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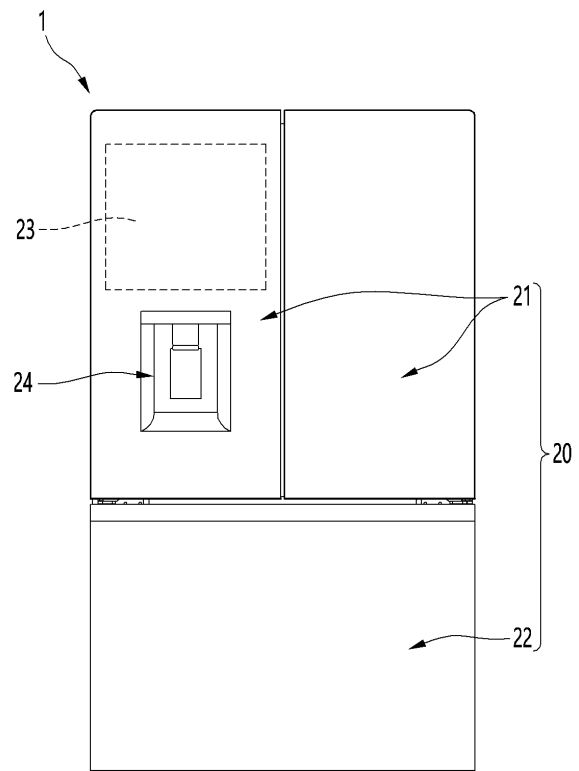
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(54) **REFRIGERATOR**

(57) The present disclosure relates to a refrigerator, and the refrigerator includes a cabinet having a storage space; a door configured to open and close the storage space; and an ice maker provided in the door, in which the ice maker includes a first tray made of metal material, fixed to the door, and having a plurality of first cells; a second tray made of a different material from the first tray and having a plurality of second cells that open and close the first cells to form a space in which ice is made; and a motor device configured to open and close the second cell, and the first tray includes a first part on which the first cell is formed; and a second part on which the motor device is mounted

[Fig. 1]



Description

BACKGROUND

[0001] The present disclosure relates to a refrigerator.

[0002] In general, a refrigerator is a home appliance that allows food to be stored at low temperatures in an internal storage space shielded by a door. Additionally, the refrigerator cools the storage space with cold air generated using a refrigeration cycle, allowing stored food to be stored in a refrigerated or frozen state.

[0003] The refrigerators are trending toward becoming more advanced and larger, and are equipped with various devices to improve convenience of use. Typically, a refrigerator may be equipped with an ice maker that automatically creates and stores ice.

[0004] Additionally, ice made in ice makers may have various shapes, and recently, ice makers that make spherical ice have been developed.

[0005] However, in the case of an ice maker that makes spherical ice, it is difficult to maintain a coupled state and an aligned state between the tray and components for making and separating spherical ice, which leads to a problem of low ice-making reliability.

SUMMARY

[0006] An object of an embodiment of the present disclosure is to provide a refrigerator that may maintain the coupling state and the aligned state of a plurality of components constituting an ice maker.

[0007] An object of an embodiment of the present disclosure is to provide a refrigerator that guarantees the ice-making quality of spherical ice.

[0008] An object of an embodiment of the present disclosure is to provide a refrigerator that improves the assembly and serviceability of the ice maker.

[0009] A refrigerator according to an embodiment of the present disclosure may include a cabinet having a storage space; a door configured to open and close the storage space; and an ice maker provided in the door, in which the ice maker may include a first tray made of metal material, fixed to the door, and having a plurality of first cells; a second tray made of a different material from the first tray and having a plurality of second cells that open and close the first cells to form a space in which ice is made; and a motor device configured to open and close the second tray, and the first tray may include a first part on which the first cell is formed; and a second part on which the motor device is mounted.

[0010] A cover may be mounted on the first tray to shield at least a portion of the first part, and the cover may be spaced apart from the first part to form a cold air flow passage that guides cold air supplied for ice-making to pass the first part.

[0011] A tray mounting part which protrudes outside the cover and is fastened with a screw that is fixed to the door may be formed on the first tray.

[0012] The door may include an ice-making compartment that accommodates the ice maker, and a mounting member that forms at least a portion of the ice-making compartment, and the screw may penetrate the mounting member to be fastened to the tray mounting part, and fix the ice maker to the ice-making compartment.

[0013] A first ejector for separating ice from the first cell may be disposed at the cover, a plurality of cell extension parts may be formed in the first tray, which communicate with the inside of each first cell and extend toward the first ejector, and the first ejector may pass through the cell extension part to separate ice from the first cell.

