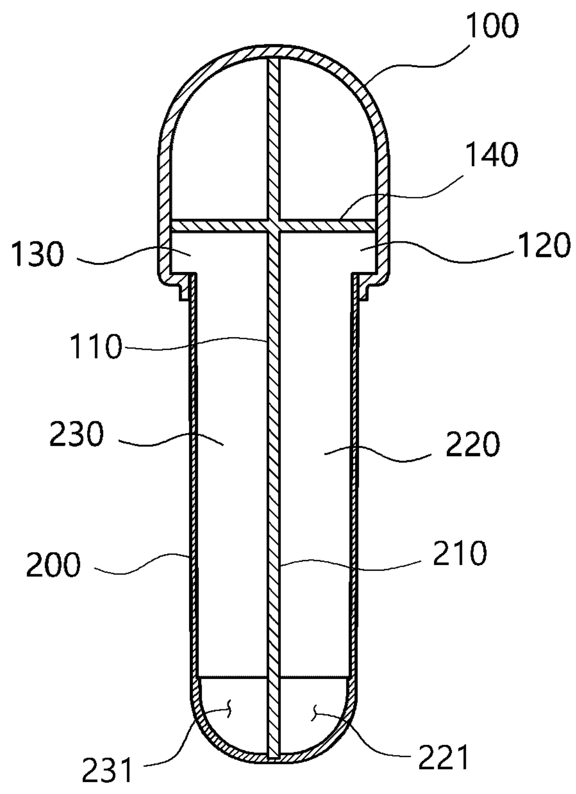


【FIG. 6】



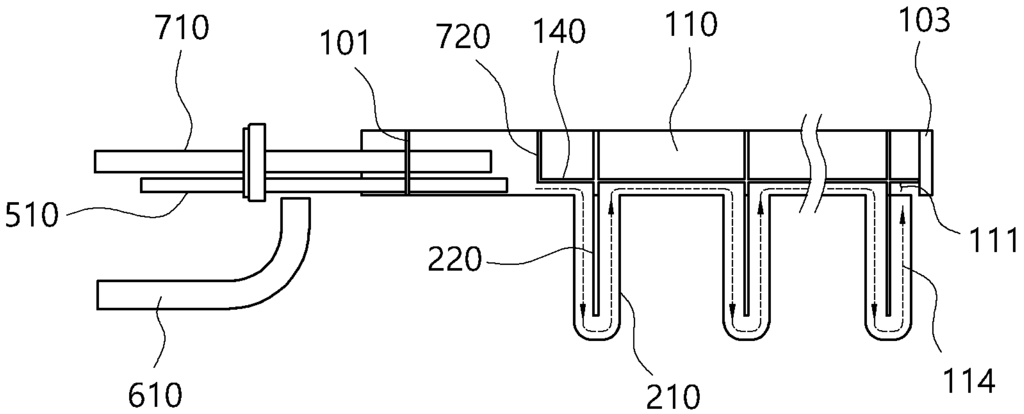
< A -A Cross-Section >

【FIG. 7】

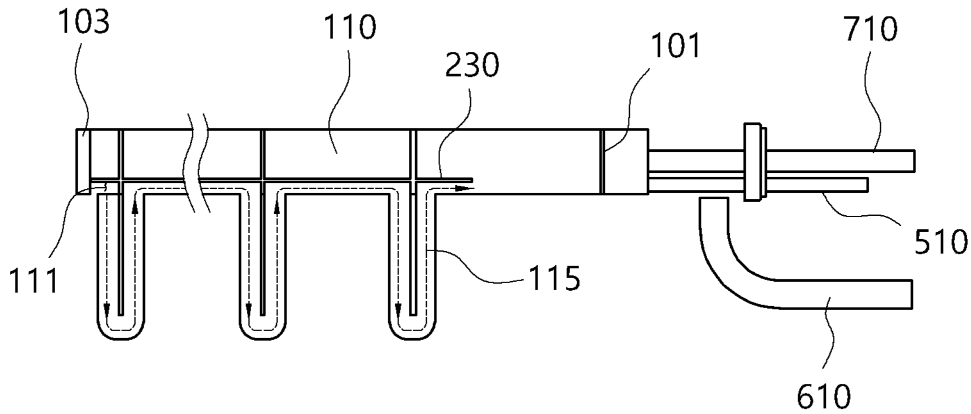


