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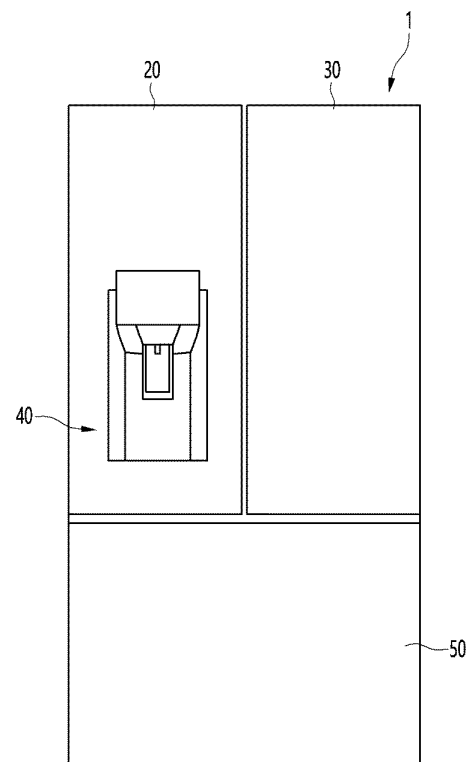
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(54) **REFRIGERATOR**

(57) A refrigerator includes an ice-making body having a peripheral portion that defines a space or a surface configured to receive water. The ice-making body includes a first peripheral portion defining a space or a surface configured to receive water and a second peripheral portion connected to the first peripheral portion and to which the water is not supplied. The first peripheral surface defines a water contact surface, and the second peripheral surface defines a non-contact surface configured to remain out of contact with water.

FIG. 1A



Description

TECHNICAL FIELD

[0001] The present specification relates to a refrigerator.

BACKGROUND

[0002] A refrigerator is an appliance that may store food at a low temperature in an internal storage space shielded by a door. The refrigerator cools the inside of the storage space by using cold air, thereby keeping the stored food in a refrigerated state or a frozen state.

[0003] In some cases, an ice maker for making ice may be provided in a freezing space of the refrigerator. For example, the ice maker receives water supplied from a water supply source or a water tank in a tray, and then cools the water to generate ice. The ice generated by the ice maker may be stored in an ice bin. The user may open a freezing space door, approach the ice bin, and take out the ice of the ice bin.

[0004] In some cases, where ice is formed hard, a child, an elderly person, or a consumer having weak teeth may file discomfort when chewing the ice.

SUMMARY

[0005] The present application describes apparatus and method configured to generate chewable ice having reduced hardness.

[0006] The present disclosure describes a refrigerator capable of manufacturing ice having strength to an extent that a consumer may chew and eat.

[0007] The present disclosure describes a refrigerator capable of providing a tray including a peripheral surface in which ice is generated, and cooling water supplied to the peripheral surface to manufacture thin ice (ice in a first state or first state ice).

[0008] The present disclosure describes a refrigerator capable of providing a blade on one side of the tray to separate the thin ice from the peripheral surface and manufacture powdered ice (ice in a second state or second state ice).

[0009] The present disclosure describes a refrigerator capable of compressing the powdered ice to manufacture molded ice (ice in a third state or a third state ice) having a predetermined strength.

[0010] The present disclosure describes a refrigerator in which, so that cooling of the tray is rapidly performed by supplied cold air, the tray is made of a material having high thermal conductivity, for example, a metal material.

[0011] The present disclosure describes a refrigerator in which, so that ice-making performance in the tray may be improved, a part of the peripheral surface among the peripheral surfaces of the tray, namely a first peripheral surface, forms a space or surface for ice-making, and another part of the peripheral surface, namely a second

peripheral surface, does not form a space or surface for ice-making.

[0012] The present disclosure describes a refrigerator including, as the peripheral surfaces of the tray, a first peripheral surface and a second peripheral surface separated from each other, so that ice-making performance in the tray may be improved.

[0013] The present disclosure describes a refrigerator in which the first peripheral surface of the tray has a first center distance from a center of the tray so as to be immersed in or contacted with water of a reservoir, and the second peripheral surface of the tray has a second center distance from the center of the tray so as not to be immersed in or contacted with the water of the reservoir.

[0014] The present disclosure describes a refrigerator in which the second center distance is less than the first center distance.

[0015] The present disclosure describes a refrigerator having a cut shape such that, when the tray is at an ice-making position (freezing standby position), the second peripheral surface facing the reservoir is not immersed in water of the reservoir, so that freezing of the tray is not performed in a state in which a low-temperature tray is immersed in water of the reservoir.

[0016] The present disclosure describes a refrigerator capable of optimally proposing a ratio of areas of the first and second peripheral surfaces based on an amount of ice to be made in the tray.

[0017] The present disclosure describes a refrigerator capable of forming a predetermined ratio between an area of the first peripheral surface forming an ice-generation space or ice-generation surface of the tray and an area of the second peripheral surface not forming an ice-making space or ice-making surface, thereby balancing an amount of ice made in the first peripheral surface and an amount of ice compressed in a compression part.

[0018] The present disclosure describes a refrigerator in which the peripheral surface of the tray includes one first peripheral surface and one second peripheral surface, and the first and second peripheral surfaces form different curvatures.

[0019] The present disclosure describes a refrigerator in which the peripheral surface of the tray includes one first peripheral surface and one second peripheral surface, and the first and second peripheral surfaces have different center distances from the center of the tray.

[0020] The present disclosure describes a refrigerator in which the peripheral surface of the tray includes a plurality of first peripheral surfaces and a plurality of second peripheral surfaces, and the plurality of first and second peripheral surfaces are alternately arranged based on a rotational direction of the tray.

[0021] The present disclosure describes a refrigerator in which a protrusion is provided at a portion where the first peripheral surface and the second peripheral surface meet, and an angle between two surfaces defining the protrusion forms an angle of 90 degrees or an acute angle smaller than 90 degrees so as to prevent water from

forming on the protrusion and undesired freezing from occurring.

[0022] Here, the two surfaces may include a first surface forming at least a portion of the first peripheral surface and a second surface forming at least a portion of the second peripheral surface.

[0023] The present disclosure describes a refrigerator such that a surface state of finally supplied ice forms a quasi-liquid layer so that a user's chewing satisfaction may be high. The present disclosure describes a refrigerator in which at least one of a recess and a protrusion is provided on the peripheral surface of the tray so as to allow ice separated from the tray to have a small size and facilitate recombination of ice in a compression part.

[0024] The present disclosure describes a refrigerator in which a plurality of recesses and a plurality of protrusions may be alternately arranged on the peripheral surface of the tray.

[0025] The present disclosure describes a refrigerator in which an uneven structure is provided on a first peripheral wall in order to increase a contact area of water or a contact area of cold air in the tray.

[0026] The present disclosure describes a refrigerator in which, when the tray is at a water supply position, an inner circumferential wall of the tray may be disposed at an upper end of the reservoir or a position higher than the upper end so that water of the reservoir does not flow into an inner circumferential wall side of the tray.

[0027] The present disclosure describes a refrigerator including a tray cover shielding the tray so that water does not flow into an inner circumferential wall side of the tray.

[0028] In some implementations, a refrigerator may include a tray having a peripheral surface (or a peripheral wall) receiving water. However, a liquid other than water may be supplied to the peripheral surface.

[0029] The peripheral surface may define a space in which water is stored.

[0030] The tray may include a first peripheral surface to which water is supplied so that the ice is generated, and a second peripheral surface connected to the first peripheral surface and to which the water is not supplied.

[0031] The tray may include a first peripheral surface forming a contact surface with which water contacts, and a second peripheral surface forming a non-contact surface so that water does not contact.

[0032] The tray may include a first peripheral surface having a first radius of curvature so that water contacts, and a second peripheral surface having a second radius of curvature so that water does not contact.

[0033] The second peripheral surface may have a shape different from that of the first peripheral surface.

[0034] The second peripheral surface may extend to have a shape cut or severed at an end portion of the first peripheral surface.

[0035] The first peripheral surface is formed to have a first center distance from a center of the tray so as to be immersed in water of a reservoir, and the second peripheral surface is formed to have a second center distance

from the center of the tray so as not to be immersed in the water of the reservoir, and the second center distance may be different from the first center distance.

[0036] The second center distance may be less than the first center distance.

[0037] The tray may include a protrusion provided at a portion where the first peripheral surface and the second peripheral surface are connected. The protrusion may provide an interface of the first and second peripheral surfaces.

[0038] An angle between two surfaces defining the protrusion may form 90 degrees or an acute angle smaller than 90 degrees, thereby preventing water from forming on the protrusion and undesired freezing from occurring. The two surfaces may include a first surface forming at least a portion of the first peripheral surface and a second surface forming at least a portion of the second peripheral surface.

[0039] The tray may be made of a material having high thermal conductivity, for example, a metal material, and may be rapidly cooled by cold air.

[0040] The tray may include a first peripheral surface forming at least one of a recess and a protrusion.

[0041] At least one of the recess and the protrusion may form a space or surface in which water is stored.

[0042] The recess and the protrusion include a plurality of recesses and a plurality of protrusions, and the plurality of recesses and the plurality of protrusions may be alternately arranged in a thickness direction of the tray. For example, the thickness direction of the tray may be an axial direction.

[0043] The recess may have a recessed shape to have a predetermined depth to define a depth of an ice-generation space.

[0044] The recess may include a first portion having a first cross-sectional area (or a first width) with respect to a recessed direction, and a second portion formed at a position deeper than the first portion and having a second cross-sectional area (or a second width).

[0045] The second cross-sectional area (or the second width) of the second portion may be formed less than the first cross-sectional area (or the first width) of the first portion.

[0046] The recess may have a shape recessed in a trapezoidal shape between two protrusions.

[0047] The tray may be provided to be movable. For example, the tray may be provided to be rotatable.

[0048] The refrigerator may include a blade provided on one side of the tray, and the blade may be configured to de-ice the ice generated on the peripheral surface in a process in which the tray moves.

[0049] The tray may include a central bracket forming a rotational center, and an extension wall extending in a radial direction from the central bracket toward the peripheral surface.

[0050] The tray may include side walls provided at both ends of the peripheral surface. The side walls may be connected to the extension wall.

[0051] The tray may include an inner circumferential wall forming a rear surface of the peripheral surface.

[0052] At least one of the peripheral surface and the inner circumferential wall may include a portion extending in an axial direction to define a thickness of the tray.

[0053] The tray may include a tray hole defined by the central bracket, the extension wall and the inner circumferential wall, and through which cold air may pass.

[0054] The peripheral wall (peripheral surface) may be named a first wall, the side wall may be named a second wall, the inner circumferential wall may be named a third wall, the extension wall may be named a fourth wall, and the central bracket may be named a fifth wall. However, an order of the first to fifth walls is not limited thereto, and names may be given in a different order within a range in which the idea of the disclosure is clear.

[0055] The tray may be at an ice-making position (or freezing standby position) at which cold air is supplied and ice-making is performed on the first peripheral surface. At the ice-making position of the tray, an end portion of the first peripheral surface may be spaced apart from an opened end portion of the reservoir by a predetermined distance.

[0056] At the ice-making position of the tray, the second peripheral surface of the tray may face the opened end portion of the reservoir.

[0057] The tray may be at a water supply position at which the first peripheral surface is immersed in water of the reservoir.

[0058] At the water supply position of the tray, a radial length (or width) of the side wall may be formed to be equal to or greater than a predetermined length so that water of the reservoir does not flow into the tray hole.

[0059] For example, at the water supply position of the tray, a portion where the side wall and the inner circumferential wall are connected may be disposed outside an opened end portion of the reservoir, for example, at a position higher than the opened end portion.

[0060] The refrigerator may include a tray cover shielding the tray so that water does not flow into an inner circumferential wall side of the tray.

[0061] In one aspect of the present disclosure, a refrigerator includes a cabinet forming a storage space, a door opening and closing the storage space, and a tray provided in the cabinet or the door, and wherein the tray may include a central portion, a first peripheral wall extending in a circumferential direction based on the central portion to receive water, and a second peripheral wall connected to the first peripheral wall and disposed not to receive water.

[0062] With respect to the central portion, a first center distance of the first peripheral wall may be formed greater than a second center distance of the second peripheral wall.

[0063] The tray is provided to be rotatable with respect to the central portion, and the first center distance may correspond to a rotation radius of the first peripheral wall, and the second center distance may correspond to a

rotation radius of the second peripheral wall.

[0064] The refrigerator includes a reservoir provided on one side of the tray, and the first center distance of the first peripheral wall may be formed so that the first peripheral wall is contacted in water stored in the reservoir.

[0065] The refrigerator includes a reservoir provided on one side of the tray, and the second center distance of the second peripheral wall may be formed so that the second peripheral wall is not contacted with water stored in the reservoir.

[0066] The refrigerator includes a reservoir provided on one side of the tray, and at a first position of the tray, the second peripheral wall may be disposed to face the reservoir, and at a second position of the tray, the first peripheral wall may be disposed to face the reservoir.

[0067] The first peripheral wall may include at least one of a recess recessed in the first peripheral wall and a protrusion protruding from the first peripheral wall.

[0068] The recess may be formed to be recessed from an outer circumferential surface of the first peripheral wall.

[0069] The protrusion may be formed to protrude from the outer circumferential surface of the first peripheral wall.

[0070] The recess and the protrusion may be formed to extend in a circumferential direction of the tray.

[0071] When an axial direction of a central shaft connected to the central portion is defined, the at least one recess may include a plurality of recesses arranged in the axial direction.

[0072] The refrigerator includes a blade provided on one side of the tray, and the blade includes a tip arranged to face at least one of the recess and the protrusion to scrape ice.

[0073] The tray may include a plurality of extension walls extending in a radial direction from the central portion toward the first peripheral wall, and an inner circumferential wall forming a rear surface of the first peripheral wall and defining an inner circumferential surface of the tray.

[0074] The tray may include a tray hole defined by the central portion, the plurality of extension walls, and the inner circumferential wall, and forming a flow path through which cold air passes.

[0075] A plurality of tray holes are formed, and the plurality of tray holes may be formed in a circumferential direction based on the central portion of the tray.

[0076] The tray includes a side wall connected to both ends of at least one wall among the first peripheral wall and the second peripheral wall, and the side wall may extend by a predetermined width from the first peripheral wall or the second peripheral wall to be connected to the inner circumferential wall.

[0077] A protrusion protruding to guide discharge of water may be provided on the inner circumferential wall.

[0078] The first peripheral wall and the second peripheral wall extend with different curvatures, and the tray may include a protrusion provided at a portion where the

first peripheral wall and the second peripheral wall meet.

[0079] The protrusion is defined by a first surface of the first peripheral wall and a second surface of the second peripheral wall, and the first surface and the second surface may form 90 degrees or an acute angle less than 90 degrees.

[0080] Based on the central portion of the tray, a center angle of the first peripheral wall may be formed equal to or greater than a center angle of the second peripheral wall.

[0081] In some implementations, a refrigerator includes a cabinet forming a storage space, a door opening and closing the storage space, and a tray rotatably provided in the cabinet or the door, and wherein the tray may include a central bracket to which a shaft is coupled and a plurality of extension walls extending in a radial direction from the central bracket.

[0082] The refrigerator may include a first peripheral wall connected to the plurality of extension walls and extending with a first curvature, and a second peripheral wall connected to the first peripheral wall and extending with a second curvature different from the first curvature.

[0083] The refrigerator includes a reservoir provided on one side of the tray and the first peripheral wall may include a contact surface contacting water of the reservoir, and when the tray rotates from a first position to a second position, the contact surface moves from outer side the reservoir to inside the reservoir.

[0084] The second peripheral wall may be disposed to face an internal space of the reservoir at the first position of the tray and may include a non-contact surface not contacting water of the reservoir.

[0085] A second curvature of the second peripheral wall may be formed so that the second peripheral wall has a shape cut or severed from the first peripheral wall.

[0086] In some implementations, since ice having strength to an extent that a consumer may chew and eat may be manufactured, consumer satisfaction may increase.

[0087] In some implementations, a refrigerator comprises a cabinet that defines a storage space, a door configured to open and close at least a portion of the storage space and an ice-making body rotatably provided at the cabinet or the door.

[0088] The ice-making body comprises a center bracket coupled to a shaft, a plurality of extension walls extending radially from the center bracket, a first peripheral portion connected to the plurality of extension walls, the first peripheral portion having a first curvature, and a second peripheral portion connected to the first peripheral portion, the second peripheral portion having a second curvature different from the first curvature.

[0089] The refrigerator further comprises a reservoir provided at one side of the ice-making body and configured to store water, wherein the first peripheral portion is configured to, based on the ice-making body rotating from a first position to a second position, move from an outside of the reservoir to an inside of the reservoir and define a contact surface configured to contact the water in

the reservoir.

[0090] The second peripheral portion is configured to, based on the ice-making body being disposed at the first position, face the reservoir from an outside of the water in the reservoir and define a non-contact surface configured to remain out of contact with the water in the reservoir.

[0091] The second curvature of the second peripheral portion defines a shape that is cut or recessed from an outer circumference of the ice-making body relative to the first peripheral portion.

[0092] In some implementations, by providing a tray including a peripheral surface in which ice is generated, and cooling water supplied to the peripheral surface, thin ice (ice in a first state) may be manufactured.

[0093] In some implementations, by providing a blade on one side of the tray to separate the thin ice from the peripheral surface, powdered ice (ice in a second state) may be manufactured.

[0094] In some implementations, by compressing the powdered ice, molded ice (ice in a third state) having a predetermined strength may be manufactured.

[0095] In some implementations, since a first peripheral surface, which is a part of the peripheral surfaces of the tray, forms a space or surface for ice-making and a second peripheral surface, which is another part of the peripheral surfaces, does not form a space or surface for ice-making, ice-making performance in the tray may be improved.

[0096] In some implementations, since the peripheral surface of the tray includes a first peripheral surface and a second peripheral surface separated from each other, ice-making performance in the tray may be improved.

[0097] In some implementations, the first peripheral surface of the tray has a first center distance from the center of the tray so as to be immersed in or contacted with water of the reservoir, and the second peripheral surface of the tray has a second center distance from the center of the tray so as not to be immersed in or contacted with water of the reservoir, so that ice-making performance may be improved.

[0098] For example, the second center distance is formed less than the first center distance.

[0099] In some implementations, since, when the tray is at an ice-making position (freezing standby position), the second peripheral surface facing the reservoir has a cut shape so as not to be immersed in or contacted with water of the reservoir, freezing of the tray may not be performed in a state in which a low-temperature tray is immersed in or contacted with water of the reservoir.

[0100] That is, when ice-making is performed in a state in which water is supplied to the first peripheral surface at the ice-making position of the tray, since the second peripheral surface is not immersed in or contacted with water of the reservoir, the tray is prevented from being heated and the reservoir from being cooled by heat exchange between the low-temperature tray and the relatively high-temperature reservoir. Accordingly, it is possible to prevent deterioration of ice-making perfor-

mance and water supply performance.

[0101] In some implementations, based on an amount of ice to be made in the tray, it may be possible to optimally propose a ratio of areas of the first and second peripheral surfaces.

[0102] In particular, by forming a set ratio between an area of the first peripheral surface forming an ice-generation space of the tray and an area of the second peripheral surface not forming an ice-generation space, it may be possible to balance an amount of ice made in the tray and an amount of ice compressed in the compression part.

[0103] In some implementations, since the peripheral surface of the tray includes one first peripheral surface and one second peripheral surface, and the first and second peripheral surfaces form different curvatures, water supply from the reservoir is easy at the first peripheral surface, and water of the reservoir may not contact at the second peripheral surface.

[0104] In some implementations, since the peripheral surface of the tray includes one first peripheral surface and one second peripheral surface, and the first and second peripheral surfaces have different center distances from the center of the tray, water supply from the reservoir is easy at the first peripheral surface, and water of the reservoir may not contact at the second peripheral surface.

[0105] In some implementations, since the peripheral surface of the tray includes a plurality of first peripheral surfaces and a plurality of second peripheral surfaces, and the plurality of first and second peripheral surfaces are alternately arranged based on the rotational direction of the tray, ice-making performance may be improved and an ice-making amount may be adjusted.

[0106] In some implementations, since a protrusion is provided at a portion where the first peripheral surface and the second peripheral surface meet, and an angle between two surfaces defining the protrusion forms an angle of 90 degrees or an acute angle less than 90 degrees, it may be possible to prevent water from forming on the protrusion and undesired freezing from occurring.

[0107] In some implementations, since a surface state of finally supplied ice forms a quasi-liquid layer, a user's chewing satisfaction may be high. In particular, since at least one of a recess and a protrusion is provided on the peripheral surface of the tray, it may be possible to form a size of ice separated from the tray small and facilitate recombination of ice in the compression part.

[0108] In some implementations, since a plurality of recesses and a plurality of protrusions are alternately arranged on the peripheral surface of the tray, formation of a space or surface for ice-making is easy.

[0109] In some implementations, by providing an uneven structure on the first peripheral wall of the tray, it may be possible to increase a contact area of water and a contact area of cold air in the tray, and accordingly, an effect of increasing an ice generation speed in the tray appears.

[0110] In some implementations, since, when the tray is at a water supply position, the inner circumferential wall of the tray is disposed at an upper end of the reservoir or a position higher than the upper end, water of the reservoir may not flow into the inner circumferential wall side of the tray.

[0111] In some implementations, since the tray cover shielding the tray is included, water may not flow into the inner circumferential wall side of the tray.

BRIEF DESCRIPTION OF THE DRAWINGS

[0112]

FIG. 1A is a front view of an example of a refrigerator, and FIG. 1B is a view showing an example state in which one door of the refrigerator is separated.

FIG. 2A is a perspective view viewed from a front of an example of a first refrigerating space door, and FIG. 2B is a perspective view viewed from a rear of the first refrigerating space door.

FIG. 3A is a view showing an example state in which a basket and a filter are separated from the first refrigerating space door, and FIG. 3B is a view showing an example state in which an ice-making space door and a cover member are separated from the first refrigerating space door.

FIG. 4 is a perspective view showing an example of an ice maker disposed inside an ice-making space in a state in which the ice-making space door is separated from the first refrigerating space door.

FIG. 5 is a view showing an example configuration of an ice maker and a door duct.

FIG. 6 is a front perspective view showing an example configuration of an ice maker and an ice-making space bracket.

FIG. 7 is a rear perspective view showing an example configuration of an ice maker and an ice-making space bracket.

FIG. 8 is an exploded perspective view showing an example configuration of an ice maker and an ice-making space bracket.

FIG. 9 is an exploded perspective view showing an example configuration of an ice-making part of an ice maker.

FIG. 10 is an exploded perspective view showing an example configuration of a tray assembly and a reservoir.

FIG. 11A is a view showing an example state when the tray assembly is at a first position.

FIG. 11B is a view showing an example state when the tray assembly is at a second position.

FIG. 12 is an exploded perspective view showing an example configuration of a compression part of an ice maker.

FIG. 13 is a perspective view showing an example configuration of a transfer pipe and a gear device.

FIG. 14 is a plan view showing an example configuration of a transfer passage and a gear device.

FIG. 15A is a view showing an example of a piston at a first position and ice separated from a tray assembly and falling into a transfer passage.

FIG. 15B is a view showing an example a piston moving to a second position and ice in a transfer passage and compressed by the piston.

FIG. 15C is a view showing an example of a piston moving to a third position and a transfer guide device moving ice in the transfer passage.

FIG. 15D is a view showing an example of a piston returning to a first position and the transfer guide device moving to an original position.

FIG. 16 is an upper perspective view showing an example configuration of a tray.

FIG. 17 is a lower perspective view showing an example configuration of the tray.

FIG. 18 is a front view showing an example configuration of the tray.

FIG. 19 is a side view showing an example configuration of the tray.

FIG. 20 is a cross-sectional view cut along line 20-20 of FIG. 19.

FIG. 21 is a plan view showing an example of a relative arrangement state of a tray and a first blade.