[0014] Ejector guide parts may be formed on both sides of the cover, and the first ejector may include an ejector body configured to move along the ejector guide part; and a plurality of ejector pins extending from the ejector body and inserted into the plurality of cell extension parts.

[0015] The first tray may include a tray mounting part provided in the first part and configured to fix the first tray to the door, and the tray mounting part may protrude in a direction intersecting the second part based on the first part.

[0016] The second part may be located above or below the first part, and the first tray may further include a third part configured to connect the first part and the second part.

[0017] The first part, second part, and third part may be integrally formed of the same material.

[0018] The motor device may be formed with a drive shaft coupled to the second tray and a plurality of device coupling protrusions protruding in the same direction as the drive shaft, a device coupling hole into which the device coupling protrusion may be inserted is formed in the second part, and the drive shaft may be connected to the second tray when the device coupling protrusion is inserted into the device coupling hole.

[0019] The second part may include an upper surface of a coupling part that shields one surface of the motor device; and an edge of the coupling part extending along an edge of the upper surface of the coupling part to support the perimeter of the motor device, and a screw penetrating the motor device may be fastened to the second part.

[0020] First connection parts protruding toward the second tray may be formed on both sides of the first part spaced apart from each other, and a second connection part protruding to be aligned with the first connection part and configured to transmit the rotational force of the motor device may be formed on the second tray.

[0021] The refrigerator may further include tray holders fastened to pass through the first connection part on both sides of the first tray and coupled to rotate with the second connection part; and a shaft connecting the tray holders on both sides and rotates together, in which one of the tray holders on both sides may be connected to the drive shaft of the motor device and rotate.

[0022] The second tray may include a tray member formed of a deformable soft material and forming the

second cell; and a tray supporter configured to support the tray member and formed with a second connection part connected to the motor device, and a supporter hole may be formed in the tray supporter to expose the second cell.

[0023] A second ejector that is in contact with the second cell when the second tray rotates and separates the ice in the second cell may be mounted at the first tray, and the second ejector may include a second ejector body mounted on the first tray and extending to be disposed at a rotation radius of the second tray; and a plurality of second fins that protrude from the second ejector body and deform the plurality of second cells when the second tray rotates to separate ice.

[0024] An ejector mounting part extending downward and coupled to the second ejector body may be formed on the first tray, an ejector coupling part on which the ejector mounting part is seated may be formed on the second ejector body, and a screw may be fastened to the ejector mounting part to couple the ejector mounting part and the ejector coupling part.

[0025] The ejector mounting part may include an upper surface of the mounting part where the screw hole is formed; an extension surface of the mounting part extending downward from the upper surface of the mounting part; and an extension protrusion protruding from the extension surface of the mounting part and extending along the extension surface of the mounting part in the vertical direction, and an ejector groove into which the extension protrusion is inserted may be formed in the ejector coupling part.

[0026] The second ejector body may be supported on the inner surface of the door in a state where the second ejector body is coupled to the ejector mounting part.

[0027] The door may be a refrigerating compartment door that shields the refrigerating compartment formed in the cabinet, the refrigerating compartment door may be provided with an ice-making compartment that forms an insulated space, and the ice-making compartment may be equipped with the ice maker and an ice bank provided below the ice maker to store ice made by the ice maker.

[0028] A dispenser may be equipped on the front surface of the refrigerating compartment door for extracting the ice stored in the ice bank.

[0029] In another aspect, a refrigerator according to an embodiment of the present disclosure may include a cabinet having a storage space; a door configured to open and close the storage space; and an ice maker provided in the door, in which the ice maker may include a first tray made of metal material, fixed to the door, and having a plurality of first cells; a second tray in contact with the first tray by rotation and having a plurality of second cells forming space where ice is made together with the first cells; and a motor device for operating the second tray, in which the second tray is rotatably coupled to the first tray, and the motor device may be connected to the second tray in a power transmission manner in a state of being mounted on the first tray.

[0030] The following effects may be expected from the refrigerator according to the proposed embodiment.

[0031] According to an embodiment of the present disclosure, the ice maker may have a structure in which a cover, a motor device, a second tray, and a first ejector are all mounted on the first tray based on the first tray. Accordingly, components operated for ice-making and separating may maintain a coupled state and an aligned state even during repetitive operations.

[0032] In addition, by maintaining the aligned state of the ice maker's configuration, there are advantages in that the ice-making quality of spherical ice may be maintained and ice may be ensured to be made in a spherical shape. In particular, when the ice maker is mounted on the door, even when shocks from opening and closing the door are repeatedly transmitted, the plurality of components may maintain the aligned state on the first tray, which has the advantage of ensuring ice-making quality.