< B - B Cross-Section >

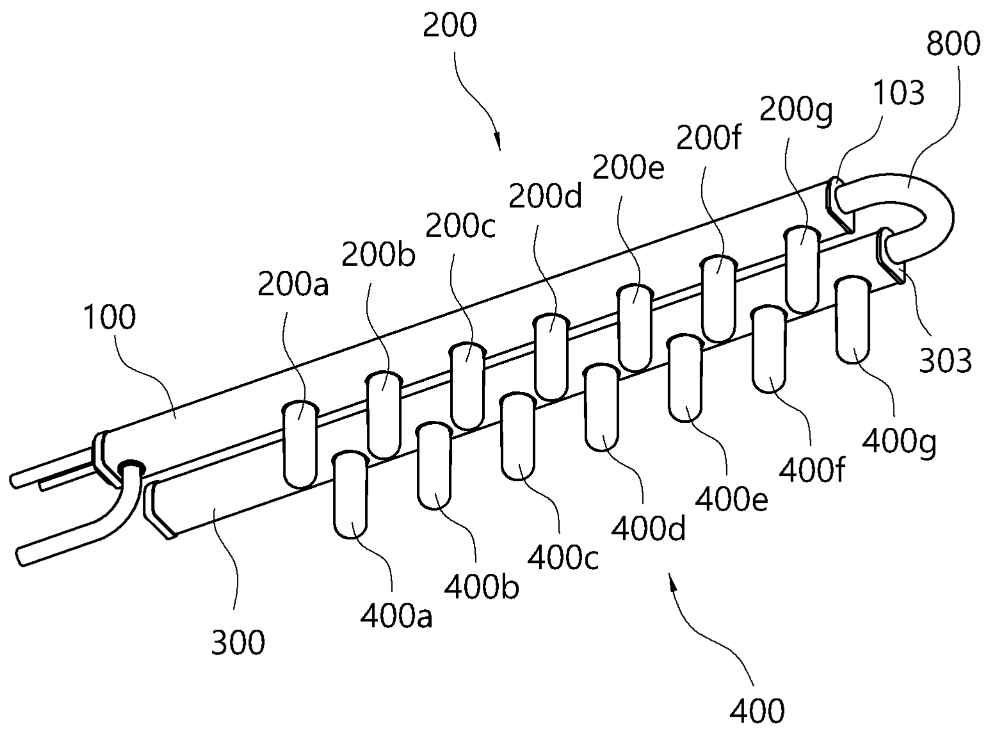
【FIG. 8】


710
101
720
140
110
103
510
220
111
610
210
114

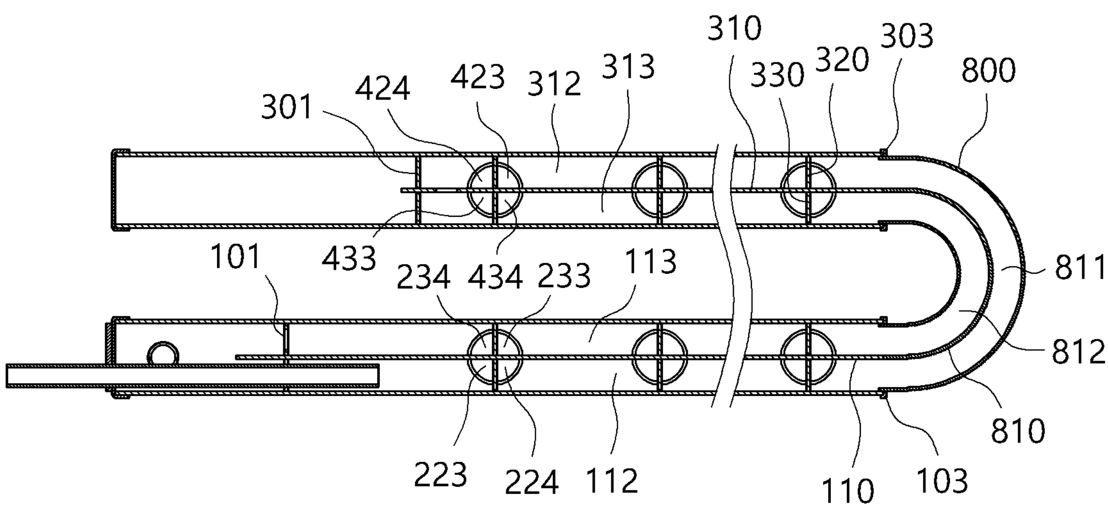
【FIG. 9】


103
110