FIG. 22 is a cross-sectional view cut along line 22-22 of FIG. 21.

FIG. 23 is a view showing an example of an arrangement state of a tray and a reservoir at a first position (ice-making position) of the tray.

FIG. 24 is a cross-sectional view cut along line 24-24

of FIG. 11A.

FIG. 25 is a view showing an example of an arrangement state of a tray and a reservoir at a second position (water supply position) of the tray.

FIG. 26 is a cross-sectional view cut along line 26-26 of FIG. 11B.

FIG. 27 is a view showing an example of a relative arrangement state of a tray and a reservoir at a first position of the tray.

FIG. 28A is a view showing an example of a relative arrangement state with a reservoir when a tray is at a first position (ice-making position).

FIG. 28B is a view showing an example of a relative arrangement state with a reservoir when the tray of FIG. 28A is at a second position (water supply position).

FIG. 29A is a perspective view showing an example configuration of a tray.

FIG. 29B is a front view showing an example configuration of the tray.

FIG. 30A is a perspective view showing an example configuration of a tray.

FIG. 30B is a front view showing an example configuration of the tray.

FIG. 31A is a perspective view showing an example configuration of a tray.

FIG. 31B is a front view showing an example configuration of the tray.

FIG. 32 is a perspective view showing an example configuration of a tray.

DETAILED DESCRIPTION

[0113] Hereinafter, some implementations of the present disclosure will be described in detail through exemplary drawings. In adding reference numerals to components in each drawing, it should be noted that the same components are given the same numerals as much as possible even if displayed on different drawings. In addition, in describing implementations of the present disclosure, if it is determined that a detailed description of a related known configuration or function interferes with understanding of the implementations of the present disclosure, the detailed description thereof will be omitted.

[0114] FIG. 1A is a front view of an example of a

refrigerator, FIG. 1B is a view showing a state in which one door of the refrigerator is separated, FIG. 2A is a perspective view viewed from a front of an example of a first refrigerating space door, and FIG. 2B is a perspective view viewed from a rear of the first refrigerating space door.

[0115] FIG. 3A is a view showing an example state in which a basket and a filter are separated from the first refrigerating space door, and FIG. 3B is a view showing an example state in which an ice-making space door and a cover member are separated from the first refrigerating space door.

[0116] Referring to FIGS. 1A to 3B, a refrigerator 1 may include a cabinet 10. The cabinet 10 may include a storage space. The refrigerator 1 may further include a door opening and closing the storage space. The door may be rotatably or movably connected to the cabinet 10.

[0117] The storage space may include a refrigerating space 18. The storage space may selectively or additionally include a freezing space 19. For example, FIG. 1B illustrates that the storage space includes the refrigerating space 18 and the freezing space 19. The refrigerating space 18 and the freezing space 19 may be partitioned by a partition wall.

[0118] The door may include refrigerating space doors 20 and 30 opening and closing the refrigerating space 18. The refrigerating space 18 may be opened and closed by one or more refrigerating space doors 20 and 30. The door may include a freezing space door 50 opening and closing the freezing space 19. The freezing space 19 may be opened and closed by one or more freezing space doors 50.

[0119] Hereinafter, an example in which the refrigerating space 18 is opened and closed by a first refrigerating space door 20 and a second refrigerating space door 30 will be described.

[0120] At least one of the first refrigerating space door 20 and the second refrigerating space door 30 may include a dispenser 40 for discharging water and/or ice. Of course, depending on a type of refrigerator, it is also possible that the freezing space door 50 includes the dispenser 40.

[0121] At least one of the first refrigerating space door 20 and the second refrigerating space door 30 may include one or more ice makers 100.

[0122] Hereinafter, an example in which the ice maker 100 is provided in the first refrigerating space door 20 will be described. In some examples, it is also possible that an ice maker is provided in the second refrigerating space door 30 or the freezing space door 50. In this case, the dispenser 40 and the ice maker may be provided in the same door. Alternatively, an additional ice maker may also be provided in the refrigerating space 18 or the freezing space 19. In some examples, the ice maker 100 may be provided as a standalone appliance

FIG. 1B illustratively shows that the refrigerator 1 is a bottom freezer type refrigerator, but unlike this, it is noted that the idea of the present disclosure may be equally

applied to a side-by-side type refrigerator or a top-mount type refrigerator. In the case of the side-by-side type or the top-mount type refrigerator, a freezing space door may include an ice maker and a dispenser, or a refrigerating space door may include an ice maker and a dispenser.

[0123] The dispenser 40 may be located on a front surface of the first refrigerating space door 20. A part of the dispenser 40 is recessed rearward to provide a space in which a container may be located.

[0124] The dispenser 40 may discharge ice generated by the ice maker 100. At least a part of the ice maker 100 may be positioned higher than the dispenser 40.

[0125] The first refrigerating space door 20 may include an outer case 21. The outer case 21 may form a front appearance. The first refrigerating space door 20 may include a door liner 70. The door liner 70 may be directly or indirectly connected to the outer case 21. The door liner 70 may open and close the refrigerating space 18.

[0126] In a state in which the outer case 21 and the door liner 70 are connected, an insulating space may be formed between the outer case 21 and the door liner 70. An insulating material may be provided in the insulating space. The insulating material may be formed by curing a foaming liquid injected from the outside. Alternatively, a vacuum insulating body may be provided in the insulating space. It is also possible that the insulating material and the vacuum insulating body are provided together in the insulating space.

[0127] The refrigerator 1 may include an ice-making space 25 providing a space in which ice is generated. The ice-making space 25 may, for example, be provided in the first refrigerating space door 20. The ice maker 100 may be located in the ice-making space 25. For example, the door liner 70 may form the ice-making space 25. The ice-making space 25 may be formed as one surface of the door liner 70 is recessed toward the outer case 21.

[0128] The first refrigerating space door 20 may further include an ice bin 500 in which ice generated by the ice maker 100 is stored. The ice stored in the ice bin 500 may be discharged to the dispenser 40. The ice bin 500 may be accommodated in the ice-making space 25 together with the ice maker 100. The ice bin 500 may be located below the ice maker 100.

[0129] For example, cold air generated by a cooler may be supplied to the ice-making space 25. That is, the cooler may be configured to supply cold air to the ice-making space 25. Alternatively, the cooler may be configured to operate to supply cold air (cooled) to the ice-making space 25. In this manner, the ice-making space 25 may be cooled by an indirect cooling method using cold air (cooled air). In some implementations, the ice-making space 25 may be cooled by a direct cooling method, e.g., using a refrigerant pipe. In some examples, an ice-making body may be disposed in the ice-making space 25 and configured to receive water, where the ice-making body can be cooled directly or indirectly by a

cooling medium such as refrigerant or cooled air. For instance, the cooling medium may contact the ice-making body and be configured to transfer heat from the ice-making body to thereby freeze water received in the ice-making body into ice.

[0130] The cooler may be configured to cool the ice-making space 25 by including at least one of a refrigerant cycle and a thermoelectric element. For example, cold air for cooling of the freezing space 19 may be supplied to the ice-making space 25.

[0131] The refrigerator 1 may further include a supply flow path 16 guiding cold air of the freezing space 19 or cold air of a space in which an evaporator generating cold air for cooling of the freezing space 19 is located, to the first refrigerating space door 20. The refrigerator 1 may include a discharge flow path 17 guiding cold air discharged from the first refrigerating space door 20 to the freezing space 19 or the space in which the evaporator is located. The supply flow path 16 and the discharge flow path 17 may be provided in the cabinet 10. Cold air circulating through the supply flow path 16 and the discharge flow path 17 may flow by a fan, for example, disposed in the freezing space 19 or the space in which the evaporator is located.

[0132] A first opening 16a forming an end portion of the supply flow path 16 may be formed in an inner wall of the refrigerating space 18. Cold air of the supply flow path 16 may be discharged from the supply flow path 16 through the first opening 16a. A second opening 17a forming an end portion of the discharge flow path 17 may be formed in the inner wall of the refrigerating space 18. Cold air of the supply flow path 16 may flow into the discharge flow path 17 through the second opening 17a. The first opening 16a and the second opening 17a may be formed in one inner wall among a plurality of inner walls of the refrigerating space 18.

[0133] The first refrigerating space door 20 may include a cold-air inlet 75. When the first refrigerating space door 20 is closed, the cold-air inlet 75 may communicate with the supply flow path 16 through the first opening 16a. The first refrigerating space door 20 may include a cold-air outlet 76. When the first refrigerating space door 20 is closed, the cold-air outlet 76 may communicate with the discharge flow path 17 through the second opening 17a.

[0134] The cold-air inlet 75 may be formed on one side surface of the door liner 70. Although not limited, the one side surface of the door liner 70 is a surface facing an inner wall of the refrigerating space 18 in which the supply flow path 16 is located when the first refrigerating space door 20 is closed. The cold-air outlet 76 may be formed on the one side surface of the door liner 70. Although not limited, the one side surface of the door liner 70 is a surface facing an inner wall of the refrigerating space 18 in which the discharge flow path 17 is located when the first refrigerating space door 20 is closed.

[0135] The one side surface of the door liner 70 may include a first side surface portion 72 and a second side surface portion 74 having different widths in a front-rear

direction. A width in the front-rear direction of the second side surface portion 74 may be formed greater than a width of the first side surface portion 72. At least one of the cold-air inlet 75 and the cold-air outlet 76 may be formed in the second side surface portion 74 of the door liner 70. The second side surface portion 74 may protrude further toward the refrigerating space 18 than the first side surface portion 72.

[0136] The first refrigerating space door 20 may include an ice-making space door 60 opening and closing the ice-making space 25. The ice-making space door 60 may be an insulating door in which an insulating material is provided inside. The ice-making space door 60 may be rotatably connected to the first refrigerating space door 20 by a hinge.

[0137] A first basket 62 capable of storing food may be provided in the ice-making space door 60. It is possible that a second basket 65 is provided in the first refrigerating space door 20. For example, the second basket 65 may be located below the first basket 62. A length in the front-rear direction of the second basket 65 may be shorter than a length in the front-rear direction of the first basket 62. The second basket 65 may overlap the dispenser 40 in the front-rear direction.

[0138] A component space 63 accommodating components may be formed in the first refrigerating space door 20. In the component space 63, at least one of a valve 68 adjusting flow of water, a filter, and a water tank 69 storing water may be accommodated. The component space 63 may be formed by the door liner 70. Alternatively, the component space 63 may be formed by a separate wall connected to the door liner 70. The first refrigerating space door 20 may include a cover member 64 covering the component space 63. A holder 67 to which the filter is coupled may be provided in the component space 63.

[0139] The cover member 64 may include an opening 64a. Through the opening 64a, the filter may be coupled to the holder 67. The second basket 65 may cover the opening 64a. When the second basket 65 is separated, the opening 64a may be exposed. The holder 67 may be exposed through the opening 64a.

[0140] FIG. 4 is a perspective view showing an example of an ice maker disposed inside an ice-making space in a state in which an ice-making space door is separated from a first refrigerating space door, and FIG. 5 is a view showing example configurations of an ice maker and a cold-air circulation duct to the ice maker.

[0141] Referring to FIGS. 4 and 5, a refrigerating space door 20 may include an ice-making space 25 accommodating an ice maker 100. The refrigerating space door 20 may include a plurality of walls 80 defining the ice-making space 25.

[0142] The plurality of walls may constitute at least a part of the door liner 70.

[0143] The plurality of walls may include a lower wall 80a defining a lower portion of the ice-making space 25, an upper wall 80b defining an upper portion of the ice-

making space 25, and two side walls 81 defining both side portions of the ice-making space 25. The plurality of walls may further include a front wall 80c defining a front surface of the ice-making space 25.

[0144] The lower wall 80a may include a take-out portion 84 for taking out ice stored in the ice bin 500 to the dispenser 40.

[0145] The ice maker 100 may be located between the upper wall 80b and the ice bin 500. For example, the ice maker 100 may be disposed adjacent to the upper wall 80b.

[0146] A first duct 90 connected to the cold-air inlet 75 to supply cold air to the ice-making space 25 may be provided in the side wall 81. For example, the first duct 90 is embedded in the side wall 81 and may not be exposed to the ice-making space 25. The first duct 90 may extend upward from the cold-air inlet 75 to an upper portion of the refrigerating space door 20 in which the ice maker 100 is located. The first duct 90 can be referred to as a door duct.

[0147] The first duct 90 includes a duct discharge portion 91 discharging cold air, and cold air discharged from the duct discharge portion 91 may flow into a cold-air duct 400 of the ice maker 100.

[0148] A supply portion 82 guiding cold air to the cold-air duct 400 may be formed in the side wall 81. The duct discharge portion 91 is connected to the supply portion 82, and the cold-air duct 400 may be connected to the duct discharge portion 91 through the supply portion 82.

[0149] A return portion 83 for sending cold air of the ice-making space 25 to the cold-air outlet 76 may be formed in the side wall 81. For example, the return portion 83 may be formed at a height at which the ice bin 500 is located.

[0150] A second duct 95 may be connected to the return portion 83. The second duct 95 may include a duct inlet portion 96 introducing cold air discharged through the return portion 83. The duct inlet portion 96 may be directly or indirectly connected to the return portion 83. For example, the second duct 95 is embedded in the side wall 81 and may not be exposed to the ice-making space 25. The second duct 95 extends downward from the return portion 83 to a lower portion of the refrigerating space door 20, and may be connected to the cold-air outlet 76.

[0151] The ice maker 100 may include an ice-making part 200 performing an operation of receiving water, cooling the water in a tray assembly 240, and de-icing cooled ice.

[0152] The ice maker 100 may include a compression part 300 configured to transfer ice de-iced from the tray assembly 240 and recombine or compress transferred ice to manufacture ice in the third state. The ice in the third state may be ice having a predetermined thickness. The ice in the third state may have, for example, a cylindrical or polygonal column shape corresponding to an inner surface shape of a cylinder 360 or a discharge pipe 370 to be described later. In some examples, the compression part 300 may be referred to as an ice-compressing assembly.

[0153] The ice maker 100 may include a cold-air duct 400 supplying cold air to the ice-making part 200. The cold-air duct 400 may be understood as being disposed between the side wall 81 and the tray assembly 240 to be described later.

[0154] Hereinafter, a detailed configuration of the ice maker 100 will be described with reference to drawings.

[0155] FIG. 6 is a front perspective view showing an example configuration of an ice maker and an ice-making space bracket, FIG. 7 is a rear perspective view showing an example configuration of the ice maker and the ice-making space bracket, and FIG. 8 is an exploded perspective view showing an example configuration of the ice maker and the ice-making space bracket.

[0156] Referring to FIGS. 6 to 8, an ice maker 100 may be installed in the ice-making space 25 of the refrigerating space door 20. The refrigerating space door 20 may include an ice-making space plate 85 forming at least a part of the wall 80 of the ice-making space 25. The ice-making space plate 85 may include the lower wall 80a and the front wall 80c.

[0157] The ice maker 100 may be supported by the front wall 80c of the ice-making space 25. The ice maker 100 may be coupled to the front wall 80c by a wall coupling portion 329. A plurality of wall coupling portions 329 may be provided on both sides of the ice maker 100. For example, the wall coupling portion 329 may be understood as a fastening device provided in the compression part 300.

[0158] The ice maker 100 is supported on an upper portion of the front wall 80c, and the ice bin 500 may be located below the ice maker 100. The refrigerating space door 20 may include a take-out motor to provide driving force to discharge ice stored in the ice bin 500 to the dispenser 40.

[0159] The wall 80 of the ice-making space 25 may include a motor accommodating portion 86 surrounding the take-out motor. The take-out motor is connected to a gear assembly located in front of the front wall 80c, and when the gear assembly operates by driving of the take-out motor, an auger of the ice bin 500 operates so that ice may be taken out. The front wall 80c may include a through portion 87 through which a shaft connecting the gear assembly and the ice bin 500 passes. Ice discharged from the ice bin 500 may be discharged to the dispenser 40 through the take-out portion 84 of the lower wall 80a.

[0160] The ice maker 100 may include an ice-making part 200 including a first motor 210. The first motor 210 may be named an "ice-making motor" providing driving force to move a tray assembly 240 in order to move the tray assembly 240.

[0161] The ice-making part 200 may include ice-making brackets 220 and 230 forming a cold-air flow path. A cold-air duct 400 is connected to one side of the ice-making brackets 220 and 230, and cold air supplied through the cold-air duct 400 may flow through a cold-air flow path formed inside the ice-making brackets 220

and 230. The cold-air duct 400 may be defined as a "first cold-air duct", and the ice-making brackets 220 and 230 may also be defined as a "second cold-air duct".

[0162] The first motor 210 may be connected to the ice-making brackets 220 and 230.

[0163] The ice-making brackets 220 and 230 may include a first bracket 220 forming an accommodating space of the tray assembly 240. The cold-air duct 400 is connected to the first bracket 220, and cold air supplied through the cold-air duct 400 may flow into the accommodating space. The cold-air duct 400 may include an inlet portion 420 connected to the supply portion 82 of the side wall 81.

[0164] The ice-making brackets 220 and 230 may include a second bracket 230 connected to the first bracket 220 and forming a cold-air flow path together with the first bracket 220. For example, one side portion of the first bracket 220 is opened, and the opened one side portion may be covered by the second bracket 230 so that a cold-air flow path may be formed therein.

[0165] The second bracket 230 may form an accommodating space in which a gear assembly 235 and 236 interworking by driving of the first motor 210 is accommodated.

[0166] The first bracket 220 and the second bracket 230 may be connected in a front-rear direction. The first motor 210 is connected to one side of the second bracket 230, and the gear assembly 235 and 236 may interwork by driving of the first motor 210. For example, the first motor 210 and the second bracket 230 may be disposed in the front-rear direction.

[0167] The ice-making space plate 85 may include a support wall 85a for supporting the ice-making part 200. The support wall 85a constitutes an upper portion of the ice-making space plate 85, and the ice-making part 200 may be supported on an upper portion of the ice-making space plate 85 through the support wall 85a.

[0168] The ice-making brackets 220 and 230 may include a plate coupling portion 229 supported by the ice-making space plate 85. For example, the plate coupling portion 229 is provided in the first bracket 220 and may be coupled to a coupling hole 88 formed in the support wall 85a.

[0169] For example, the plate coupling portion 229 may include a rib protruding from the first bracket 220. However, unlike this, the plate coupling portion 229 provided in the ice-making brackets 220 and 230 may be provided in various forms, for example, a boss or a fastening hole to which a fastening member is coupled. Correspondingly, the coupling hole 88 of the ice-making space plate 85 may also be provided in a form of a rib or a boss.

[0170] A plurality of plate coupling portions 229 may be provided at a plurality of points of the ice-making brackets 220 and 230.

[0171] The ice-making part 200 may include a reservoir 250 storing water. The reservoir 250 may supply water to the tray assembly 240.

[0172] The first bracket 220 may include a communication portion 221b guiding a water supply pipe 120 to supply water to the reservoir 250. The communication portion 221b may be formed on a surface of the first bracket 220 facing the front wall 80c.

[0173] For example, the water supply pipe 120 is inserted into the communication portion 221b, and at least a part of the water supply pipe 120 may extend into the ice-making brackets 220 and 230.

[0174] The ice maker 100 may include a compression part 300 including a second motor 310. The second motor 310 may be named a "compression motor" providing driving force to move a piston 335 for compressing or recombining ice.

[0175] The compression part 300 may include a first bracket 320 connected to the second motor 310. The first bracket 320 may support parts constituting the compression part 300.

[0176] The compression part 300 may include a discharge port 328 for discharging ice manufactured in the ice maker 100 to the ice bin 500. For example, the discharge port 328 is formed on a lower surface of the first bracket 320, and ice discharged through the discharge port 328 may fall into the ice bin 500.

[0177] The compression part 300 may include a cylinder 360 defining a movement space of ice (powdered ice) generated in the ice-making part 200. Ice introduced into the cylinder 360 may be compressed or recombined by a reciprocating piston 335 into molded ice having a predetermined volume.

[0178] The compression part 300 may include a transfer pipe 340 provided at an inlet side of the cylinder 360 and configured to transfer ice (powdered ice) discharged from the ice-making part 200 to the cylinder 360. A space for accommodating the powdered ice is formed inside the transfer pipe 340, and the powdered ice may move into the cylinder 360. In some examples, the compression part 300 includes a transfer passage or duct, and the transfer pipe 340 is an example of the transfer passage or duct.

[0179] The ice described herein may include frozen ice fragments or powder produced by mechanically separating a frozen ice body from the ice-making body and subsequently compressing the fragments or powder into a shaped ice piece. The ice fragments or powdered ice may have a water content and density suitable for the subsequent ice compressing or shaping operations described herein.

[0180] The compression part 300 may include a discharge pipe 370 provided at an outlet side of the cylinder 360 and providing a predetermined resistance so that ice present in the cylinder 360 is compressed or recombined.

[0181] For example, to provide the resistance, the discharge pipe 370 may be formed such that a cross-sectional area decreases based on a direction in which ice moves.

[0182] The discharge pipe 370 may be made of an elastically deformable material, for example, a silicone

material, to provide the resistance.

[0183] An outlet of the discharge pipe 370 is opened, and molded ice compressed or recombined while passing through the discharge pipe 370 may be discharged through the opened outlet of the discharge pipe 370.

[0184] The compression part 300 may include a cutter wall 380 disposed at a position spaced apart from the outlet of the discharge pipe 370 by a predetermined distance and interfering with molded ice discharged through the discharge pipe 370. The cutter wall 380 is supported by the first bracket 320 and may be disposed adjacent to an upper side of the discharge port 328.

[0185] The cutter wall 380 includes an inclined surface facing the discharge pipe 370, and molded ice discharged from the discharge pipe 370 may be cut while interfering with the inclined surface. Then, the cut ice may fall into the ice bin 500 through the discharge port 328.

[0186] FIG. 9 is an exploded perspective view showing an example configuration of an ice-making part of an ice maker, FIG. 10 is an exploded perspective view showing an example configuration of a tray assembly and a reservoir, FIG. 11A is a view showing an example state when a tray assembly is at a first position, and FIG. 11B is a view showing an example state when the tray assembly is at a second position.

[0187] In some implementations, referring to FIGS. 9 and 10, the ice-making part 200 may include a tray assembly 240 forming an ice-making space.

[0188] The tray assembly 240 may include a tray 241 receiving water to perform ice-making. The tray 241 may be provided to be movable by receiving power from the first motor 210. For example, the tray 241 may be provided to be rotatable.

[0189] The tray 241 may include peripheral surfaces 242a and 242b forming a water storage space. The peripheral surfaces 242a and 242b may include ice-generation cavity.

[0190] For example, the tray 241 may have a drum shape having a peripheral surface. The peripheral surface may form an outer circumferential surface of the drum. That is, the peripheral surfaces 242a and 242b may be understood as extending in a circumferential direction to form the outer circumferential surface of the tray 241.

[0191] In some examples, the tray 241 may have a disk shape or a plate shape including both side walls and a peripheral surface. In some examples, the tray 241 may be referred to as an ice-making body or a rotating body having a disk shape, a plate shape, a fan shape, an arc shape, a cylindrical shape, etc.

[0192] The peripheral surfaces 242a and 242b may include a first peripheral surface 242a forming a water storage space. The first peripheral surface 242a may form at least a part of the outer circumferential surface of the tray 241. When the first peripheral surface 242a is at a position facing the reservoir 250, the first peripheral surface 242a may include a surface contacting water stored in the reservoir 250. In some examples, the first

peripheral surface 242a may be referred to as a circumferential portion or a peripheral portion of the ice-making body (e.g., tray 241) configured to receive water.

[0193] The first peripheral surface 242a may be disposed adjacent to the first blade 280 so that ice generated on the first peripheral surface 242a contacts the first blade 280.

[0194] The first peripheral surface 242a may include at least one of a first part defining a recessed portion and a second part defining a protruding portion so as to increase a contact area for cooling water. The first part may include a recess 241a, and the second part may include a protrusion 241b.

[0195] When a recessed portion of the first peripheral surface 242a is viewed as a reference position, it may be understood that the first peripheral surface 242a includes the protrusion 241b, and when a protruding portion of the first peripheral surface 242a is viewed as a reference position, it may be understood that the first peripheral surface 242a includes the recess 241a.

[0196] Due to configurations of the recess 241a and the protrusion 241b, the first peripheral surface 242a may be understood as including an uneven structure.

[0197] A plurality of recesses 241a and a plurality of protrusions 241b may each be provided. The plurality of recesses 241a and the plurality of protrusions 241b may have a structure in which they are alternately arranged.

[0198] The peripheral surfaces 242a and 242b may include a second peripheral surface 242b. When the second peripheral surface 242b is at a position facing the reservoir 250, the second peripheral surface 242b may include a surface that does not contact water stored in the reservoir 250.

[0199] The second peripheral surface 242b may be disposed relatively far away from the first blade 280 so that ice generated on the second peripheral surface 242b does not contact the first blade 280.

[0200] A center distance from a center of the tray 241 to the second peripheral surface 242b, that is, a radius distance of the second peripheral surface 242b, may be formed less than a center distance from the center of the tray 241 to the first peripheral surface 242a, that is, a radius distance of the first peripheral surface 242a. For example, the second peripheral surface 242b may have a shape cut from an edge of the first peripheral surface 242a in a direction toward the center of the tray 241.

[0201] When the first peripheral surface 242a is at a position to be frozen by contacting cold air, the second peripheral surface 242b is disposed to face the reservoir 250. In some examples, since the second peripheral surface 242b does not contact water of the reservoir 250, the reservoir 250 may not be cooled by the tray 241 forming a low temperature surface. Accordingly, freezing of water stored in the reservoir 250 may be prevented.

[0202] At least one first peripheral surface 242a may be provided. For example, a plurality of first peripheral surfaces 242a are provided, and the second peripheral

surface 242b may be disposed between the plurality of first peripheral surfaces 242a based on the circumferential direction of the tray 241.

[0203] At least one second peripheral surface 242b may be provided. For example, a plurality of second peripheral surfaces 242b are provided, and the first peripheral surface 242a may be disposed between the plurality of second peripheral surfaces 242b based on the circumferential direction of the tray 241.

[0204] The tray 241 may include side walls 244 also referred to as side surfaces. The side wall 244 may include a portion extending in a radial direction of the tray 241.

[0205] A plurality of side walls 244, for example, two side walls 244, may be provided to form both side surfaces of the tray 241. The two side walls 244 may be disposed spaced apart in an axial direction of the first motor 210. The peripheral surfaces 242a and 242b may be formed between the two side walls 244.

[0206] The tray 241 may include an inner circumferential wall 244a connected to the side wall 244. The inner circumferential wall 244a is understood to form an inner circumferential surface of the tray 241, and may include a surface opposite to the peripheral surfaces 242a and 242b with respect to the side wall 244.

[0207] A bar 249 is coupled to the tray 241 as a "central shaft" of the tray 241. The bar 249 may have a non-circular shape.

[0208] The bar 249 may be disposed to pass through a central portion or a rotational center portion of the tray 241. The central portion of the tray 241 includes a central bracket 243, and the central bracket 243 may have a shape surrounding at least a part of the bar 249.

[0209] The bar 249 is coupled to gear assemblies 235 and 236, and may rotate in interworking with the gear assemblies 235 and 236. For example, the bar 249 may be integrally formed with the gear assemblies 235 and 236, or may be provided to be separable.

[0210] Another example is proposed. The bar 249 is removed, and a central shaft protruding from the gear assemblies 235 and 236 may be directly coupled to the central bracket 243 of the tray 241.

[0211] The tray 241 may include extension walls 243a extending from the central bracket 243 toward the side walls 244. The extension wall 243a may, for example, extend in a radial direction from the central bracket 243.

[0212] A plurality of extension walls 243a are provided, and the plurality of extension walls 243a may be disposed spaced apart from each other in a circumferential direction.

[0213] Directions will be defined. Throughout the specification, an "axial direction" means a direction in which a shaft of the first motor 210 or the second motor 310 extends, and a "radial direction" means a direction of a radius crossing the axial direction.

[0214] The tray 241 may form tray holes 245 (ice-making body holes). The tray hole 245 may be understood as a hole penetrating in the axial direction of the tray

241. Through the tray hole 245, cold air flows so that a cooling area of the tray 241 may increase.

[0215] The tray hole 245 may be understood as a space defined by the central bracket 243, the plurality of extension walls 243a, and the inner circumferential wall 244a. A plurality of tray holes 245 are formed, and the plurality of tray holes 245 may be disposed in a circumferential direction of the tray 241.

[0216] The tray assembly 240 may include tray covers 246 and 247 connected to the tray 241. The tray covers 246 and 247 may be provided on both side walls 244 of the tray 241.

[0217] The tray covers 246 and 247 are disposed to cover at least one side of the tray 241 and may function to prevent water of the reservoir 250 from flowing into the tray holes 245 of the tray 241.

[0218] The tray covers 246 and 247 may be made of a material having low thermal conductivity so that generation of ice is limited. For example, the material having low thermal conductivity may include a non-metal material. A plastic material may be proposed as an example of the non-metal material.

[0219] The tray cover 246 and 247 may include a first tray cover 246 provided on one side wall 244 of the tray 241. The first tray cover 246 may include a first cover wall 246a covering the one side wall 244 of the tray 241. A radial length or width of the first cover wall 246a may be formed greater than a radial length or width of the side wall 244 of the tray 241 so as to prevent water from flowing into the tray hole 245 of the tray 241.

[0220] The first tray cover 246 may include a first through hole 246b through which the central bracket 243 of the tray 241 passes. The first through hole 246b may be axially aligned with the central bracket 243 of the tray 241.

[0221] The first tray cover 246 may include a first extension wall 246c extending from the first through hole 246b toward the first cover wall 246a. The first extension wall 246c may extend in a radial direction to cover the extension walls 243a of the tray 241. The first extension wall 246c may be provided in a plurality corresponding to the extension walls 243a.

[0222] The first tray cover 246 may include a first inner circumferential wall 246d connected to the first cover wall 246a. The first inner circumferential wall 246d may be understood to form an inner circumferential surface of the first tray cover 246.

[0223] The first tray cover 246 may include a first cover fastening portion 246e protruding from the first inner circumferential wall 246d. The first cover fastening portion 246e may include a boss, and a predetermined fastening member may pass through the boss and be fastened to a second cover fastening portion 247e of the second tray cover 247. However, the shape of the first cover fastening portion 246e is not limited thereto, and as long as it may be coupled to the second cover fastening portion 247e, it may also be provided in a shape of a rib or a locking protrusion.

[0224] The first tray cover 246 may include a first communication portion 246f communicating with the tray hole 245 of the tray 241. Cold air may pass through the tray hole 245 via the first communication portion 246f.

[0225] The tray covers 246 and 247 may include a second tray cover 247 provided on the other side wall 244 of the tray 241. The second tray cover 247 may include a second cover wall 247a covering the other side wall 244 of the tray 241. A radial length or width of the second cover wall 247a may be formed greater than a radial length or width of the side wall 244 of the tray 241 so as to prevent water from flowing into the tray hole 245 of the tray 241.

[0226] A configuration of the second tray cover 247 is substantially similar to a configuration of the first tray cover 246. The second tray cover 247 may include a second through hole 247b corresponding to the first through hole 246b of the first tray cover 246.

[0227] The second tray cover 247 may include a second extension wall 247c corresponding to the first extension wall 246c of the first tray cover 246.

[0228] The second tray cover 247 may include a second inner circumferential wall 247d corresponding to the first inner circumferential wall 246d of the first tray cover 246.

[0229] The second tray cover 247 may include a second cover fastening portion 247e corresponding to the first cover fastening portion 246e of the first tray cover 246.

[0230] The second tray cover 247 may include a second communication portion 247f communicating with the tray hole 245 of the tray 241. Cold air may pass through the second communication portion 247f via the first communication portion 246f and the tray hole 245.

[0231] In some examples, the first tray cover 246 and the second tray cover 247 may be understood as one component of a "tray" in a broad sense. In this case, the tray assembly 240 may be referred to as a "tray", the tray 241 may be referred to as a "tray part", and the first and second tray covers 246 and 247 may constitute a part of the tray assembly 240.

[0232] In some implementations, the first and second tray covers 246 and 247 may not be provided, and the tray assembly 240 may be configured to include only the tray 241.

[0233] The ice-making part 200 may include the first bracket 220 forming a first accommodating space 220a for the tray assembly 240.

[0234] The first bracket 220 may include a first wall 221 supported by the ice-making space plate 85. The first wall 221 may be understood as a wall shielding at least a portion of one side surface of the tray assembly 240.

[0235] In another aspect, the first wall 221 may be disposed to support the tray 241. The first wall 221 may include an insertion hole 221a into which at least a portion of the tray 241 is inserted to support the tray 241. For example, the central bracket 243 of the tray 241 may be rotatably inserted into the insertion hole 221a.

[0236] The first wall 221 may include communication portion 221b guiding the water supply pipe 120. The water supply pipe 120 is inserted into the communication portion 221b, and at least a part of the water supply pipe 120 may be located in the first accommodating space 220a.

[0237] The first wall 221 may form at least a portion of a wall guiding flow of cold air introduced through the cold-air duct 400.

[0238] The ice-making part 200 may include a second wall 222 connected to the first wall 221. The second wall 222 is connected to an end portion of the first wall 221, for example, an upper end portion, and may protrude in a direction toward the first motor 210. The second wall 222 may form an upper end portion of the ice-making part 200.

[0239] The ice-making part 200 may include a third wall 223 connected to the first wall 221. The third wall 223 is connected to an end portion of the first wall 221, for example, a lower end portion, and may protrude in a direction toward the first motor 210. The third wall 223 may form a lower end portion of the ice-making part 200.

[0240] The ice-making part 200 may include a fourth wall 224 and a fifth wall 225 connected to the third wall 223. The fourth wall 224 is connected to one side of the third wall 223, and the fifth wall 225 may be connected to the other side of the third wall 223. For example, the fourth wall 224 and the fifth wall 225 may protrude at both ends of the third wall 223. In some examples, any one of the first to fifth walls that contacts the reservoir may be referred to as a supporting wall. For example, the third wall 223 may be a supporting wall that supports the reservoir 250, and the fourth wall 224 and the fifth wall 225 may be extending walls protruding from the supporting wall.

[0241] The ice-making part 200 may include a second accommodating space 220b in which the reservoir 250 is placed. The second accommodating space 220b may be understood as a space defined by the third wall 223, the fourth wall 224, and the fifth wall 225. The second accommodating space 220b may be formed below the first accommodating space 220a.

[0242] The reservoir 250 may include a case having a predetermined capacity, and a heater 255 attached to a wall of the case and providing heat so that water stored in the reservoir 250 is not frozen. The heater 255 may be named a "reservoir heater".

[0243] The ice-making part 200 may include a water supply guide wall 224a guiding water supplied from the water supply pipe 120 to the reservoir 250. The water supply guide wall 224a may form at least a portion of the fourth wall 224.

[0244] The water supply guide wall 224a may be located adjacent to a discharge portion of the water supply pipe 120, and may include an inclined surface guiding a flow of water discharged from the water supply pipe 120. The inclined surface of the water supply guide wall 224a may extend to be inclined with respect to a direction from

the communication portion 221b toward the reservoir 250.

[0245] Water discharged from the water supply pipe 120 falls onto the inclined surface, and the fallen water flows downward at a low speed along the inclined surface and may flow into the reservoir 250.

[0246] The ice-making part 200 may include a first blade 280 contacting ice made to separate ice made in the tray 241. The first blade 280 may be located adjacent to a rotation path of the tray 241. In particular, the first blade 280 may be located adjacent to the first peripheral surface 242a when the tray 241 rotates.

[0247] The first blade 280 may be provided in the fifth wall 225. For example, the reservoir 250 is disposed on an inner surface of the fifth wall 225, and the first blade 280 may be coupled to a surface of the fifth wall 225.

[0248] The ice-making part 200 may include a second blade 285 contacting frozen ice to separate frozen ice from the tray assembly 240.

[0249] The second blade 285 may be located adjacent to both side walls of the tray assembly 240 so as to scrape frozen ice on both side walls, that is, the first cover wall 246a and the second cover wall 247a.

[0250] A plurality of second blades 285 may be provided, and one second blade 285 may be provided in the first wall 221. Another second blade 285 may be provided in an outer wall of the second bracket 230, for example, an outer wall of the gear bracket 231.

[0251] The first blade 280 and the second blade 285 may be disposed at positions spaced apart from each other, for example, disposed opposite to each other based on a center of the tray assembly 240. With this configuration, it may be possible to prevent a cold-air flow path formed in the ice-making part 200 from being interfered with by the first and second blades 280 and 285.

[0252] In detail, cold air introduced through the cold-air duct 400 flows from an area in which the second blade 285 is located to an opposite area in which the first blade 280 is located based on the center of the tray assembly 240. If the first and second blades 280 and 285 are disposed in one side area based on the center of the tray assembly 240, there is a problem in that these blades act as flow-path resistance. Accordingly, in the present implementation, by disposing the first and second blades 280 and 285 on both sides of the tray assembly 240, an effect of reducing resistance of cold-air flow may appear.

[0253] While the tray assembly 240 rotates, frozen ice contacting the second blade 285 is separated from the tray assembly 240, and the separated ice may flow into the reservoir 250.

[0254] So that ice separated by the second blade 285 may flow into the reservoir 250, the second blade 285 may be disposed at a position adjacent to the reservoir 250. For example, based on a height direction with respect to a ground supporting the refrigerator, the reservoir 250 is disposed below the tray assembly 240 and the second blade 285 may be disposed at a position lower than a center of the tray assembly 240.

[0255] In another aspect, the second blade 285 may be disposed at a position overlapped in an up-down direction with respect to an opened upper end of the reservoir 250. The opened upper end of the reservoir 250 may be understood as an end portion into which water flows.

[0256] A cold-air flow path through which cold air introduced from the cold-air duct 400 flows may be formed inside the first bracket 220. At least a portion of the cold-air flow path may be formed in the first accommodating space 220a.

[0257] The first bracket 220 may include a first opening 224b to which the cold-air duct 400 is coupled and which forms a cold-air inlet portion. The first opening 224b may be formed in a fourth wall 224 also referred to as a side wall of the first bracket 220. For example, the first opening 224b may be formed on a side on which the water supply guide wall 224a is provided, and may be located above the water supply guide wall 224a.

[0258] The first opening 224b and the reservoir 250 may be located opposite to each other based on the center of the tray 241. For example, the first opening 224b may be formed at a position higher than the center of the tray 241, and the reservoir 250 may be disposed at a position lower than the center of the tray 241. With such a configuration, it may be possible to prevent cold air introduced through the first opening 224b from directly flowing into the reservoir 250.

[0259] The ice-making part 200 may include a guide wall 226 disposed to guide cold air to the peripheral surfaces 242a and 242b of the tray 241. The guide wall 226 is provided in the first wall 221 and may be formed to be rounded corresponding to a curvature of the peripheral surfaces 242a and 242b.

[0260] A first portion of the guide wall 226 may be connected to the first wall 221, and a second portion may be connected to the second wall 222.

[0261] The guide wall 226 and the first opening 224b may be located opposite to each other based on the center of the tray 241. Accordingly, since air supplied to an outer circumferential surface of the tray 241 through the first opening 224b is guided by the guide wall 226 located opposite to the first opening 224b, it may be possible to form cold-air flow path along the outer circumferential surface of the tray 241.

[0262] A space between the guide wall 226 and the first blade 280 forms a second opening 227 through which powdered ice separated from the tray 241 is discharged, and cold air guided by the guide wall 226 may flow to the ice-making space 25 through the second opening 227.

[0263] The ice-making part 200 may include gear assemblies 235 and 236 interworking with the first motor 210. The gear assemblies 235 and 236 may include a driving gear 235 connected to the first motor 210 and a driven gear 236 interworking with the driving gear 235.

[0264] The number of gear teeth of the driving gear 235 is formed less than the number of gear teeth of the driven gear 236, so that the gear assemblies 235 and 236 may constitute a reduction gear. Accordingly, torque for rotat-

ing the tray assembly 240 may increase.

[0265] The ice-making part 200 may include the second bracket 230 accommodating the gear assemblies 235 and 236. The second bracket 230 may shield an opened one side of the first bracket 220 to form a cold-air flow path within the ice-making bracket 220 and 230.

[0266] The second bracket 230 may include the gear bracket 231 supporting the gear assemblies 235 and 236. The gear bracket 231 includes a bracket wall 231a covering the opened one side of the first bracket 220, and the bracket wall 231a may form at least one surface of the cold-air flow path.

[0267] The gear assemblies 235 and 236 may be rotatably supported by the bracket wall 231a. A hole to which a shaft of the first motor 210 is connected is formed in a first center portion 235a of the driving gear 235, and the shaft of the first motor 210 may be supported by the bracket wall 231a through the hole.

[0268] The bar 249 may be connected to a second center portion 236a of the driven gear 236 through the bracket wall 231a. A hole to which the bar 249 is connected is formed in the second center portion 236a of the driven gear 236, and the bar 249 may be supported by the bracket wall 231a through the hole.

[0269] The first center portion 235a and the second center portion 236a may each include a bracket forming a hole.

[0270] The second bracket 230 may include a gear cover 232 connected to the gear bracket 231. The gear cover 232 may shield an opened one side of the gear bracket 231. The gear bracket 231 and the gear cover 232 may constitute a "gear housing".

[0271] For example, the gear cover 232 may be fastened to the gear bracket 231. The gear bracket 231 may include a first fastening portion 231b fastened to the gear cover 232, and the gear cover 232 may include a second fastening portion 232a fastened to the first fastening portion 231b. A predetermined fastening member may be coupled to the first fastening portion 231b and the second fastening portion 232a.

[0272] The gear bracket 231 may include a first coupling portion 231c fastened to the first bracket 220. The first bracket 220 may include a second coupling portion 222a fastened to the first coupling portion 231c. A predetermined fastening member may be coupled to the first coupling portion 231c and the second coupling portion 222a.

[0273] The gear cover 232 may be coupled to the first motor 210. The first motor 210 includes a fastening rib 215, and the gear cover 232 may include a fastening boss 237 coupled to the fastening rib 215. A predetermined fastening member may pass through the fastening rib 215 and be coupled to the fastening boss 237.

[0274] The gear cover 232 may include a first through portion 232b through which the shaft of the first motor 210 passes. The shaft of the first motor 210 may be coupled to the first center portion 235a of the driving gear 235 through the first through portion 232b. The first center

portion 235a of the driving gear 235 may be rotatably supported by the first through portion 232b.

[0275] The gear cover 232 may include a second through portion 232c by which the second center portion 236a of the driven gear 236 is supported. The second center portion 236a of the driven gear 236 may be rotatably supported by the second through portion 232c.

[0276] When the first motor 210 rotates, the driving gear 235 and the driven gear 236 interwork, and the bar 249 connected to the driven gear 236 may rotate. According to rotation of the bar 249, the tray assembly 240 may rotate.

[0277] The operation of the tray assembly 240 will be described with reference to FIGS. 11A and 11B. FIG. 11A illustrates a state in which the tray assembly 240 is at an ice-making position (a first position), and FIG. 11B illustrates a state in which the tray assembly 240 is at a water-supply position (a second position).

[0278] Referring to FIG. 11A, based on driving of the first motor 210, the tray assembly 240 may be at the ice-making position. At the ice-making position, a first peripheral surface 242a of the tray 241 may not be immersed in the reservoir 250 and may be located in a first accommodation space 220a of the first bracket 220. For example, as illustrated in FIG. 11A, two first peripheral surfaces 242a may be located on both upper sides of the reservoir 250.

[0279] At the ice-making position, water supplied to the first peripheral surface 242a may be cooled by cold air supplied through the cold-air duct 400 and may undergo a phase change into thin ice. A state of ice cooled on the first peripheral surface 242a may be referred to as a first state (first state ice). The ice in the first state may be formed to a predetermined height on surfaces of a recess 241a and a protrusion 241b provided on the first peripheral surface 242a. The ice in the first state may be understood as ice having a thin layer thickness.

[0280] When a predetermined time elapses at the ice-making position, the first motor 210 may be driven so that the tray assembly 240 rotates. For example, as illustrated in FIG. 11A, the tray assembly 240 may rotate counter-clockwise.

[0281] During rotation of the tray assembly 240, when the first peripheral surface 242a is at a position where the first blade 280 is provided, the first blade 280 may contact ice formed on the first peripheral surface 242a. In the contact process, the ice may be separated from the first peripheral surface 242a and may be de-iced.

[0282] The de-iced ice may be introduced into the compression part 300, in particular into the transfer pipe 340. The de-iced ice may have a shape of powdered ice, and such a state of ice may be referred to as a second state (second state ice).

[0283] The de-icing process may be performed during a section in which the tray 241 makes one rotation (a 360-degree rotation), so that ice formed on the two first peripheral surfaces 242a may be separated by the first blade 280.

[0284] In some examples, in this process, the first peripheral surface 242a on which de-icing has been completed may further rotate and pass the water-supply position as illustrated in FIG. 11A. While passing the water-supply position, water may be supplied to the first peripheral surface 242a.

[0285] In detail, the tray assembly 240 rotates counter-clockwise from the position of FIG. 11A, de-icing is performed on the first peripheral surface 242a, and the tray assembly 240 moves to the position of FIG. 11B. In some examples, the first peripheral surface 242a is immersed in or contacted with water of the reservoir 250. Water that contacts the first peripheral surface 242a may remain on the first peripheral surface 242a due to surface tension.

[0286] Such a water-supply operation may be performed until water is supplied to the two first peripheral surfaces 242a. That is, when the tray assembly 240 makes one rotation from the position of FIG. 11A, the de-icing operation and the water-supply operation may be performed.

[0287] FIG. 12 is an exploded perspective view illustrating an example configuration of the compression part of the ice maker, FIG. 13 is a perspective view illustrating an example configuration of the transfer pipe and a gear device, FIG. 14 is a plan view illustrating an example configuration of the transfer pipe and the gear device, FIG. 15A is a view illustrating an example state in which the piston is at a first position and de-iced ice from the tray assembly falls into the transfer pipe, and FIG. 15B is a view illustrating an example state in which the piston moves to a second position and ice in the transfer pipe is compressed by the piston.

[0288] In some implementations, referring to FIGS. 12 to 14, the ice maker 100 may include a compression part 300 for compressing or recombining ice (powdered ice, ice in the second state) de-iced from the ice-making part 200.

[0289] The compression part 300 may include a second motor 310 for providing driving force. The second motor 310 may include a motor shaft 312.

[0290] The compression part 300 may include a pinion gear 315 coupled to the motor shaft 312 and rotating according to driving of the second motor 310. The pinion gear 315 may include a shaft coupling portion 314 coupled to the motor shaft 312.

[0291] The compression part 300 may include a rack gear 330 interworking with the pinion gear 315. The rack gear 330 may include a bar-shaped rack body 331 and a first gear 332 formed on the rack body 331 and interworking with the pinion gear 315.

[0292] The rack gear 330 may include a rail 334 guiding movement of the rack gear 330. For example, the rail 334 may be provided at a lower end portion of the rack body 331. The rail 334 may move along a rail groove 324a provided in a fastening wall 324 of the first bracket 320.

[0293] The compression part 300 may include a piston 335 that moves together with the rack gear 330. The piston 335 may include a portion extending in a direction

corresponding to an extension direction of the rack gear 330, and may be provided to be capable of reciprocating motion. The piston 335 may move only up to an inlet side of the cylinder 360, or at least a portion of the piston 335 may move so as to be inserted into the cylinder 360.

[0294] For example, the piston 335 may have a substantially cylindrical shape corresponding to an internal shape of a second part 342 of the transfer pipe 340.