230
101
710
111
115
510
610

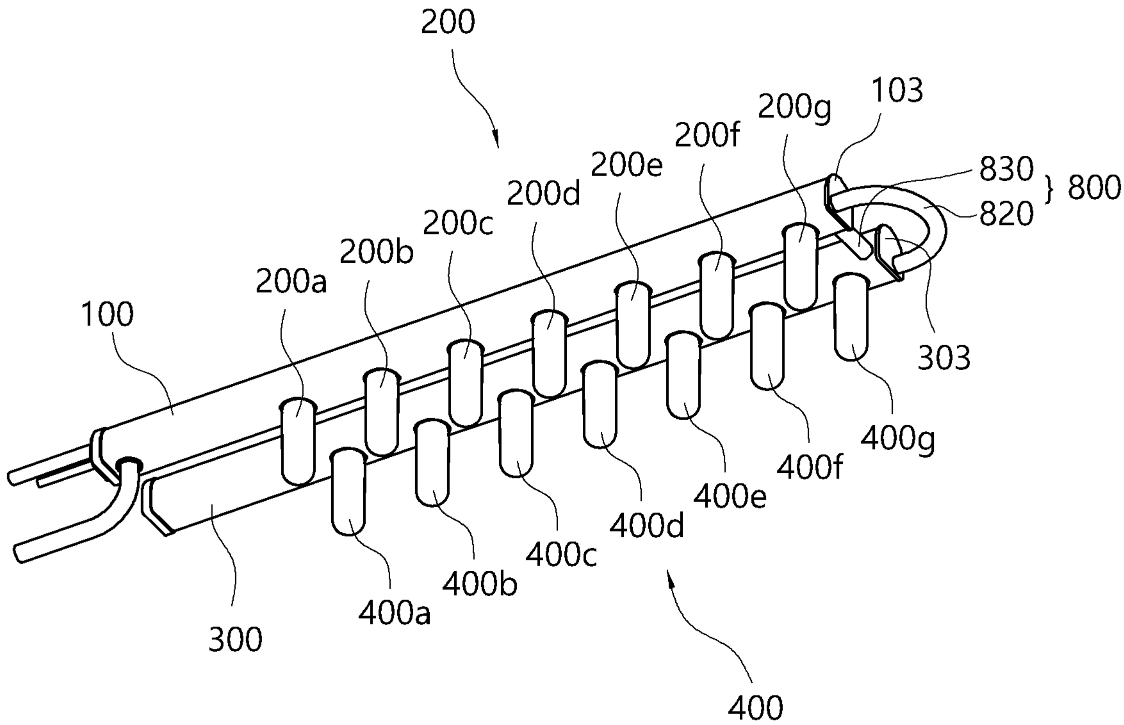
【FIG. 10】


200
800
103
200g
200f
200e
200d
200c
200b
200a
100
303
400g
400f
400e
400d
400c
400b
400a
300
400