[0295] The compression part 300 may include a coupling bracket 336 provided at one side of the piston 335 and coupling the piston 335 and the rack gear 330. The coupling bracket 336 may be coupled to the rack body 331. The coupling bracket 336 may include a rack fastening portion 336a, and the rack body 331 may include a bracket fastening portion 331a. A predetermined fastening member may couple the rack fastening portion 336a and the bracket fastening portion 331a.

[0296] The compression part 300 may include a transfer pipe 340 forming an accommodation space 341a for ice in the second state. The transfer pipe 340 may be disposed at an inlet side of the cylinder 360.

[0297] The transfer pipe 340 may include a first part 341 having the accommodation space 341a. The first part 341 may form an opening so that the ice in the second state may be introduced.

[0298] The transfer pipe 340 may include a second part 342 having an internal space communicating with the accommodation space 341a. The piston 335 may be inserted into the second part 342.

[0299] The second part 342 may have an inner diameter slightly larger than an outer diameter of the piston 335 so that the piston 335 may reciprocate in an inserted state. For example, the second part 342 may have a hollow cylindrical shape.

[0300] The second part 342 may be positioned below the transfer pipe 340 with respect to a gravity direction. Ice introduced into the first part 341 may move downward by the gravity and may be introduced into the internal space of the second part 342. The piston 335 may reciprocate in the internal space of the second part 342.

[0301] The transfer pipe 340 may be supported by the first bracket 320. The transfer pipe 340 may include a fastening portion 343 provided at the first part 341. The fastening portion 343 may be coupled to a transfer pipe fastening portion 321d of the first bracket 320 by a predetermined fastening member. By fastening the fastening portion 343 and the transfer pipe fastening portion 321d, an upper portion of the transfer pipe 340 may be stably supported by the first bracket 320.

[0302] A plurality of fastening portions 343 may be provided, and the plurality of fastening portions 343 may be provided at upper and lower portions of the transfer pipe 340. In FIG. 13, fastening portions 343a, 343b, and 343c are illustrated.

[0303] The transfer pipe 340 may include a protrusion 344, and the first bracket 320 may include a protrusion groove 321e accommodating the protrusion 344. The protrusion 344 may be provided at a lower position than

the fastening portion 343, for example at the second part 342. After the protrusion 344 is inserted into the protrusion groove 321e for temporary assembly, the fastening portion 343 may be fastened to the transfer pipe fastening portion 321d.

[0304] The compression part 300 may include a lever 350 movably provided to guide movement of ice in the transfer pipe 340. For example, the lever 350 may be rotatably provided. The lever 350 may be referred to as a transfer guide device.

[0305] The lever 350 may include a rotation bar 351 forming a rotational center of the lever 350. The rotation bar 351 may be rotatably inserted into a bar support portion 345 of the transfer pipe 340. The bar support portion 345 may protrude from the first part 341 and may have a rib shape having a recessed groove into which the rotation bar 351 is fitted.

[0306] The lever 350 may include a plate 352 extending from the rotation bar 351. The plate 352 may be provided at a central portion of the rotation bar 351. The plate 352 may rotate about the rotation bar 351 so as to move into the transfer pipe 340.

[0307] The transfer pipe 340 may form an opening 341b through which the plate 352 passes. The plate 352 may move into or out of the transfer pipe 340 through the opening 341b.

[0308] The transfer pipe 340 may include a stopper 347 provided outside the opening 341b. The stopper 347 may have a shape bent along at least a portion of a circumference of the plate 352. The stopper 347 may limit a movement distance of the plate 352 when the plate 352 moves outward from the transfer pipe 340. The plate 352 may move outward only to a position interfering with the stopper 347.

[0309] The plate 352 may include a rounded portion 352a extending with a predetermined curvature. A curved direction of the rounded portion 352a may correspond to a direction facing downward inside the transfer pipe 340.

[0310] By the rounded portion 352a, ice present inside the transfer pipe 340 may be pressed downward. Accordingly, ice present in the first part 341 may be moved to the second part 342 by the lever 350.

[0311] A hole 354 may be formed in the rounded portion 352a. The hole 354 is for preventing a situation in which ice introduced into the transfer pipe 340 is blocked by the rounded portion 352a and movement toward a lower portion of the transfer pipe 340 is restricted. Ice may move to a lower side of the rounded portion 352a through the hole 354.

[0312] The compression part 300 may include a spring 358 providing a restoring force to the lever 350. The spring 358 may be provided at one end among both ends of the rotation bar 351. For example, the spring 358 may include a torsion spring.

[0313] The spring 358 may provide a restoring force so that the lever 350 returns to the outside of the transfer pipe 340 when the linkage with the second gear 333 is

released while the lever 350 has moved to the inside of the transfer pipe 340 through linkage with the second gear 333.

[0314] A spring support portion 351a may be provided on the rotation bar 351, and one side of the spring 358 may be supported by the spring support portion 351a.

[0315] The spring support portion 351a may protrude in a direction intersecting an extension direction of the rotation bar 351 at a position adjacent to both ends of the rotation bar 351. The restoring force of the spring 358 may be transmitted to the lever 350 through the spring support portion 351a.

[0316] The compression part 300 may include a third gear 355 transmitting power to the lever 350. The third gear 355 may be connected to the other end of the rotation bar 351. The other end may be understood as an end opposite to the one end at which the spring 358 is provided.

[0317] The third gear 355 may engage with the second gear 333 provided on the rack gear 330. The second gear 333 may be positioned laterally of the first gear 332. The first gear 332 and the second gear 333 may be axially arranged on an upper surface of the rack body 331.

[0318] The first gear 332 may be configured to have gear teeth for a predetermined length in a direction from a first end toward a second end of the rack body 331, that is, toward the cylinder 360. The second gear 333 may be configured to have gear teeth for a predetermined length in a direction from the second end toward the first end of the rack body 331. The number of gear teeth of the second gear 333 may be less than the number of gear teeth of the first gear 332.

[0319] The compression part 300 may include the cylinder 360 disposed at an outlet side of the transfer pipe 340. Ice collected at a lower portion of the transfer pipe 340 may be moved into the cylinder 360 by the piston 335.

[0320] The cylinder 360 may also be understood as constituting a portion of a transfer pipe in a broad sense in that it guides movement of ice. Accordingly, the transfer pipe 340 may be referred to as a first transfer pipe, and the cylinder 360 may be referred to as a second transfer pipe.

[0321] The compression part 300 may include a discharge pipe 370 provided at an outlet side of the cylinder 360 and providing a force for compressing or recombining ice transferred in the cylinder 360. For example, the discharge pipe 370 may be configured so that a cross-sectional area decreases in a direction in which ice is discharged.

[0322] The discharge pipe 370 may be formed of an elastically deformable material to provide resistance in a direction opposite to a transfer direction of ice. For example, the discharge pipe 370 may be formed of silicone.

[0323] Since the piston 335 presses one side of ice present in the cylinder 360 and resistance is provided on the other side by the discharge pipe 370, compression or recombination of powdered ice may be achieved. Com-

pressed powdered ice may be formed into ice having a predetermined shape (third state, molded ice) and may be discharged through a discharge portion of the discharge pipe 370.

[0324] The molded ice discharged from the discharge portion may interfere with a cutter wall 380 spaced apart from the discharge pipe 370 by a set distance, and in this process the molded ice may be cut. A distance between the discharge pipe 370 and the cutter wall 380 may be determined according to an ice size desired by a consumer. The cut molded ice may be introduced into an ice bin 500 through a discharge port 328 of the first bracket 320.

[0325] The compression part 300 may include compression brackets 320 and 327 for supporting the plurality of components described above.

[0326] The compression brackets 320 and 327 may include the first bracket 320 forming a first through-hole 321a through which the motor shaft 312 of the second motor 310 passes. The first bracket 320 may include a first wall 321 extending so as to face the ice-making space plate 85. For example, the first wall 321 may form a vertical wall extending in a vertical direction. The first through-hole 321a may be formed in the first wall 321.

[0327] The first bracket 320 may include a second wall 322 forming the discharge port 328. The second wall 322 may be connected to a lower end of the first bracket 320 and may extend in a direction away from the ice-making space plate 85. For example, the second wall 322 may form a horizontal wall extending in a horizontal direction.

[0328] The compression brackets 320 and 327 may include the second bracket 327 coupled to the first bracket 320. A space in which the rack gear 330 and the piston 335 are positioned may be formed between the first bracket 320 and the second bracket 327.

[0329] The first wall 321 may include a plurality of fastening portions.

[0330] The plurality of fastening portions may include a first fastening portion 321b coupled to a first fastening portion 328a of the second bracket 327. The first fastening portion 321b may protrude from the first wall 321 and may include a boss to which a fastening member is coupled. The first fastening portion 328a of the second bracket 327 may include a hole into which the fastening member is inserted.

[0331] The plurality of fastening portions may include a second fastening portion 321c coupled to a second fastening portion 328b of the second bracket 327. The second fastening portion 321c may be formed in a fastening wall 324 provided at a position spaced apart from the first wall 321 in a direction toward the second bracket 327. For example, the second fastening portions 328b and 321c may include holes. A predetermined fastening member may be fastened to the second fastening portions 328b and 321c.

[0332] An upper surface of the fastening wall 324 may include a guide surface guiding sliding of the coupling bracket 336. Since the coupling bracket 336 is supported

on the guide surface, stable reciprocating motion of the rack gear 330 and the piston 335 may be achieved. Of course, the coupling bracket 336 may be disposed to be slightly spaced apart from the upper surface of the fastening wall 324.

[0333] The fastening wall 324 may include the rail groove 324a guiding movement of the rail 334 of the rack gear 330. The rail groove 324a may be formed on a surface of the fastening wall 324 facing the rack gear 330 among a plurality of surfaces defining the fastening wall 324. At least a portion of the rail 334 may be fitted into the rail groove 324a, and the rail 334 may move along the rail groove 324a.

[0334] The second bracket 327 may include a bracket wall 327a covering at least a portion of the rack gear 330 and the piston 335. The bracket wall 327a may include a second through-hole 327b in which a central portion 315a of the pinion gear 315 is rotatably supported. For example, the central portion 315a may be inserted into the second through-hole 327b.

[0335] A process in which powdered ice generated in the ice-making part 200 and supplied to the compression part 300 is compressed will be described with reference to FIGS. 15A to 15B.

[0336] A position of the piston 335 illustrated in FIG. 15A is defined as a first position. At the first position, the second motor 310 is in a stopped state, and the first motor 210 of the ice-making part 200 is driven so that powdered ice I1 may be supplied into the transfer pipe 340. The state of FIG. 15A may be maintained for a first predetermined time.

[0337] After the first predetermined time elapses, when the second motor 310 is driven in a forward direction, the piston 335 moves in a direction toward the cylinder 360 by engagement of the pinion gear 315 and the first gear 332 (forward movement of the piston), and in this process, as illustrated in FIG. 15B, powdered ice collected in a lower portion of the transfer pipe 340, that is, in the second part 342, is moved into the cylinder 360.

[0338] In FIG. 15B, the piston 335 is illustrated as moving only up to an inlet side of the cylinder 360. However, unlike this illustration, at least a portion of the piston 335 may be inserted into the cylinder 360. A position of the piston 335 in FIG. 15B is defined as a second position.

[0339] In the state of FIG. 15B, when the second motor 310 is driven in a reverse direction, the piston 335 may move in a direction away from the cylinder 360 (rearward movement of the piston). The rack gear 330 moves together with the piston 335, and at an end of movement of the rack gear 330, the second gear 333 may engage with the third gear 355. Accordingly, the third gear 355 rotates clockwise based on FIG. 15C, and thus the lever 350 rotates clockwise about the rotation bar 351.

[0340] When the lever 350 rotates, the plate 352 and the rounded portion 352a move into the accommodation space 341a of the transfer pipe 340 and transfer powdered ice present in the transfer pipe 340. For example,

ice present in an upper portion of the transfer pipe 340, that is, in the first part 341, may be pressed downward and moved toward a lower portion of the transfer pipe 340, that is, toward the second part 342. A position of the piston 335 in FIG. 15C is defined as a third position.

[0341] In the state of FIG. 15C, when the second motor 310 is driven in the forward direction, the piston 335 may move in a direction toward the cylinder 360. When the rack gear 330 moves for movement of the piston 335, engagement between the second gear 333 and the third gear 355 is released, and by restoring force of the spring 358, the lever 350 moves to an upright position as illustrated in FIG. 15A. Then, the piston 335 may return to the first position.

[0342] By repeating the processes of FIGS. 15A to 15C, powdered ice may undergo compression or recombination within an internal space of the cylinder 360 and may be manufactured into molded ice I2, that is, ice in a third state (third state ice). When pressure sufficient to pass through the discharge pipe 370 is applied to the molded ice I2 by the piston 335, the molded ice I2 may be discharged through the discharge pipe 370. In some examples, the third state ice may be heated before being discharged from discharge pipe 370 and generate fourth state ice. In some examples, the temperature of ice may sequentially increase from the first state ice to the fourth state ice based on the locations of ice. For example, the first state ice on the ice-making body may have a first temperature, and the second state ice separated from the ice-making body may have a second temperature higher than or equal to the first temperature. The third state ice molded into shape at an inlet side of the cylinder has a third temperature higher than or equal to the second temperature, and the fourth state ice at an outlet side of the cylinder may have a fourth temperature higher than the third temperature.

[0343] Ice discharged from the discharge pipe 370 interferes with the cutter wall 380 and is cut to a predetermined size, and the cut ice may be introduced into the ice bin 500.

[0344] FIG. 16 is an upper perspective view illustrating an example configuration of the tray, FIG. 17 is a lower perspective view illustrating the configuration of the tray, and FIG. 18 is a front view illustrating the configuration of the tray.

[0345] Referring to FIGS. 16 to 18, the tray 241 may have a drum shape having a predetermined thickness in an axial direction and including an inner circumferential surface and an outer circumferential surface.

[0346] The tray 241 may be provided to be movable. For example, the tray 241 may be provided to be rotatable.

[0347] The tray 241 may include a plurality of walls.

[0348] The tray 241 may include a center bracket 243 constituting at least one wall among the plurality of walls and forming a rotational center of the tray 241. The center bracket 243 may form an insertion hole 2431 into which a bar 249 is inserted. The insertion hole 2431 may be

formed to penetrate the center bracket 243 in an axial direction.

[0349] The tray 241 may include peripheral walls 242a and 242b constituting at least one wall among the plurality of walls and forming an outer circumferential surface.

[0350] The peripheral walls 242a and 242b may include a first peripheral wall 242a to which water is supplied. The first peripheral wall 242a may extend in a circumferential direction based on a center of the tray 241.

[0351] The first peripheral wall 242a may form a water contact surface. The first peripheral wall 242a may have a first curvature defined based on the center bracket 243 and may extend in the circumferential direction.

[0352] A radial distance from the center bracket 243 to the first peripheral wall 242a may form a first radial distance S1. The first radial distance S1 may correspond to a rotational radius of the first peripheral wall 242a.

[0353] A plurality of first peripheral walls 242a may be provided. The plurality of first peripheral walls 242a may include one wall 242a1 and another wall 242a2 spaced apart from the one wall 242a1. The one wall 242a1 and the other wall 242a2 may be disposed opposite to each other based on the center bracket 243.

[0354] The peripheral walls 242a and 242b may include a second peripheral wall 242b forming a non-water contact surface to which water is not supplied. Since water is not supplied to the second peripheral wall 242b, the second peripheral wall 242b may not include a recess 241a or a protrusion 241b. The second peripheral wall 242b may have a curvature different from the first curvature based on the center bracket 243.

[0355] A radial distance from the center bracket 243 to the second peripheral wall 242b may form a second radial distance S2. The second radial distance S2 may be less than the first radial distance S1.

[0356] The second peripheral wall 242b may include a portion having a shape cut or recessed toward a center direction of the tray 241 from the first peripheral wall 242a. Specifically, as illustrated in FIG. 18, when an outer circumferential extension line ℓ_o connecting two first peripheral walls 242a1 and 242a2 having a predetermined curvature is defined, the second peripheral wall 242b may be located closer to the center of the tray 241, that is, to the center bracket 243, than the outer circumferential extension line ℓ_o .

[0357] When the second peripheral wall 242b having a cut or recessed shape is not provided in a comparative configuration, in the ice-making position of the tray 241, a lower portion of the tray is immersed in or contacted with water of the reservoir 250 and an upper portion of the tray is exposed to cold air and rotates while being cooled.

[0358] At an initial stage of ice-making, freezing of water supplied to the peripheral surface of the tray may be properly performed. However, as ice-making operation is repeated, the tray is heated by water of the reservoir, and a quantity of frozen ice may decrease.

[0359] Further, as a lower portion of the tray at a low

temperature contacts water of the reservoir, a temperature of the water of the reservoir gradually decreases. Eventually, a problem may occur in which supply of water from the reservoir to the tray is not smooth.

[0360] In some implementations, in order to solve such problems, the second peripheral wall 242b having a cut or recessed shape is formed on the tray and separated from the first peripheral wall 242a forming a water contact surface, thereby maintaining an ice freezing amount at or above a predetermined amount and maintaining a temperature of the reservoir at room temperature, thus preventing freezing of water in the reservoir.

[0361] A plurality of second peripheral walls 242b may be provided. The plurality of second peripheral walls 242b may include one wall 242b1 and another wall 242b2 spaced apart from the one wall 242b1. The one wall 242b1 and the other wall 242b2 may be disposed opposite to each other based on the center bracket 243.

[0362] The second peripheral wall 242b may include a plurality of portions having varying curvatures.

[0363] Specifically, the second peripheral wall 242b may include a first part 1242b1 extending from the one wall 242a1 of the first peripheral wall 242a with a second curvature. The first part 1242b1 may extend from an end of the one wall 242a1 of the first peripheral wall 242a toward the center of the tray 241 in a rounded or bent shape.

[0364] The second peripheral wall 242b may include a second part 1242b2 extending from the first part 1242b1 with a third curvature. The second part 1242b2 may be connected to the first part 1242b1 and may extend in a rounded or bent shape in a direction away from the center of the tray 241.

[0365] The peripheral walls 242a and 242b may have a thickness in an axial direction. Specifically, the first peripheral wall 242a may have a first thickness W1 in the axial direction, and the second peripheral wall 242b may have a second thickness W2 in the axial direction.

[0366] For example, the first thickness W1 and the second thickness W2 may be equal to each other. However, the present disclosure is not limited thereto, and one of the first and second thicknesses may be greater or less than the other.

[0367] For example, the first thickness W1 may be equal to a thickness of an inner circumferential wall 244a of the tray 241, and the second thickness W2 may be equal to the thickness of the inner circumferential wall 244a.

[0368] The tray 241 may include the inner circumferential wall 244a constituting at least one wall among the plurality of walls and defining an inner circumferential surface of the tray 241.

[0369] The inner circumferential wall 244a may include a first inner circumferential wall 244a1 forming a rear surface of the first peripheral wall 242a. A radial distance from the center bracket 243 to the first inner circumferential wall 244a1 may form a third radial distance S3.

[0370] The inner circumferential wall 244a may include

a second inner circumferential wall 244a2 forming a rear surface of the second peripheral wall 242b. The second inner circumferential wall 244a2 may be connected to the first inner circumferential wall 244a1. A radial distance from the center bracket 243 to the second inner circumferential wall 244a2 may form a fourth radial distance S4, and the fourth radial distance S4 may be less than the third radial distance S3.

[0371] The tray 241 may include extension walls 243a constituting at least one wall among the plurality of walls. Each of the extension walls 243a may be understood as a wall connecting the center bracket 243 and the inner circumferential wall 244a.

[0372] Each of the extension walls 243a may have a thickness in the axial direction, and the thickness in the axial direction of each of the extension walls 243a may be equal to at least one of the first thickness W1 of the first peripheral wall 242a and the second thickness W2 of the second peripheral wall 242b.

[0373] Each of the extension walls 243a may extend in a radial direction from the center bracket 243 toward a boundary point between the first inner circumferential wall 244a1 and the second inner circumferential wall 244a2.

[0374] A plurality of extension walls 243a may be provided, and the plurality of extension walls 243a may be connected to boundary points at which the two first peripheral walls 242a and the two second peripheral walls 242b meet. For example, in some implementations, the plurality of extension walls 243a may include four extension walls.

[0375] Among the plurality of extension walls, a first extension wall 243a1 and a second extension wall 243a2 connected to both ends of the first inner circumferential wall 244a1 may define a first angle $\theta 1$. That is, a first extension line $\ell 1$ and a second extension line $\ell 2$ extending from a center C of the tray 241 toward both ends of the first inner circumferential wall 244a1 may form the first angle $\theta 1$. The first inner circumferential wall 244a1 forms a rear surface of the first peripheral wall 242a, and the first angle $\theta 1$ may be determined to an appropriate value according to an ice-making amount.

[0376] Among the plurality of extension walls, a first extension wall 243a1 and a third extension wall 243a3 connected to both ends of the second inner circumferential wall 244a2 may define a second angle $\theta 2$. That is, a third extension line $\ell 3$ and a fourth extension line $\ell 4$ extending from the center C of the tray 241 toward both ends of the second inner circumferential wall 244a2 may form the second angle $\theta 2$. The second inner circumferential wall 244a2 forms a rear surface of the second peripheral wall 242b, and the second angle $\theta 2$ may be determined to an appropriate value according to the ice-making amount.

[0377] The first angle $\theta 1$ and the second angle $\theta 2$ may have different values. For example, the first angle $\theta 1$ may be less than the second angle $\theta 2$. The first angle $\theta 1$ may form an acute angle of 90 degrees or less, and the second

angle θ_2 may form an obtuse angle of 90 degrees or greater.

[0378] In FIG. 18, reference numeral 243a4 indicates a fourth extension wall extending opposite to the first extension wall 243a1 based on the center bracket 243.

[0379] The tray 241 may include side walls 244 constituting at least one wall among the plurality of walls. The side walls 244 define side surfaces of the tray 241 and may be understood as surfaces facing the ice-making brackets 220 and 230.

[0380] A plurality of side walls 244 may be provided and may be disposed at both sides of the peripheral walls 242a and 242b. Among the plurality of side walls 244, one side wall may include a surface facing a first wall 221 of the first bracket 220 supporting one side of the tray 241.

[0381] Among the plurality of side walls 244, another side wall may include a surface facing a bracket wall 231a of the second bracket 230, particularly a gear bracket 231, supporting the other side of the tray 241.

[0382] The side walls 244 may be connected to the extension walls 243a.

[0383] The tray 241 may include tray holes 245 defined by the center bracket 243, the plurality of extension walls 243a, and the inner circumferential wall 244a and through which cold air passes. Each of the tray holes 245 may have a hole shape penetrating the tray 241 in the axial direction.

[0384] A plurality of tray holes 245 may be formed in the circumferential direction based on the center bracket 243.

[0385] Cold air introduced into the ice-making brackets 220 and 230 may flow along the peripheral walls 242a and 242b of the tray 241, and may flow toward an inner circumferential surface side of the tray 241 through the tray holes 245. Accordingly, cold air may be supplied to both an exterior and an interior of the tray 241, thereby facilitating cooling of the tray 241.

[0386] The tray 241 may be formed of a material having high thermal conductivity so that cooling is facilitated. For example, the tray 241 may be formed of a metal material. Examples of the metal material may include steel or aluminum.

[0387] The tray 241 may include protrusions 242c provided at portions where the first peripheral walls 242a1 and 242a2 and the second peripheral walls 242b1 and 242b2 meet. Each of the protrusions 242c may be understood as a portion defined by at least a portion of the first peripheral walls 242a1 and 242a2 and at least a portion of the second peripheral walls 242b1 and 242b2.

[0388] Since curvatures of the first peripheral walls 242a1 and 242a2 and the second peripheral walls 242b1 and 242b2 are formed differently from each other, the protrusion 242c may form a pointed tip at a portion where the first and second peripheral walls meet.

[0389] If an angle formed by first and second surfaces defining the protrusion 242c is excessively large, water may accumulate at the protrusion 242c and undesired

freezing may occur. Accordingly, in order to prevent undesired freezing at the protrusion 242c, an angle θ_e between the first and second surfaces may form an acute angle of 90 degrees or less.

5 [0390] FIG. 19 is a side view illustrating an example configuration of the tray, FIG. 20 is a cross-sectional view taken along line 20-20 of FIG. 19, FIG. 21 is a plan view illustrating an example of a relative arrangement of the tray and the first blade, and FIG. 22 is a cross-sectional view taken along line 22-22 of FIG. 21.

10 [0391] Referring first to FIGS. 19 and 20, the tray 241 may include the first peripheral surface 242a forming a water storage space.

[0392] In order to generate ice having a hardness that is easy for a user to chew and to supply the ice to the user, a surface of the finally supplied ice may need form a quasi-liquid layer. The quasi-liquid layer may be understood as a state in which the surface is not completely frozen solid but has a slightly melted or slightly moist surface.

20 [0393] In order to form the quasi-liquid layer, a method of forming ice particles to be small before recombination or compression through the compression part 300, a method of compressing the ice particles to form predetermined voids air layers between particles, or a method of providing predetermined heat during the compression process may be used.

25 [0394] in some implementations, one feature is that small ice particles are formed on the peripheral surface of the tray 241 so that the quasi-liquid layer may be formed.

30 [0395] The first peripheral surface 242a may include a recess 241a having a predetermined depth and a protrusion 241b connected to ends of the recesses 241a.

[0396] The recess 241a may have a length in a circumferential direction along the first peripheral surface 242a. During ice separation, as the tray 241 rotates, ice formed in the recesses 241a extending in the circumferential direction may be separated by the first blade 280.

35 [0397] The protrusion 241b may also extend in the circumferential direction along the first peripheral surface 242a. During ice separation, as the tray 241 rotates, ice formed on the protrusions 241b extending in the circumferential direction may be separated by the first blade 280.

40 [0398] A plurality of recesses 241a and a plurality of protrusions 241b may be provided. The protrusions 241b may be positioned between adjacent recesses 241a and protrude relative to the recesses 241a, and the recesses 241a may be positioned between adjacent protrusions 241b. The recesses 241a may be recessed relative to the protrusions 241b. In some examples, the recesses 241a are defined at the peripheral surfaces 242a such that the protrusions 241b are formed between the recesses 241a. In some examples, the protrusions 241b are disposed at the peripheral surfaces 242a such that the recesses 241a are formed between the protrusions 241b.

50 [0399] The plurality of recesses 241a and the plurality of protrusions 241b may be alternately arranged in an

axial direction.

[0400] Each of the recesses 241a may form a water storage space. Of course, a water storage space may also be formed on the protrusions 241b. However, since each of the recesses 241a forms a storage space having a predetermined depth, a thickness of ice formed in each of the recesses 241a may be greater than a thickness of ice formed on each of the protrusions 241b.

[0401] As water is stored in the plurality of recesses 241a and the stored water is frozen, small-sized ice particles may be pre-separated by the protrusions 241b. In some examples, ice frozen on the protrusions 241b may have a relatively small thickness and may serve to connect ice formed in the plurality of recesses 241a with a weak force. Further, ice frozen on the protrusions 241b may be separated or broken by the first blade 280.

[0402] Referring to FIGS. 21 and 22, at least one of the recesses 241a and the protrusions 241b of the tray 241 may be arranged to face the first blade 280.

[0403] The first blade 280 may be connected to a fifth wall 225 provided on the first bracket 220 of the ice-making brackets 220 and 230. The first blade 280 may include a blade body 281 forming fastening holes 280a fastened to the fifth wall 225.

[0404] The blade body 281 may have a thin plate shape and may be configured to be coupled to the fifth wall 225 and to extend upward from a lower end of the first bracket 220.

[0405] The first blade 280 may include tips 282 and 283 extending from the blade body 281 to scrape off ice formed on the tray 241.

[0406] The tips 282 and 283 may include a first tip 282 extending obliquely from the blade body 281. The first tip 282 may be disposed to face the protrusions 241b of the tray 241 and may be positioned adjacent to the protrusions 241b when the tray 241 rotates so as to scrape ice formed on the protrusions 241b.

[0407] However, in order to prevent damage to the tray 241 by the first tip 282, the first tip 282 may not be disposed to directly contact the protrusions 241b.

[0408] The tips 282 and 283 may further include a second tip 283 extending obliquely from the blade body 281. The second tip 283 may be disposed to face the recesses 241a of the tray 241 and may be positioned adjacent to the recesses 241a when the tray 241 rotates so as to scrape ice formed in the recesses 241a.

[0409] However, in order to prevent damage to the tray 241 by the second tip 283, the second tip 283 may not be disposed to directly contact the recesses 241a.

[0410] At least a portion of the second tip 283 may be disposed to be inserted into the recesses 241a. Accordingly, an end of the second tip 283 may be disposed closer to the tray 241 than an end of the first tip 282.

[0411] The recesses 241a may be formed to have a polygonal shape in which a width or cross-sectional area becomes narrower in a depth direction of the recesses 241a, for example, a trapezoidal shape. According to

such a shape, formation of the recesses 241a through a mold may be facilitated when manufacturing the tray 241, and since a contact area of ice at a deepest end of each of the recesses 241a is small, ice separation performance may be improved.

[0412] A plurality of second tips 283 may be provided. The plurality of second tips 283 may be spaced apart from each other in the axial direction, and at least a portion of the first tip 282 may be disposed in a space between adjacent second tips 283.

[0413] When the tray 241 and the first blade 280 are disposed at positions closest to each other so that ice separation is performed, the first and second tips 282 and 283, the recesses 241a and the protrusions 241b may move relative to each other while facing each other.

[0414] In some examples, since a contact area between the first peripheral surface 242a and water increases due to formation of the recesses 241a and the protrusions 241b, a water supply state at the first peripheral surface 242a may be stably maintained.

[0415] FIG. 23 is a view illustrating an example of an arrangement of the tray and the reservoir when the tray is in the first position (ice-making position), FIG. 24 is a cross-sectional view taken along line 24-24 of FIG. 23, FIG. 25 is a view illustrating an example of an arrangement of the tray and the reservoir when the tray is in the second position (water supply position), and FIG. 26 is a cross-sectional view taken along line 26-26 of FIG. 25.

[0416] Referring first to FIGS. 23 and 24, when the tray 241 is in the first position (ice-making position), the first peripheral walls 242a1 and 242a2 of the tray 241 may face laterally, and the second peripheral walls 242b1 and 242b2 may face upward and downward.

[0417] In some examples, since the first peripheral walls 242a1 and 242a2 are exposed to a cold air flow path inside the ice-making brackets 220 and 230, water supplied to the first peripheral walls 242a1 and 242a2 may be frozen.

[0418] Lower ends of the second peripheral walls 242b1 and 242b2 may face the reservoir 250. Since a radial distance of the second peripheral walls 242b1 and 242b2 based on the center of the tray 241 is small, the second peripheral walls 242b may not be immersed in or contacted with water stored in the reservoir 250.

[0419] For example, when an extension line $\ell 1$ passing through a maximum water level of the reservoir 250 is defined as a first extension line, and an extension line $\ell 2$ passing through a lowest end 240a of the tray assembly 240 in the first position of the tray 241 is defined as a second extension line, the second extension line $\ell 2$ may be formed at a position higher than the first extension line $\ell 1$. Accordingly, the second peripheral walls 242b1 and 242b2 may pass through the reservoir 250 in a state in which water is not supplied thereto.

[0420] First and second tray covers 246 and 247 may be selectively provided. When the first and second tray covers 246 and 247 are provided, lowest ends of the first and second tray covers 246 and 247 covering the second

peripheral walls 242b1 and 242b2 may form a lowest end of the tray assembly 240 and may not be immersed in or contacted with water stored in the reservoir 250.

[0421] When the first and second tray covers 246 and 247 are not provided, lowest ends of the second peripheral walls 242b1 and 242b2 of the tray 241 may form the lowest end of the tray assembly 240 and may not be immersed in or contacted with water stored in the reservoir 250.

[0422] In the first position of the tray 241, the inner circumferential wall 244a, particularly the second inner circumferential wall 244a2, may be disposed at a position higher than the first extension line $\ell 1$.

[0423] In order for the second inner circumferential wall 244a2 to be disposed at a position higher than the first extension line $\ell 1$, a radial dimension of the side wall 244 connected to the second peripheral walls 242b1 and 242b2 may be sufficiently large.

[0424] For example, in the first position of the tray 241, the inner circumferential wall 244a, particularly the second inner circumferential wall 244a2, may be disposed at a position higher than an opened end of the reservoir 250 by a predetermined height Δh . The opened end of the reservoir 250 may form an opening through which water is introduced. From another viewpoint, the opened end of the reservoir 250 may form a passage through which the tray 241 is introduced.

[0425] Referring next to FIGS. 25 and 26, when the tray 241 is in the second position (water supply position), the first peripheral walls 242a1 and 242a2 may face upward and downward, and the second peripheral walls 242b1 and 242b2 may face laterally.

[0426] Among the two first peripheral walls 242a1 and 242a2, a lower wall 242a1 may face the reservoir 250. A radial distance of the first peripheral walls 242a1 and 242a2 based on the center of the tray 241 may be formed such that the first peripheral walls 242a1 and 242a2 are immersed in or contacted with water stored in the reservoir 250.

[0427] When an extension line $\ell 3$ passing through a lowest end of the first peripheral walls 242a1 and 242a2 in the second position of the tray 241 is defined as a third extension line, the third extension line $\ell 3$ may be formed at a position lower than the first extension line $\ell 1$ passing through the maximum water level of the reservoir 250. Accordingly, water of the reservoir 250 may be supplied to the first peripheral walls 242a1 and 242a2. For example, water may wet the first peripheral walls 242a1 and 242a2 to form a water film.

[0428] In the second position of the tray 241, the inner circumferential wall 244a, particularly the first inner circumferential wall 244a1, may be disposed at a position higher than the first extension line $\ell 1$ passing through the maximum water level of the reservoir 250. Accordingly, water stored in the reservoir 250 may be prevented from flowing toward the first inner circumferential wall 244a1.

[0429] In order for the first inner circumferential wall 244a1 to be disposed at a position higher than the first

extension line $\ell 1$, a radial thickness of the side wall 244 connected to the first peripheral walls 242a1 and 242a2 may be sufficiently large.

[0430] In some examples, when the first and second tray covers 246 and 247 are provided, since the first and second tray covers 246 and 247 surround the first inner circumferential wall 244a1, water of the reservoir 250 may be prevented from flowing toward the first inner circumferential wall 244a1. In this case, inner circumferential walls of the first and second tray covers 246 and 247 may be disposed at a position higher than the first extension line $\ell 1$.

[0431] Even when the first and second tray covers 246 and 247 are not provided, since the first inner circumferential wall 244a1 is disposed at a position higher than the first extension line $\ell 1$, water of the reservoir 250 may be prevented from flowing toward the first inner circumferential wall 244a1.

[0432] During rotation of the tray 241, states of the tray 241 in the first position and the second position may be repeatedly performed. Accordingly, water may be supplied to the first peripheral walls 242a1 and 242a2 to form a space or surface for ice-making, and water may not be supplied to the second peripheral walls 242b1 and 242b2 so that a space or surface for ice-making is not formed thereon.

[0433] FIG. 27 is a view illustrating an example of a relative arrangement of the tray and the reservoir in the first position of the tray.

[0434] Referring to FIG. 27, in some implementations, the tray 241 may be configured such that, in the first position (ice-making position), a portion where the first peripheral wall 242a and the second peripheral wall 242b meet, that is, the protrusion 242c, is disposed at a position adjacent to the first blade 280.

[0435] For example, in the first position (ice-making position) of the tray 241, a tip 283 of the first blade 280 may be disposed to face the protrusion 242c.

[0436] From another viewpoint, the first blade 280 may be disposed such that the tip 283 is positioned adjacent to the protrusion 242c so that, when rotation of the tray 241 begins from the first position (ice-making position) toward the second position (water supply position), ice on the first peripheral wall 242a may begin to be scraped off.

[0437] In the first position of the tray 241, when the first blade 280 is disposed spaced upward from the protrusion 242c as illustrated in FIG. 11A, ice may grow in a space between the tray 241 and the first blade 280 or in a space between the tray 241 and the fifth wall 225, thereby causing a phenomenon in which rotation of the tray 241 is restricted.

[0438] Accordingly, in some implementations, when the tray 241 is in the first position (ice-making position), the first blade 280 and the protrusion 242c are disposed adjacent to each other in order to solve such a problem.

[0439] FIG. 28A is a view illustrating an example of a relative arrangement of the tray and the reservoir when the tray is in the first position (ice-making position), and

FIG. 28B is a view illustrating an example of a relative arrangement of the tray and the reservoir when the tray of FIG. 28A is in the second position (water supply position).

[0440] Referring to FIGS. 28A and 28B, in some implementations, the tray 1241 may include a first peripheral wall 1242a forming a space or surface for ice-making and a second peripheral wall 1242b connected to the first peripheral wall 1242a and not forming a space or surface for ice-making.

[0441] For example, based on a center C of the tray 1241, a central angle θ_{31} of the first peripheral wall 1242a may be 180 degrees or greater, and a central angle θ_{32} of the second peripheral wall 1242b may be 180 degrees or less. However, depending on an ice-making capacity of the tray 1241, a central angle θ_{31} of the first peripheral wall 1242a and a central angle θ_{32} of the second peripheral wall 1242b may be formed differently.

[0442] The first peripheral wall 1242a may include a first end 1242a1 and a second end 1242a2 connected to the second peripheral wall 1242b.

[0443] The second peripheral wall 1242b may include a planar portion connecting the first end 1242a1 and the second end 1242a2. Similar to the configuration of the previously described examples, the second peripheral wall 1242b may be configured to have a cut or recessed shape from the first peripheral wall 1242a.

[0444] When the tray 1241 is in the first position (ice-making position), the first and second ends 1242a1 and 1242a2 of the first peripheral wall may be disposed not to overlap an internal space of the reservoir 250 in a vertical direction. That is, the first and second ends 1242a1 and 1242a2 may be disposed to have a greater central angle than a central angle of both end edges of the reservoir 250 based on the center C of the tray 1241.

[0445] For example, when a first extension line ℓ_{11} connecting the center C of the tray 1241 and the first end 1242a1 of the first peripheral wall and a second extension line ℓ_{12} connecting the center C and the second end 1242a2 are defined, an angle formed by the first and second extension lines ℓ_{11} and ℓ_{12} may form a first angle θ_{11} . The center C of the tray 1241 may be a center of a center bracket 1243.

[0446] When a first extension line ℓ_{21} connecting the center C of the tray 1241 and an opened first end 251a of the reservoir 250 and a second extension line ℓ_{22} connecting the center C and an opened second end 251b of the reservoir 250 are defined, an angle formed by the first and second extension lines ℓ_{21} and ℓ_{22} may form a second angle θ_{21} .

[0447] The first angle θ_{11} may be formed to be greater than the second angle θ_{21} .

[0448] In some implementations, in the first position of the tray 1241, since the first peripheral wall 1242a is not disposed to face an internal space of the reservoir 250, a possibility that water adheres to the first peripheral wall 1242a may be reduced.

[0449] In some implementations, even when an error occurs in driving control of the first motor 210 such that

the first position of the tray 1241 is not precisely controlled and the tray 1241 rotates slightly further in a counter-clockwise direction than illustrated in FIG. 28A, a possibility that water adheres to the first peripheral wall 1242a may be reduced.

[0450] The tray 1241 may rotate further in the counter-clockwise direction from the state of FIG. 28A to move to the second position (water supply position), and during this process, ice formed on the first peripheral wall 1242a may be separated due to interference with the first blade 280.

[0451] The tray 1241 may include extension walls 1243a, side walls 1244, and tray holes 1245 corresponding to the extension walls 243a and the tray holes 245 of the tray 241.

[0452] In some implementations, recesses and protrusions may be alternately arranged on the first peripheral wall 1242a.

[0453] FIG. 29A is a perspective view illustrating an example configuration of a tray, and FIG. 29B is a front view illustrating the configuration of the tray.

[0454] Referring to FIGS. 29A and 29B, in some implementations, the tray 2241 may include a first peripheral wall 2242a forming a space or surface for ice-making and a second peripheral wall 2242b connected to the first peripheral wall 2242a and not forming a space or surface for ice-making.

[0455] For example, based on a center C of the tray 2241, a central angle θ_{31} of the first peripheral wall 2242a may be 180 degrees or greater, and a central angle θ_{32} of the second peripheral wall 2242b may be 180 degrees or less. However, depending on an ice-making capacity of the tray 2241, the central angle θ_{31} of the first peripheral wall 2242a and the central angle θ_{32} of the second peripheral wall 2242b may be formed differently.

[0456] The second peripheral wall 2242b may include a portion having a shape cut or recessed toward a center direction of the tray 2241 from the first peripheral wall 2242a.

[0457] Specifically, as illustrated in FIG. 29B, when an outer circumferential extension line ℓ_o connecting both ends of the first peripheral wall 2242a having a predetermined curvature is defined, the second peripheral wall 2242b may be positioned closer to the center C of the tray 2241, that is, to a center bracket 2243, than the outer circumferential extension line ℓ_o .

[0458] A radial distance of the first peripheral wall 2242a with respect to the center C of the tray 2241 may be greater than a radial distance of the second peripheral wall 2242b. Accordingly, the second peripheral wall 2242b may not be immersed in or contacted with water of the reservoir 250 in the first position (ice-making position) of the tray 2241.

[0459] The tray 2241 may include a protrusion 2242c provided at a portion where the first peripheral wall 2242a and the second peripheral wall 2242b meet. In order to prevent undesired freezing at the protrusion 2242c, an angle θ_e between a first surface of the first peripheral wall

2242a and a second surface of the second peripheral wall 2242b defining the protrusion 2242c may form an acute angle of 90 degrees or less.

[0460] A plurality of recesses 2241a and protrusions 2241b corresponding to the recesses 241a and protrusions 241b may be alternately arranged on the first peripheral wall 2242a.

[0461] The tray 2241 may include extension walls 2243a, side walls 2244, and tray holes 2245 corresponding to the extension walls 243a, side walls 244, and tray holes 245 of the tray 241.

[0462] The tray 2241 may rotate further in a counter-clockwise direction from the state of FIG. 29A to move to the second position (water supply position), and during this process, ice formed on the first peripheral wall 2242a may be separated due to interference with the first blade 280.

[0463] FIG. 30A is a perspective view illustrating an example configuration of a tray, and FIG. 30B is a front view illustrating the configuration of the tray.

[0464] Referring to FIGS. 30A and 30B, in some implementations, the tray 3241 may include a first peripheral wall 3242a forming a space or surface for ice-making. The first peripheral wall 3242a may form an entire peripheral wall of the tray 3241.

[0465] The first peripheral wall 3242a may include a first end 3242a1 and a second end 3242a2 defining both ends thereof. The first end 3242a1 and the second end 3242a2 may be spaced apart from each other, and a space between the first and second ends 3242a1 and 3242a2 may form an empty space.

[0466] The first end 3242a1 may be connected to a center bracket 3243 by one extension wall 3243a. The second end 3242a2 may be connected to the center bracket 3243 by another extension wall 3243a. Descriptions regarding the extension walls 3243a and the center bracket 3243 may correspond to those of the previously described examples.

[0467] As illustrated in FIG. 30B, when the tray 3241 is projected onto a plane perpendicular to an axial direction, the tray 3241 may have an arc shape defined by the first peripheral wall 3242a and a plurality of extension walls 3243a.

[0468] Based on a center C of the tray 3241, the first peripheral wall 3242a forms a central angle θ_{41} of 180 degrees or greater and includes a portion that comes into contact with water, and the plurality of extension walls 3243a form a central angle θ_{42} of 180 degrees or less and the space between the plurality of extension walls 3243a may form an area that does not come into contact with water. However, depending on an ice-making capacity of the tray 3241, the central angles θ_{41} and θ_{42} may be formed differently.

[0469] A plurality of recesses 3241a and protrusions 3241b corresponding to the recesses 241a and protrusions 241b may be alternately arranged on the first peripheral wall 3242a.

[0470] Compared with the structure of the tray 2241,

the tray 3241 may correspond to a configuration in which the second peripheral wall 2242b of the tray 2241 is removed.

[0471] The tray 3241 may include extension walls 3243a, side walls 3244, and tray holes 3245 corresponding to the extension walls 243a, side walls 244, and tray holes 245 of the tray 241.

[0472] The tray 3241 may rotate further in a counter-clockwise direction from the state of FIG. 30A to move to the second position (water supply position), and during this process, ice formed on the first peripheral wall 3242a may be separated due to interference with the first blade 280.

[0473] FIG. 31A is a perspective view illustrating an example configuration of a tray, and FIG. 31B is a front view illustrating the configuration of the tray.

[0474] Referring to FIGS. 31A and 31B, the tray 4241 may include a first peripheral wall 4242a forming a space or surface for ice-making. The first peripheral wall 4242a may extend in a circumferential direction based on a center of the tray 4241.

[0475] The tray 4241 may include a center bracket 4243 forming a rotational center and a plurality of extension walls 4243a extending radially from the center bracket 4243. Descriptions of the center bracket 4243 and the plurality of extension walls 4243a may correspond to those of the previously described examples.

[0476] Both ends of the first peripheral wall 4242a may be connected to the plurality of extension walls 4243a. That is, a first end of the first peripheral wall 4242a may be connected to a first extension wall 4243a, and a second end of the first peripheral wall 4242a may be connected to a second extension wall 4243a.

[0477] For example, based on a center C of the tray 4241, a central angle θ_{51} of the first peripheral wall 4242a may be 180 degrees. However, depending on an ice-making capacity of the tray 4241, the central angle θ_{51} of the first peripheral wall 4242a may be formed differently.

[0478] A plurality of recesses 4241a and protrusions 4241b corresponding to the recesses 241a and the protrusions 241b may be alternately arranged on the first peripheral wall 4242a.

[0479] Protrusions 4242c may be provided at both ends of the first peripheral wall 4242a. Tips of the protrusions 4242c may define end portions of the first peripheral wall 4242a.

[0480] In order to prevent undesired freezing at the protrusions 4242c, an angle θ_{5e} between a first surface 4242a1 and a second surface 4242a2 of the first peripheral wall 4242a defining the protrusions 4242c may form an acute angle of 90 degrees or less.

[0481] The first surface 4242a1 may include a first portion of the first peripheral wall 4242a extending in the circumferential direction, and the second surface 4242a2 may include a second portion connecting the first surface 4242a1 to the extension wall 4243a.

[0482] The tray 4241 may include a second peripheral wall 4300 connected to the first peripheral wall 4242a and

not forming a space or surface for ice-making. The second peripheral wall 4300 may extend in the circumferential direction based on the center of the tray 4241.

[0483] The second peripheral wall 4300 may be connected to one extension wall 4243a among the plurality of extension walls 4243a and may extend in the circumferential direction to be connected to another extension wall 4243a.

[0484] For example, based on the center C of the tray 4241, a central angle $\theta 52$ of the second peripheral wall 4300 may be 180 degrees. However, depending on the ice-making capacity of the tray 4241, the central angle $\theta 51$ of the first peripheral wall 4242a and the central angle $\theta 52$ of the second peripheral wall 4300 may be formed differently.

[0485] A radial distance R1 of the first peripheral wall 4242a with respect to the center C of the tray 4241 may be greater than a radial distance R2 of the second peripheral wall 4300. Accordingly, the second peripheral wall 4300 may not be immersed in or contacted with water of the reservoir 250 in the first position (ice-making position) of the tray 4241. The radial distances R1 and R2 may correspond to rotational radii of the first and second peripheral walls 4242a and 4300, respectively.