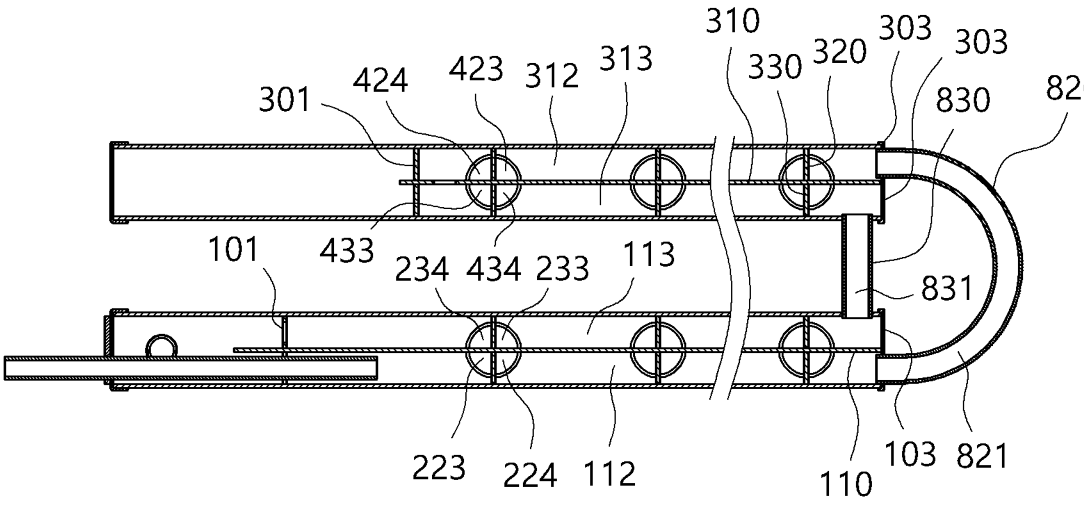
【FIG. 11】


310
303
330
320
800
313
312
423
424
301
101
433
434
234
233
113
811
812
810
223
224
112
110
103

【FIG. 12】


200
200a
200b
200c
200d
200e
200f
200g
103
830
820
800
100
303
400g
400f
400e
400d
400c
400b
400a
300
400

【FIG. 13】


310
303
303
301
424
423
312
313
330
320
830
820
101
433
434
234
233
113
831
223
224
112
110
103
821

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/008368

A. CLASSIFICATION OF SUBJECT MATTER

F25C 1/08(2006.01)i; **F25B 39/02**(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)

F25C 1/08(2006.01); B01D 35/06(2006.01); B01D 35/18(2006.01); F25B 39/02(2006.01); F25C 1/04(2006.01); F25C 1/06(2006.01); F25C 1/12(2006.01)

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

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 제빙(ice making), 증발기(evaporator), 돌출(projection), 분리벽(partition), 냉매 유로(refrigerant path)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	KR 10-1337080 B1 (LG ELECTRONICS INC.) 05 December 2013 (2013-12-05) See paragraphs [0032]-[0035], [0038], [0039], [0042], [0044], [0047]-[0049] and [0057]-[0061] and figures 1, 4 and 5.	1-6,8-14,16-20 7,15
Y	KR 10-2013-0013475 A (JUSIKHOESA ENELOHATAEK) 06 February 2013 (2013-02-06) See paragraphs [0056] and [0058] and figure 7.	7
Y	KR 10-1893533 B1 (S&I CO., LTD. et al.) 30 August 2018 (2018-08-30) See paragraph [0055] and figure 5.	15
X Y	KR 10-2021-0003525 A (COWAY CO., LTD.) 12 January 2021 (2021-01-12) See paragraphs [0055]-[0081] and figures 2-6.	1-6,8-14,16 7,15

☑ 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
"D" document cited by the applicant in the international application
"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
28 September 2022	**04 October 2022**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208**	
Facsimile No. **+82-42-481-8578**	Telephone No.

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/008368

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2019-0074572 A (TAESUNG CO., LTD.) 28 June 2019 (2019-06-28) See claim 1 and figures 2-4.	1-20

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2022/008368

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
KR 10-1337080 B1	05 December 2013	None	
KR 10-2013-0013475 A	06 February 2013	None	
KR 10-1893533 B1	30 August 2018	None	
KR 10-2021-0003525 A	12 January 2021	None	
KR 10-2019-0074572 A	28 June 2019	KR 10-2089470 B1	27 May 2020

Form PCT/ISA/210 (patent family annex) (July 2019)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 1020210146979 **[0001]**
- KR 1020210003525 **[0005]**
- KR 101092627 **[0006]**
- KR 1020180009521 **[0007]**