[0486] The tray 4241 may include extension walls 4243a, side walls 4244, and tray holes 4245 corresponding to the extension walls 243a, side walls 244, and tray holes 245 of the tray 241.

[0487] The tray 4241 may rotate further in a counter-clockwise direction from the state of FIG. 3 1A to move to the second position (water supply position), and during this process, ice formed on the first peripheral wall 4242a may be separated due to interference with the first blade 280.

[0488] FIG. 32 is a perspective view illustrating an example configuration of a tray.

[0489] Referring to FIG. 32, the tray 5241 may include an inner circumferential wall 5244a provided with protrusions 5256. The protrusions 5256 may be configured to protrude from the inner circumferential wall 5244a by a predetermined height.

[0490] A plurality of protrusions 5256 may be provided, and the plurality of protrusions 5256 may be uniformly distributed over an entire area of the inner circumferential wall 5244a.

[0491] Due to the protrusions 5256, water introduced toward the inner circumferential wall 5244a may be discharged to an outside of the inner circumferential wall 5244a. That is, the protrusions 5256 may function as a discharge guide device for discharging water introduced into an interior of the tray 5241 to the outside.

[0492] Although the configuration of the protrusions 5256 has been described based on the tray structure of the example shown in FIG. 32, the protrusions 5256 may likewise be provided on inner circumferential walls of trays 1241, 2241, 3241, and 4241.

[0493] Among the tray structures according to the various implementations described above, for trays includ-

ing the second peripheral wall 242b, 1242b, 2242b, or 4300, a water-repellent coating layer may be provided on the second peripheral wall 242b, 1242b, 2242b, or 4300.

[0494] The water-repellent coating layer may include a silicone resin. The water-repellent coating layer may be formed by spraying a liquid coating agent onto the second peripheral wall.

[0495] Due to the water-repellent coating layer, water droplet formation on the second peripheral wall may be prevented, and even when water of the reservoir adheres to the second peripheral wall, the water may be removed.

Claims

1. A refrigerator comprising:

a cabinet that defines a storage space;
a door configured to open and close at least a portion of the storage space; and
an ice-making body provided at the cabinet or the door,
wherein the ice-making body comprises:

a center portion,
a first peripheral portion that extends about the center portion in a circumferential direction and is configured to receive water and to generate ice from the water, and
a second peripheral portion that is connected to the first peripheral portion and does not receive water.

2. The refrigerator of claim 1, wherein the ice-making body further comprises a center bracket disposed at the center portion, and
wherein a first radial distance between the center bracket and the first peripheral portion is greater than a second radial distance between the center bracket and the second peripheral portion.

3. The refrigerator of claim 2, wherein the ice-making body is configured to rotate about the center portion, and
wherein the first radial distance defines a rotational radius of the first peripheral portion, and the second radial distance defines a rotational radius of the second peripheral portion.

4. The refrigerator of claim 2 or 3, further comprising a reservoir provided at one side of the ice-making body and configured to store water,

wherein the first radial distance of the first peripheral portion is defined to allow the first peripheral portion to contact the water stored in the reservoir, and/or
wherein the second radial distance of the sec-

ond peripheral portion is defined such that at least a portion of the second peripheral portion remains spaced apart from the water stored in the reservoir.

5. The refrigerator of any one of claims 2 to 4, further comprising a reservoir provided at one side of the ice-making body and configured to store water,

wherein the ice-making body is configured to move to a first position and a second position, wherein the second peripheral portion is configured to face the reservoir based on the ice-making body being at the first position, and wherein the first peripheral portion is configured to face the reservoir based on the ice-making body being at the second position.

6. The refrigerator of any one of claims 1 to 5, wherein the first peripheral portion defines:
at least one recess that is recessed from an outer circumferential surface of the first peripheral portion.

7. The refrigerator of claim 1, wherein the first peripheral portion defines:
a plurality of recesses that are recessed from an outer circumferential surface of the first peripheral portion and arranged in an axial direction of the ice-making body.

8. The refrigerator of claim 6, further comprising a blade provided at one side of the ice-making body,

wherein the first peripheral portion comprises at least one protrusion that is disposed adjacent to the at least one recess and that radially protrudes relative to the at least one recess, and wherein the blade is configured to face the at least one recess and the at least one protrusion, the blade comprising a tip configured to separate ice from each of the at least one recess and the at least one protrusion.

9. The refrigerator of any one of claims 1 to 8, wherein the ice-making body further comprises:

a plurality of extension walls extending radially from the center portion toward the first peripheral portion; and
an inner circumferential wall that defines an inner surface of the first peripheral portion.

10. The refrigerator of claim 9, wherein the ice-making body has an ice-making body opening that is defined by the center portion, the plurality of extension walls, and the inner circumferential wall, the ice-making body opening defining a flow path of cooled air configured to cool the ice-making body.

11. The refrigerator of claim 9 or 10, wherein the ice-making body comprises side walls connected to ends of at least one of the first peripheral portion or the second peripheral portion, and wherein the side walls extend by a predetermined width from the first peripheral portion or the second peripheral portion and are connected to the inner circumferential wall.

12. The refrigerator of any one of claims 9 to 11, wherein the ice-making body further comprises one or more protrusions disposed at the inner circumferential wall and configured to guide discharge of water from the inner circumferential wall.

13. The refrigerator of any one of claims 1 to 12, wherein a curvature of the first peripheral portion is different from a curvature of the second peripheral portion, and wherein the ice-making body comprises a protrusion disposed at a connection portion between the first peripheral portion and the second peripheral portion.

14. The refrigerator of claim 13, wherein the protrusion is defined by a first surface of the first peripheral portion and a second surface of the second peripheral portion, and wherein an angle defined between the first surface and the second surface is an angle less than 90 degrees.

15. The refrigerator of any one of claims 1 to 14, wherein a central angle of the first peripheral portion is greater than or equal to a central angle of the second peripheral portion based on the center portion of the ice-making body.

FIG. 1A

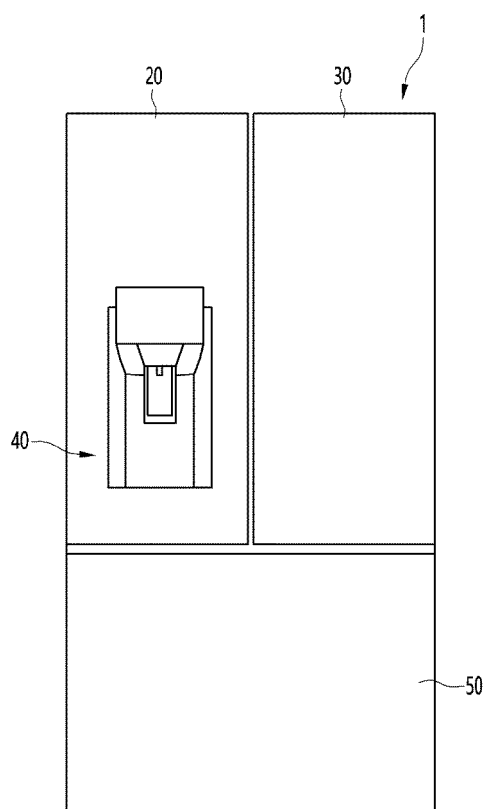


FIG. 1B

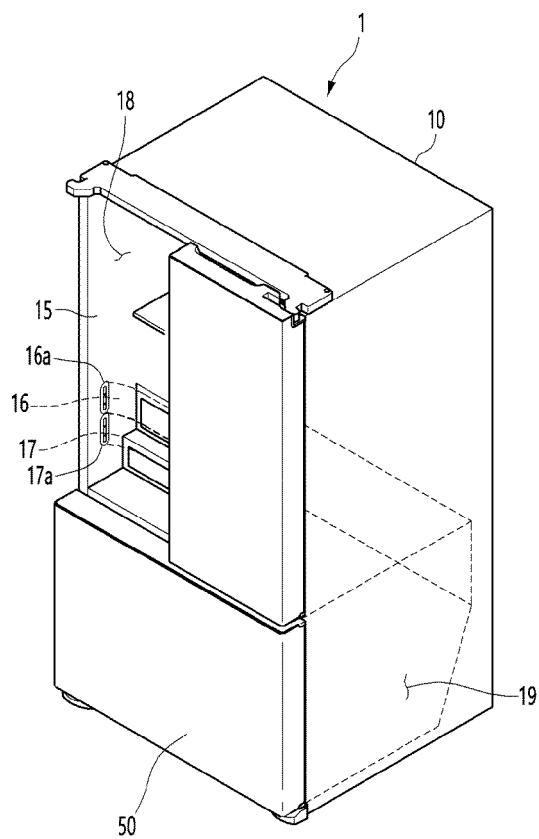


FIG. 2A

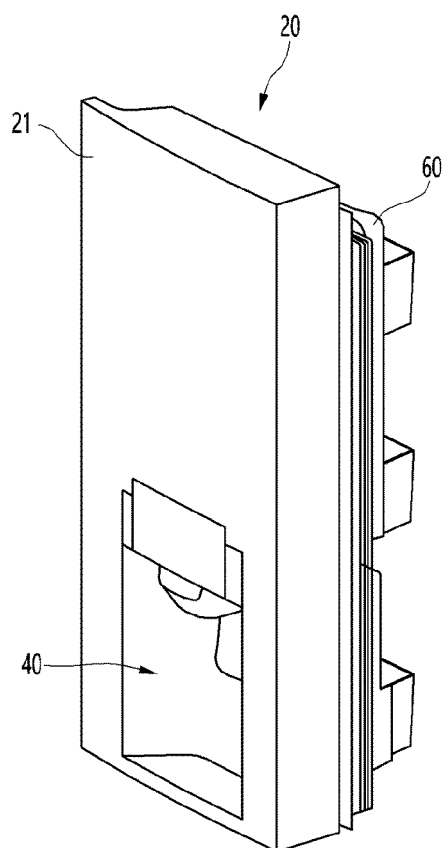


FIG. 2B

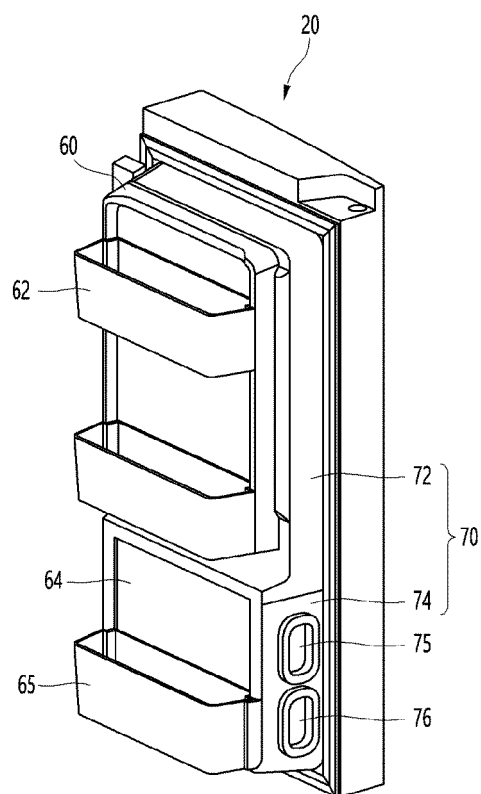


FIG. 3A

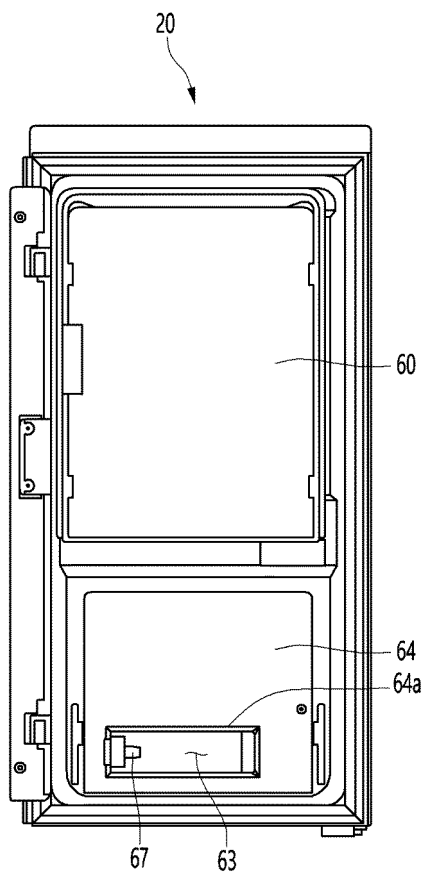


FIG. 3B

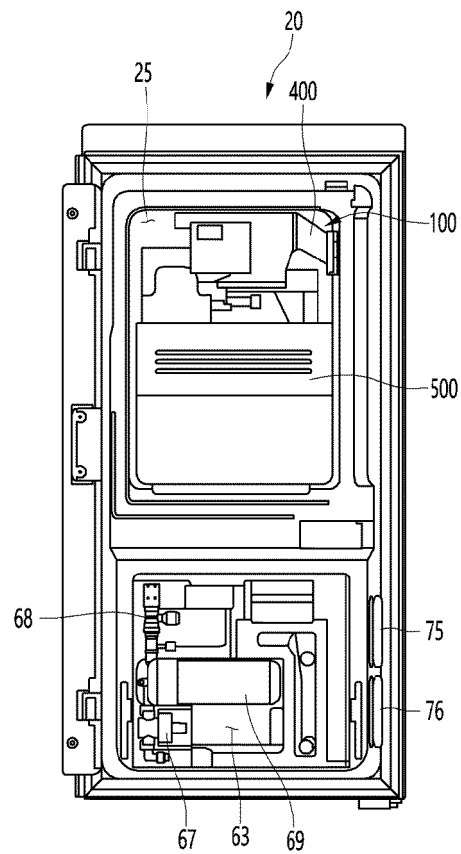


FIG. 4

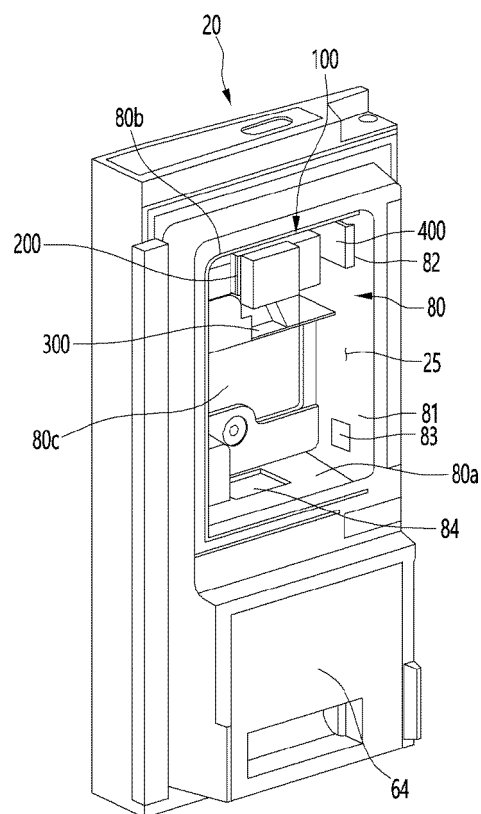


FIG. 5

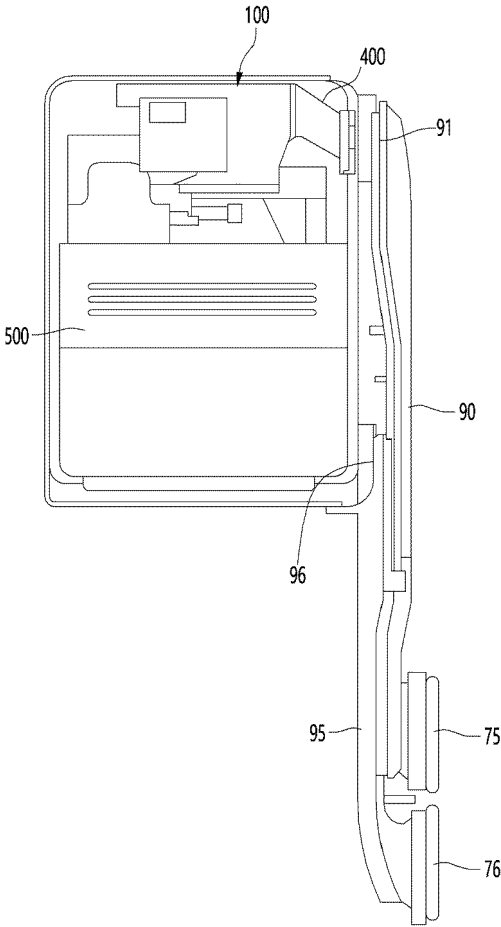


FIG. 6

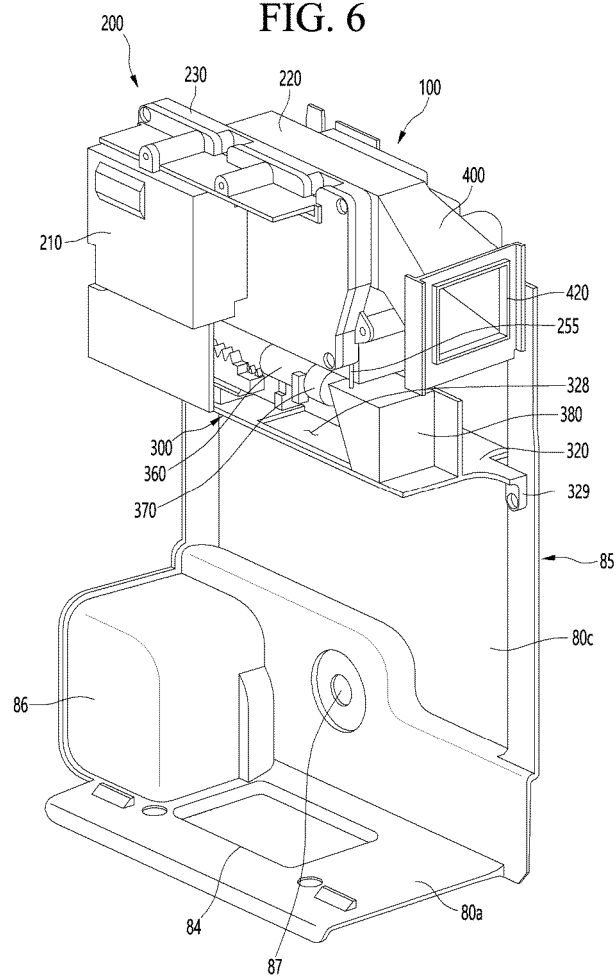


FIG. 7

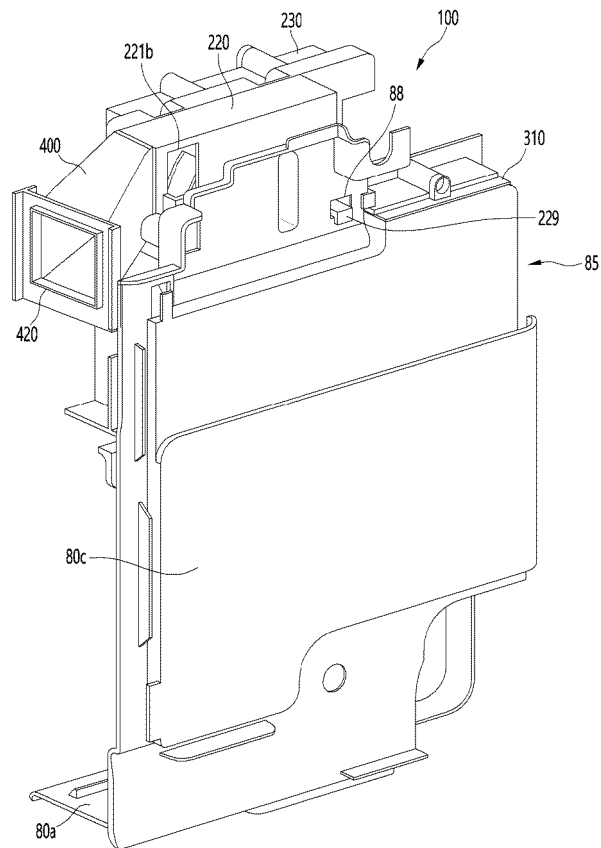


FIG. 8

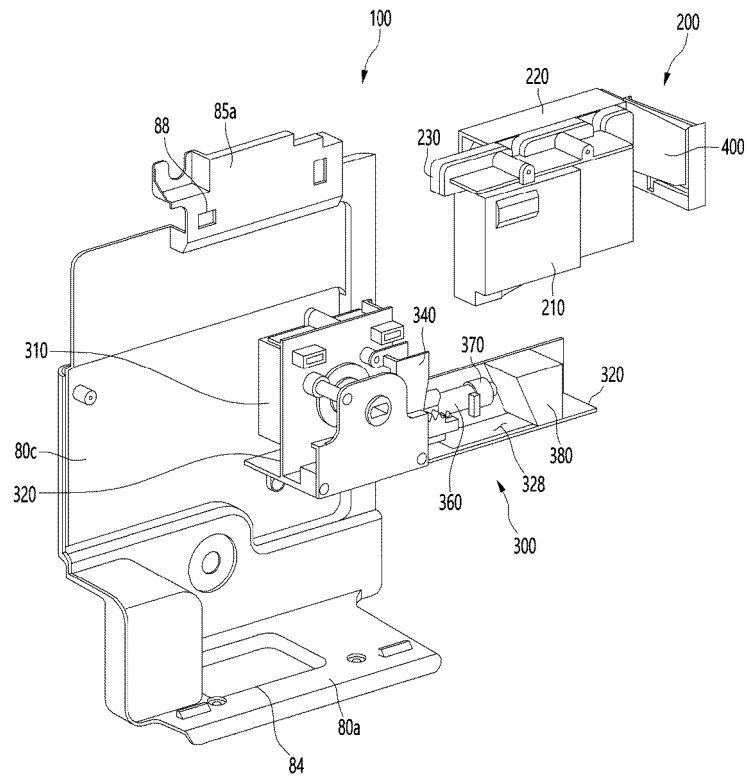


FIG. 9

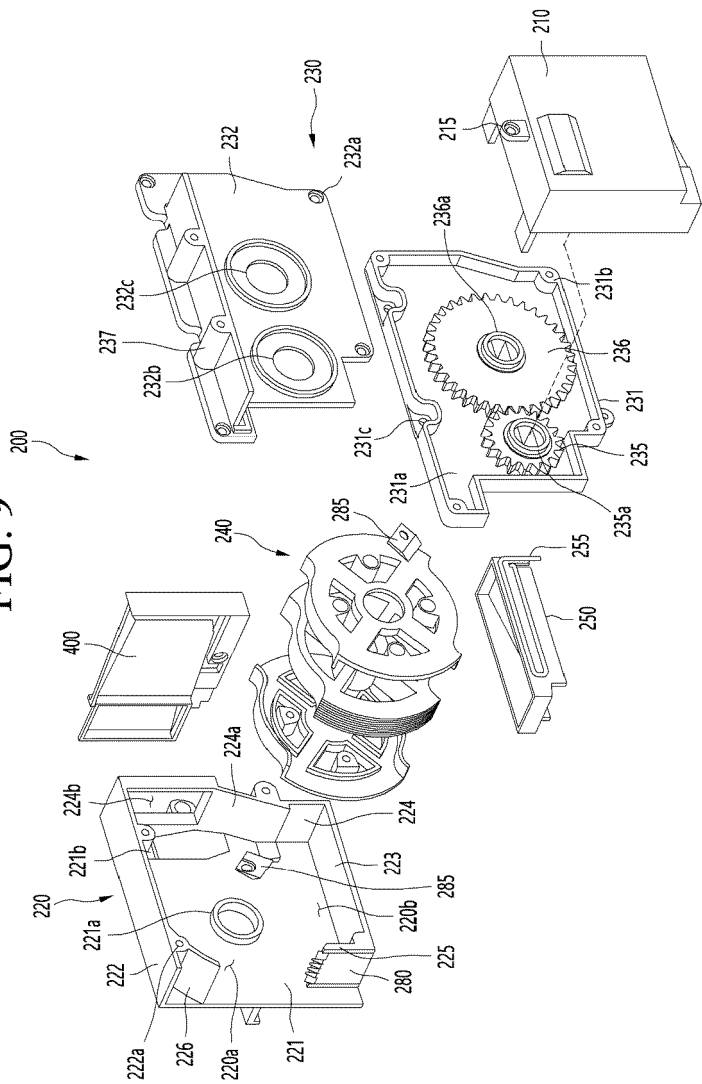


FIG. 10

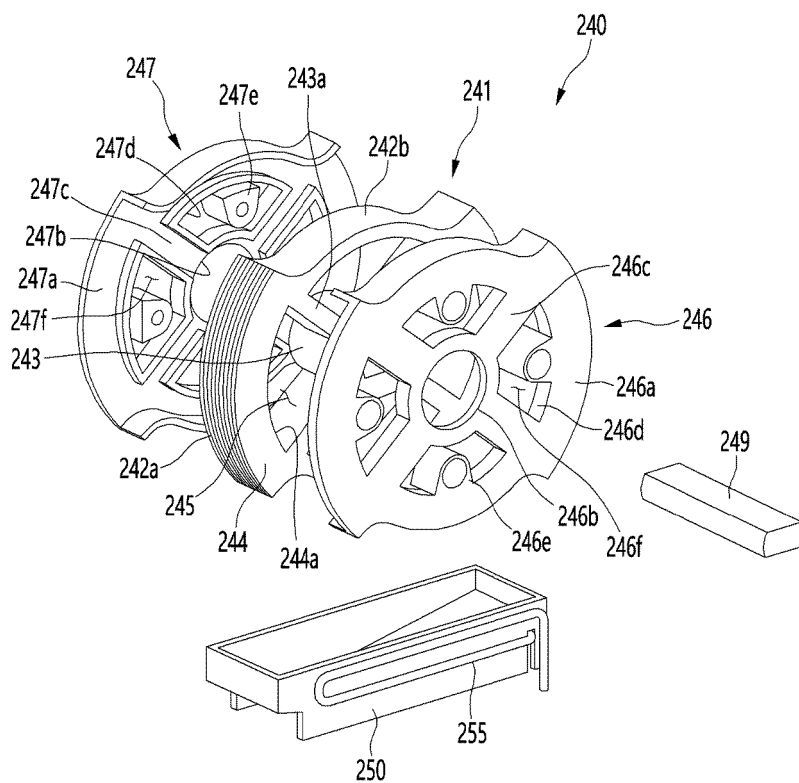


FIG. 11A

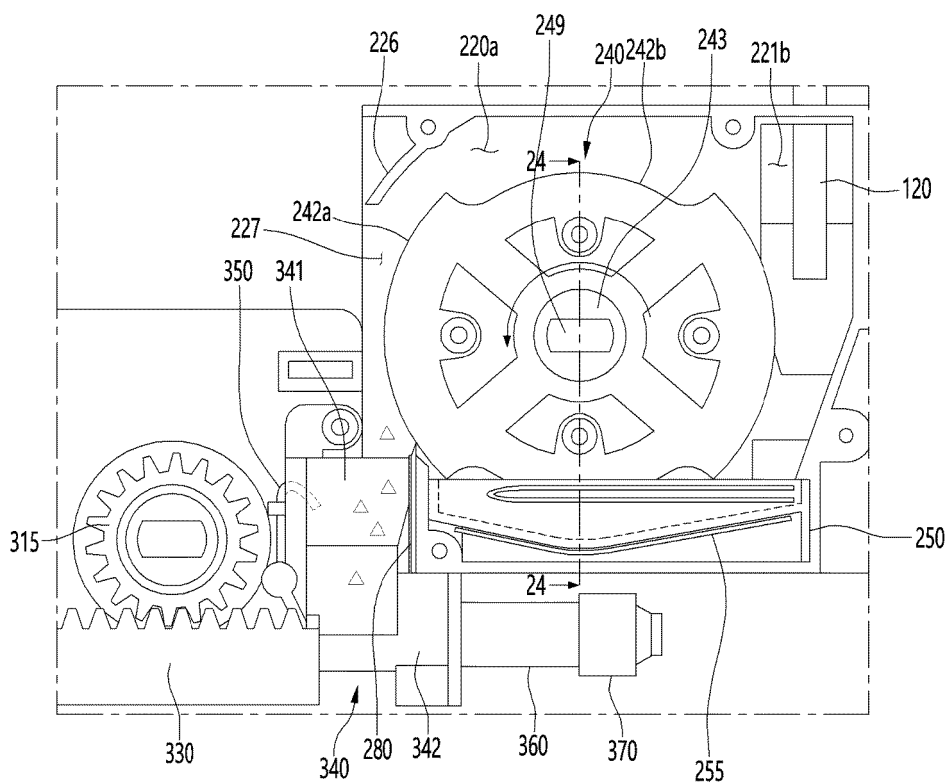


FIG. 11B

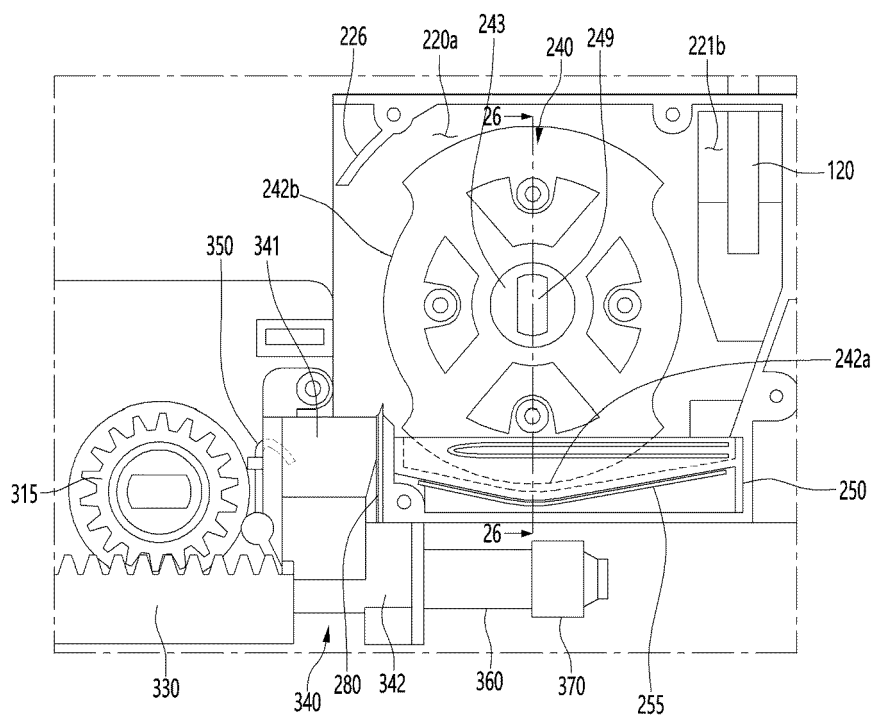


FIG. 12

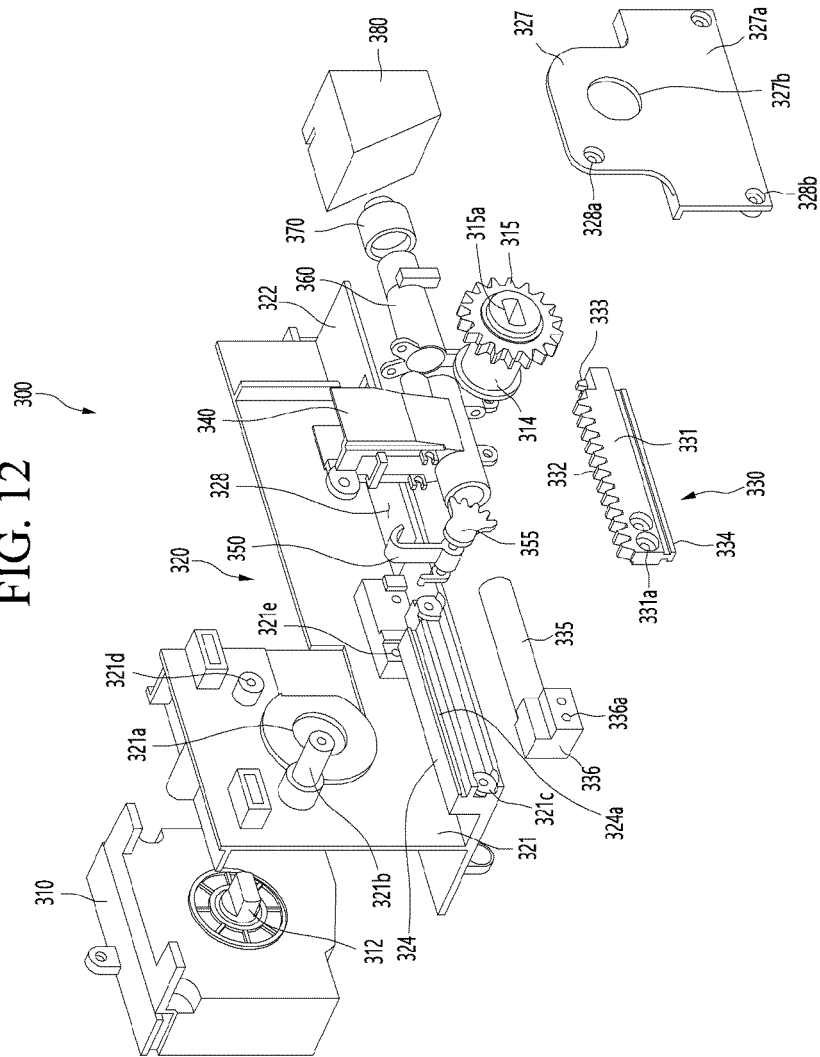


FIG. 13

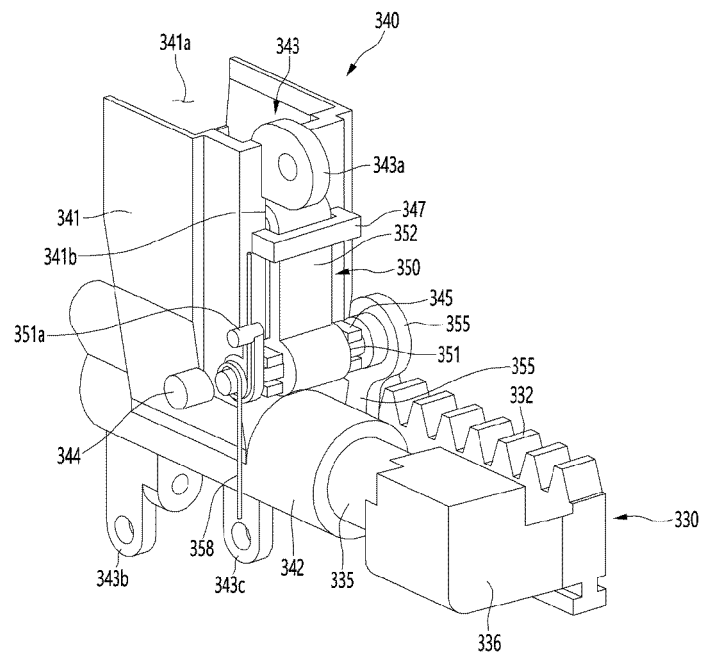


FIG. 14

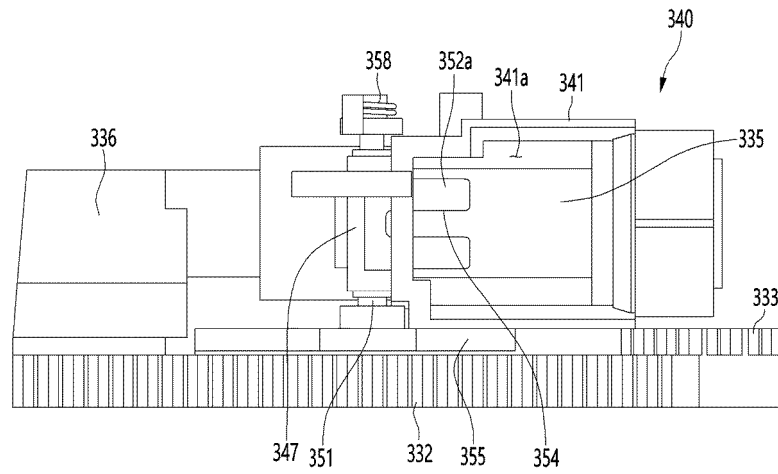


FIG. 15A

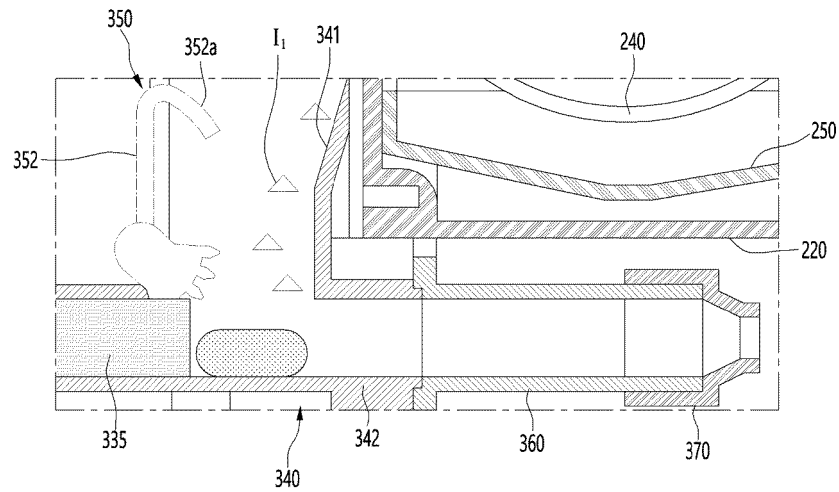


FIG. 15B

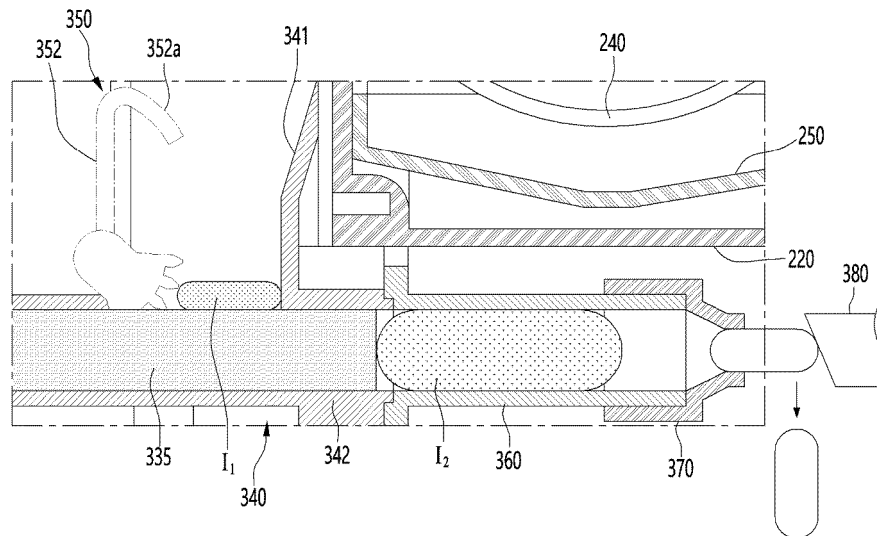


FIG. 15C

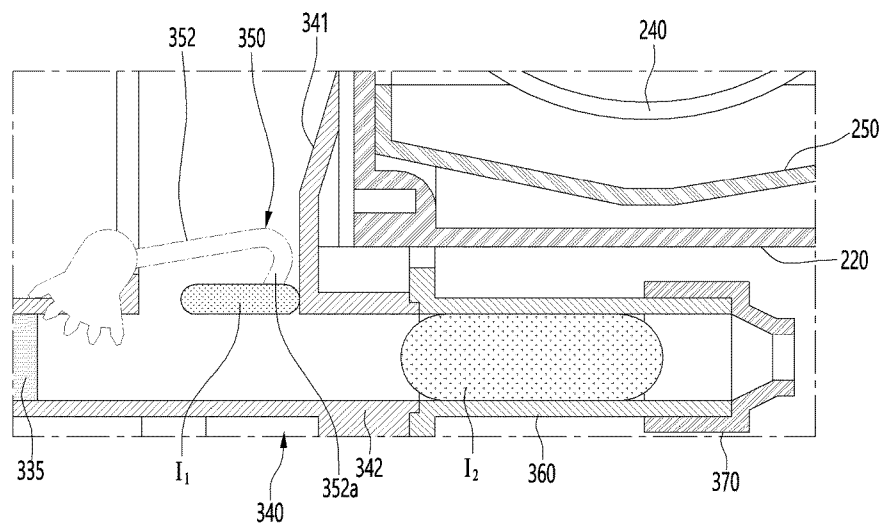


FIG. 15D

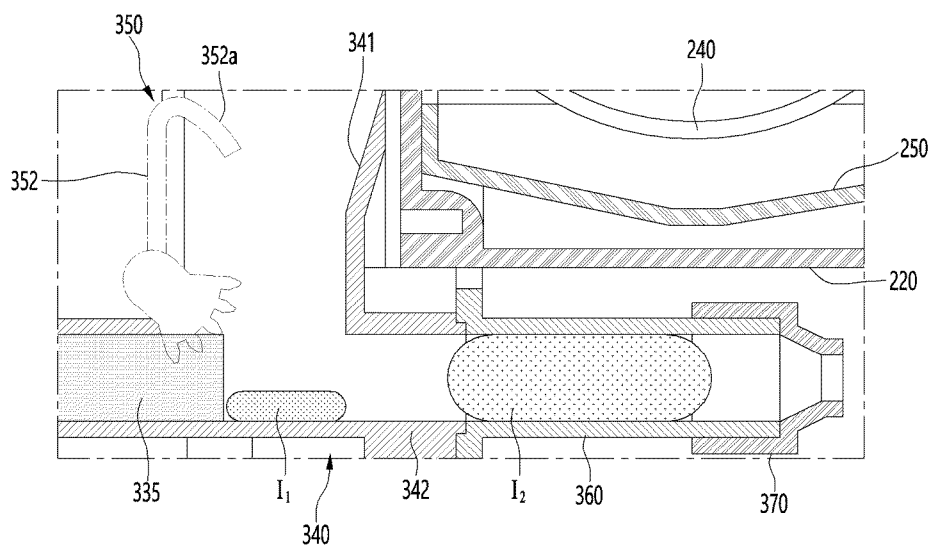


FIG. 16

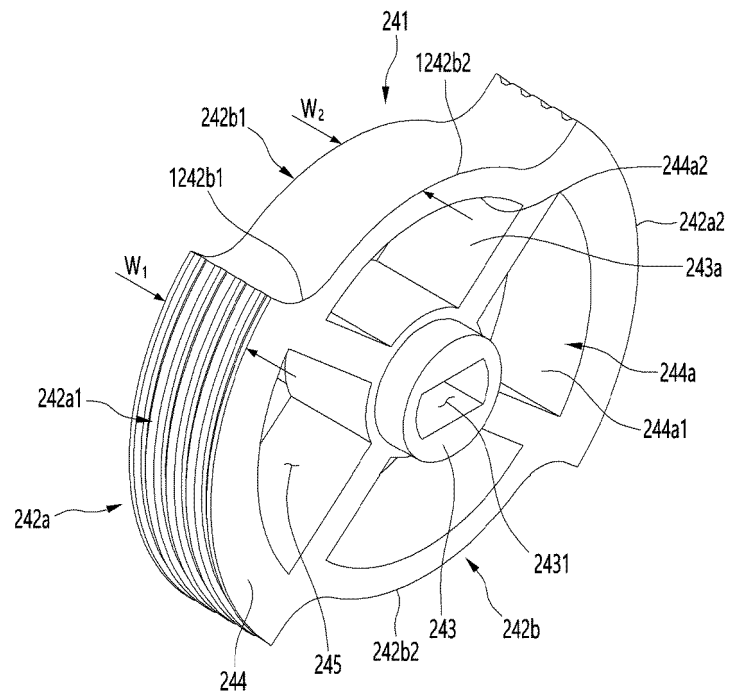


FIG. 17

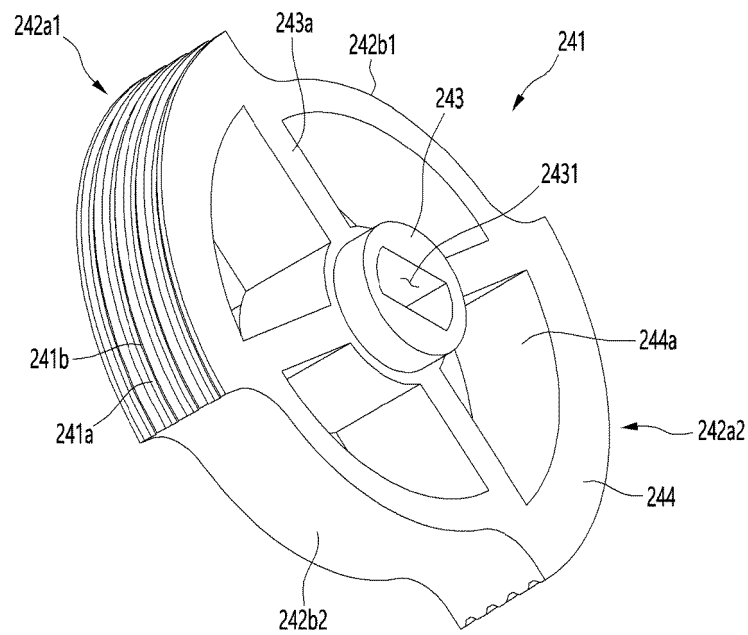


FIG. 18

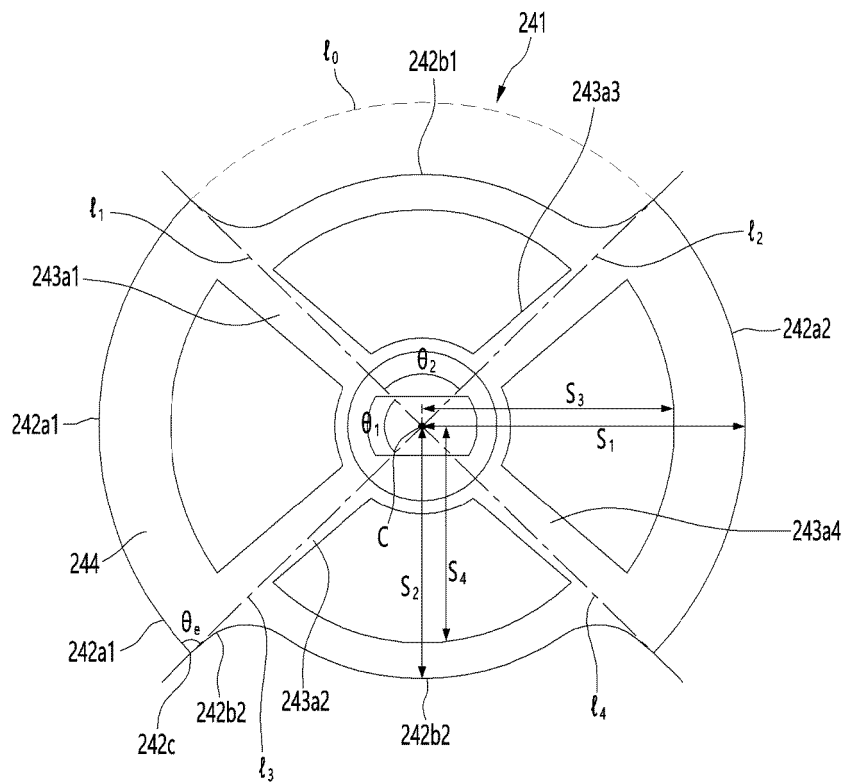


FIG. 19

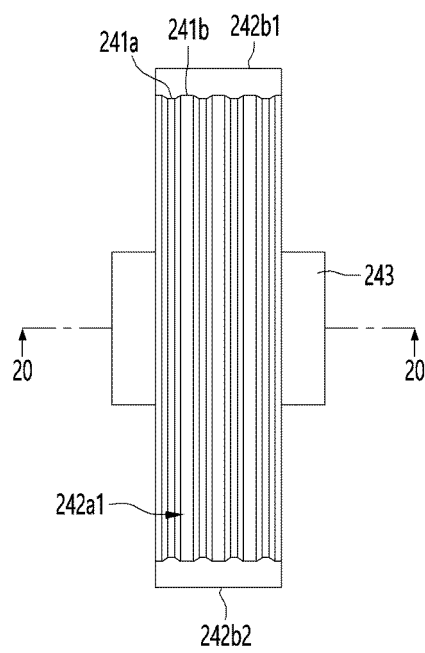


FIG. 20

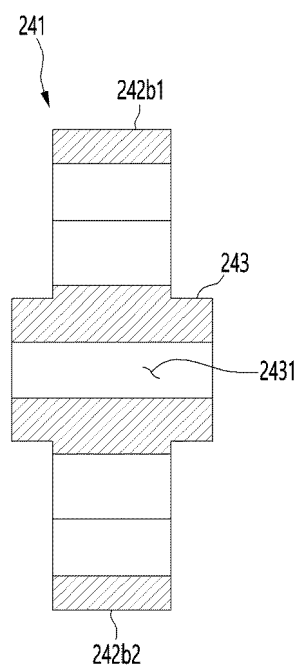


FIG. 21

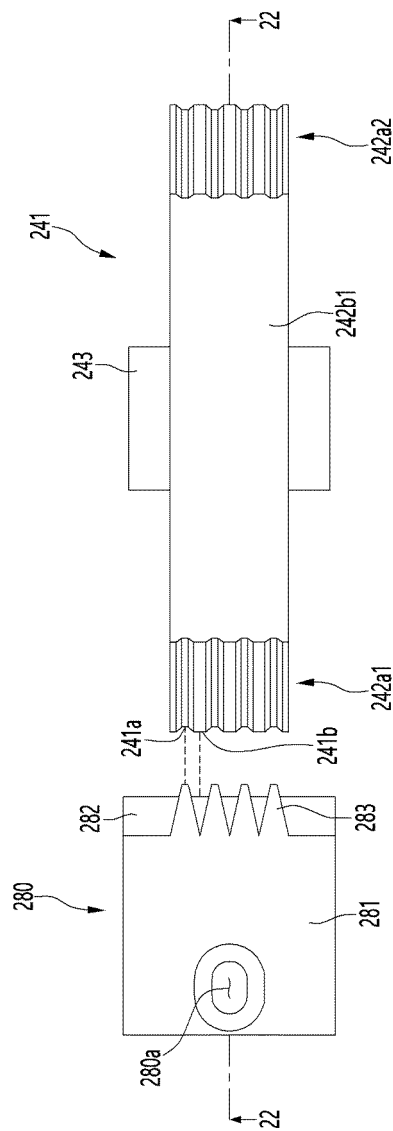


FIG. 22

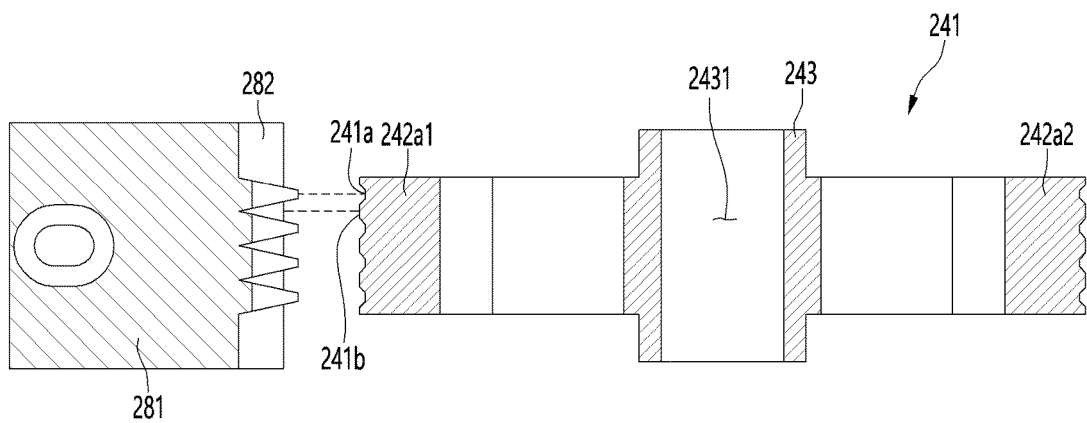


FIG. 23

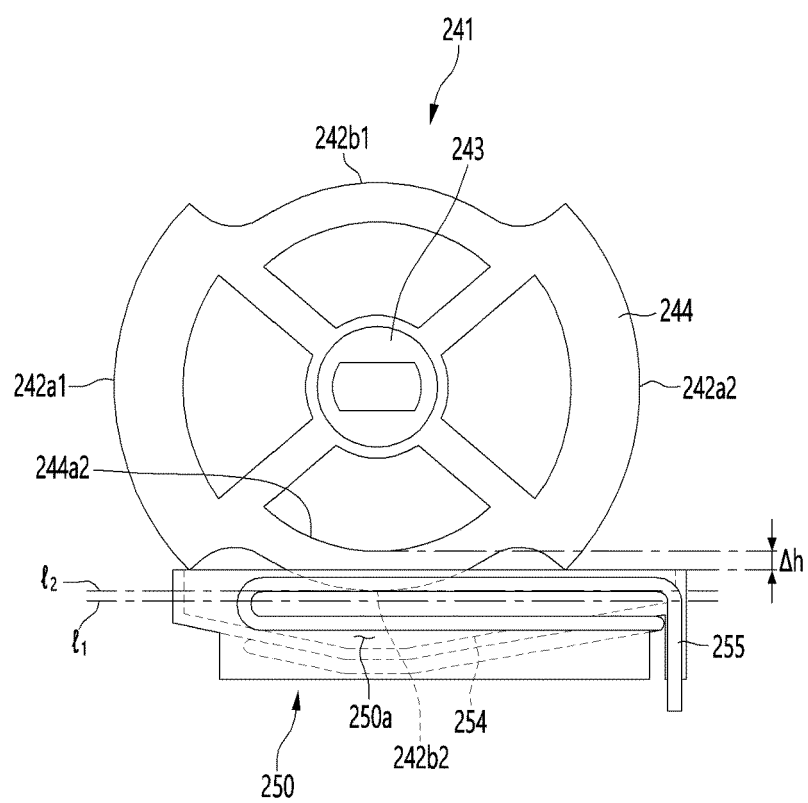


FIG. 24

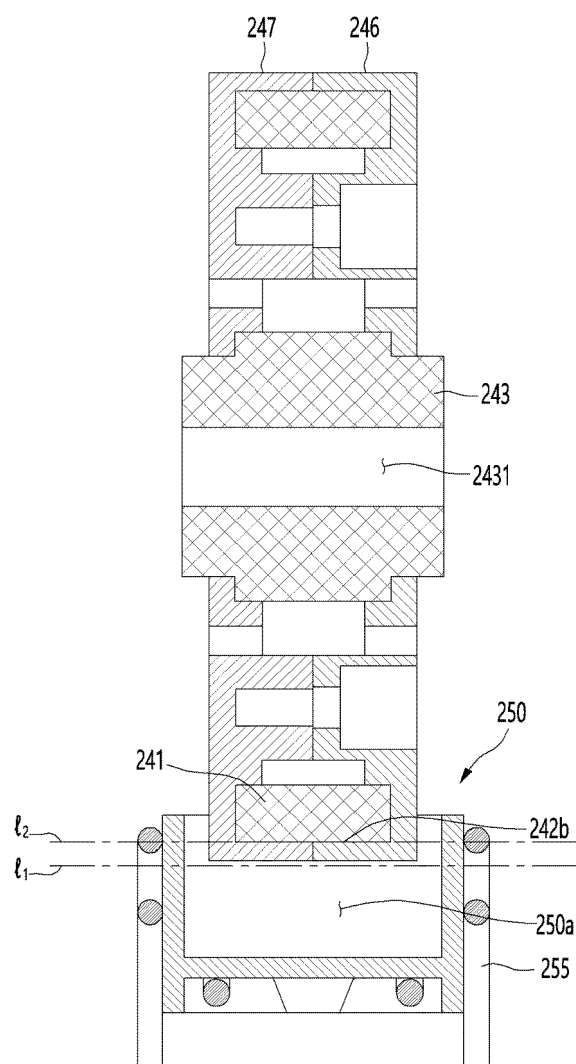


FIG. 25

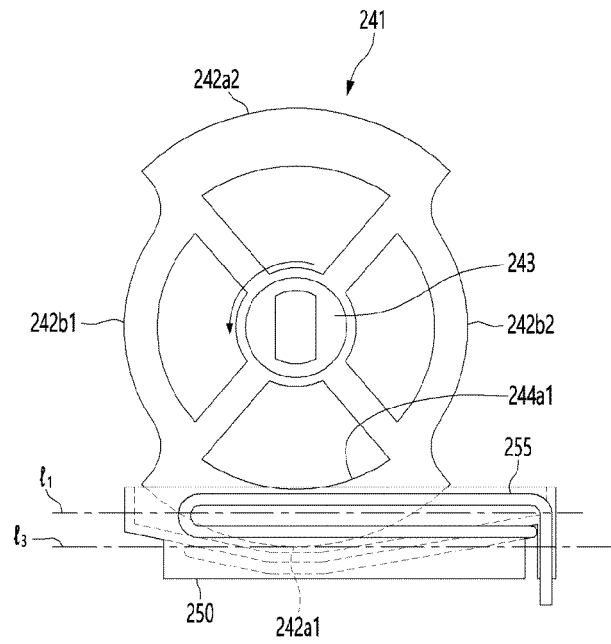


FIG. 26

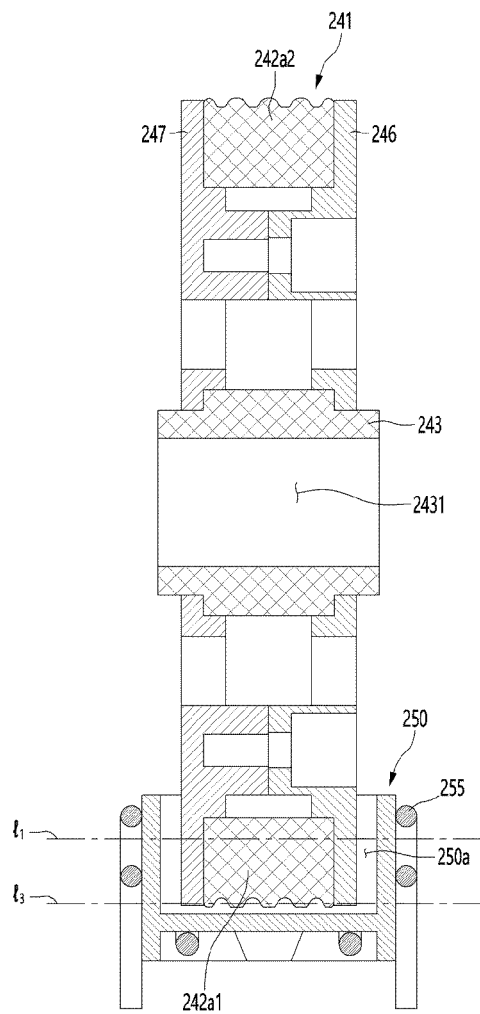


FIG. 27

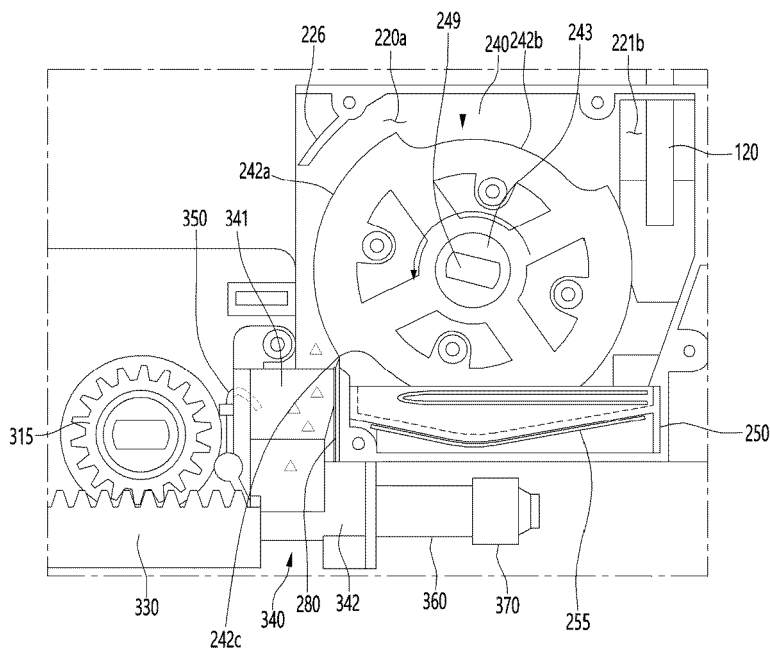


FIG. 28A

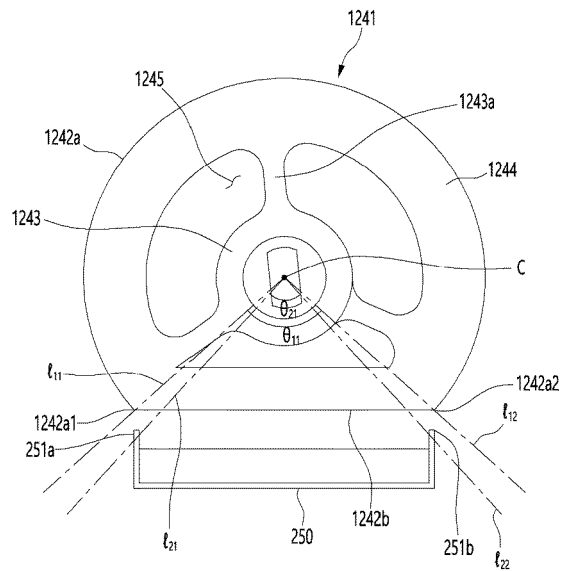


FIG. 28B

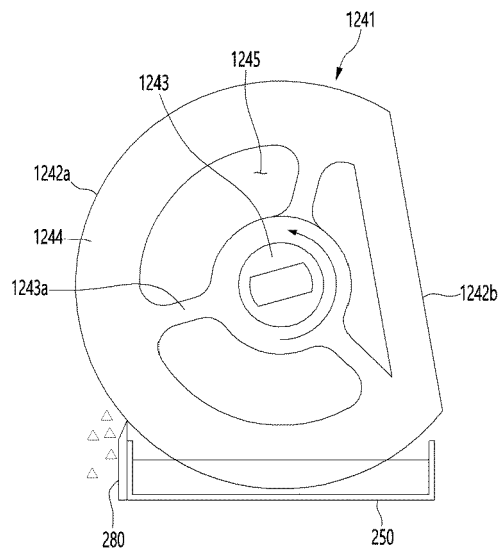


FIG. 29A

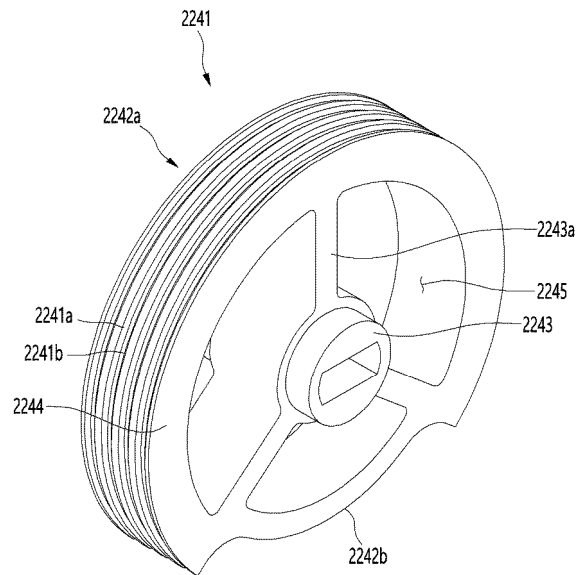


FIG. 29B

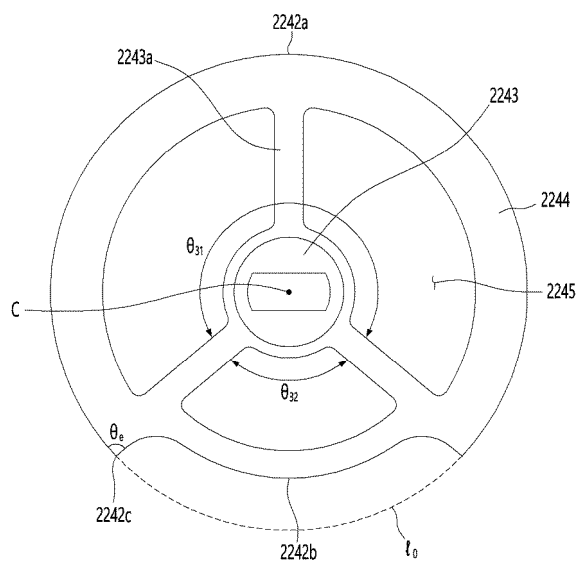


FIG. 30A

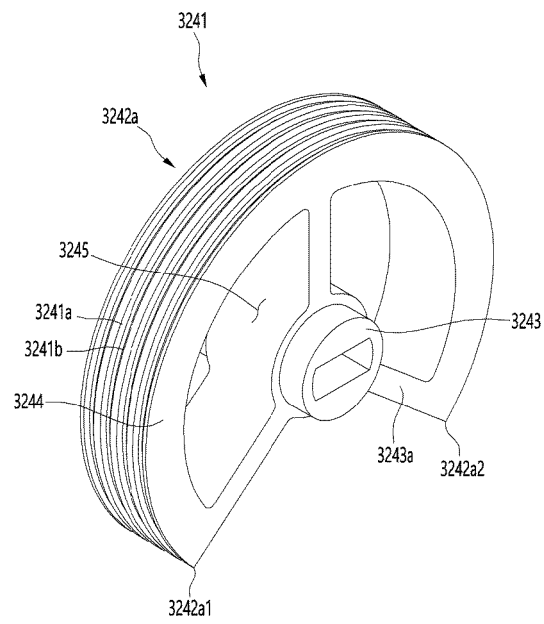


FIG. 30B

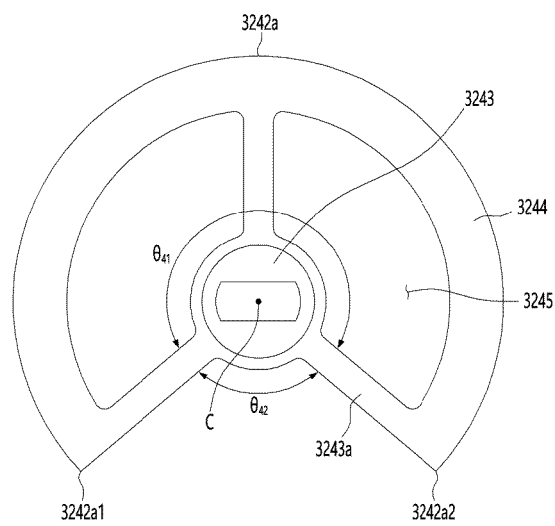


FIG. 31A

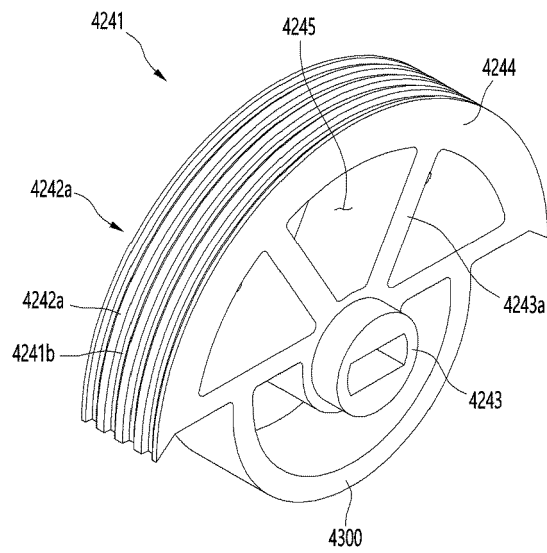


FIG. 31B

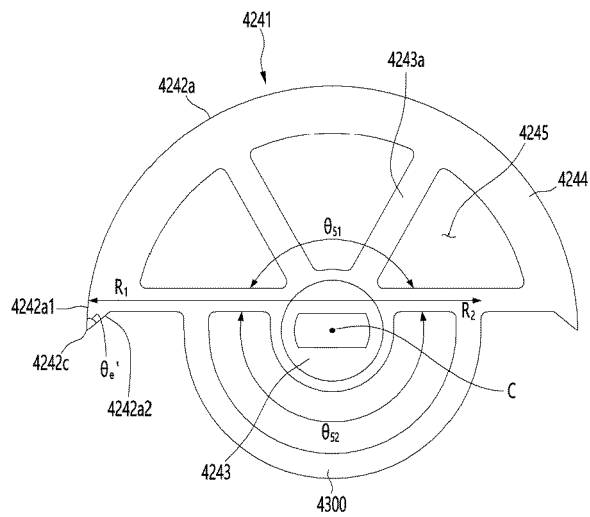
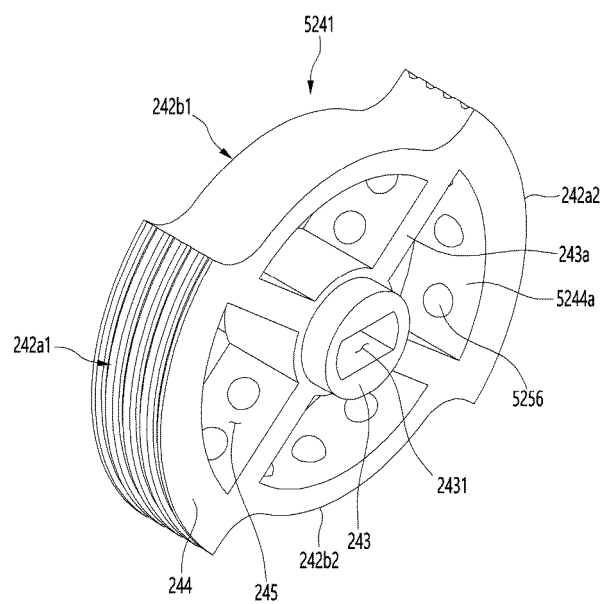


FIG. 32





EUROPEAN SEARCH REPORT

Application Number

EP 26 16 9012

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2011/146324 A1 (LEE SEUNG MOK [KR] ET AL) 23 June 2011 (2011-06-23)	1-3,6-15	INV.
Y	* paragraph [0060] - paragraph [0175];	4	F25C1/24
A	figures 3-19 *	5	F25C5/04
	-----		F25C5/06
X	US 2010/319366 A1 (KIM SEONG-JAE [KR] ET AL) 23 December 2010 (2010-12-23)	1,9,15	F25C5/14
Y	* paragraph [0038] - paragraph [0067];	4	F25C5/20
	figures 1-11 *		F25D23/02
	-----		F25D23/04
X	CN 102 365 513 A (LG ELECTRONICS INC) 29 February 2012 (2012-02-29)	1,9,15	
	* paragraph [0035] - paragraph [0086];		
	figures 1-15 *		

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F25C
			F25D
Place of search			Examiner
The Hague			Kolev, Ivelin
Date of completion of the search			
13 July 2026			
CATEGORY OF CITED DOCUMENTS			
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Y : particularly relevant if combined with another document of the same category			
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D : document cited in the application			
L : document cited for other reasons			
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& : member of the same patent family, corresponding document			

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 26 16 9012

5

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13-07-2026

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