[0033] In addition, the ice maker in the assembled state may be fixedly mounted by the tray mounting part of the first tray. Therefore, installation or detachment of the ice maker becomes simple and easy.

[0034] Additionally, the first tray is made of a metal material and has the advantage of being able to provide sufficient strength so that the components of the ice maker may be installed and serve as a fixture for the ice maker.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035]

FIG. 1 is a front view illustrating a refrigerator according to a first embodiment of the present disclosure.

FIG. 2 is a view schematically illustrating the path of cold air flow between the door and the cabinet.

FIG. 3 is a view illustrating the inside of the ice-making compartment of the door.

FIG. 4 is a view illustrating a state where the mounting member, ice maker, and ice bank are separated from the door.

FIG. 5 is a perspective view illustrating the ice maker seen from one direction.

FIG. 6 is an exploded perspective view illustrating the ice maker.

FIG. 7 is a perspective view illustrating the first tray viewed from above.

FIG. 8 is a perspective view illustrating the first tray viewed from below.

FIG. 9 is an exploded perspective view illustrating the coupled structure of the first tray and the cover.

FIG. 10 is a plan view illustrating a state where the first tray and cover are coupled.

FIG. 11 is a cross-sectional view taken along line 11-11 of FIG. 10.

FIG. 12 is a partial perspective view illustrating a state where the motor device is coupled to the first tray.

FIG. 13 is a front view illustrating the coupled structure of the first tray, the second tray, and the motor device.

FIG. 14 is a perspective view illustrating the ice maker with the second tray open, as seen from below.

FIG. 15 is a cross-sectional view taken along line 15-15 of FIG. 13.

FIG. 16 is a cross-sectional view taken along line 16-16 of FIG. 13.

FIG. 17 is a perspective view illustrating the second ejector of the ice maker

FIG. 18 is a cross-sectional view illustrating the coupled structure of the first tray and the second ejector

FIG. 19 is a perspective view illustrating the ice maker seen from another direction.

FIG. 20 is an exploded perspective view illustrating the coupled structure of other components based on the first tray of the ice maker.

FIG. 21 is a cross-sectional view illustrating a state where water is supplied to the ice maker.

FIG. 22 is a cross-sectional view illustrating the ice maker when it is in an ice-making state.

FIG. 23 is a cross-sectional view illustrating the ice maker when it is in a separating state.

FIG. 24 is an exploded perspective view illustrating the coupling structure of the first tray according to the second embodiment of the present disclosure.

FIG. 25 is an exploded perspective view illustrating the coupling structure of the first tray according to the third embodiment of the present disclosure.

FIG. 26 is an exploded perspective view illustrating the coupled structure of the first tray and the motor device according to the fourth embodiment of the present disclosure.

FIG. 27 is a cross-sectional view illustrating the coupled state of the first tray and the motor device.

FIG. 28 is a perspective view illustrating the first tray according to the fifth embodiment of the present disclosure.

FIG. 29 is a perspective view illustrating the first tray according to the sixth embodiment of the present disclosure.

FIG. 30 is a view illustrating the cold air flow state in the ice maker according to the sixth embodiment of the present disclosure.

FIG. 31 is an exploded perspective view illustrating the second tray according to the seventh embodiment of the present disclosure.

FIG. 32 is a cross-sectional view illustrating an ice maker according to the seventh embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0036] Hereinafter, specific embodiments of the present disclosure will be described in detail along with the

drawings. However, the present disclosure cannot be said to be limited to the embodiments in which the idea of the present disclosure is presented, and other disclosures that are regressive or other embodiments included within the scope of the present disclosure may be easily suggested by adding, changing, or deleting other components.

[0037] Additionally, in describing the components of the embodiments of the present disclosure, terms such as first, second, A, B, (a), and (b) may be used. These terms are only used to distinguish the component from other components, and an essence, order or sequence of a corresponding component is not limited by the terms. When a component is described as being "connected," "coupled," or "joined" to another component, it should be understood that component may be connected or joined directly to other component, but another component between respective components may be "connected," "coupled," or "joined."

[0038] Before explaining, define the direction. In an embodiment of the present disclosure, the direction in which the front surface of the door illustrated in FIG. 1 faces may be defined as a front direction, the direction toward the cabinet based on the front surface of the door may be defined as a rear direction, the direction toward the floor surface on which the refrigerator is installed may be defined as a downward direction, and the direction away from the floor surface may be defined as an upward direction. Additionally, the direction toward the center of the door or cabinet may be defined as inside, and the direction away from the center may be defined as outside.

[0039] FIG. 1 is a front view illustrating a refrigerator according to a first embodiment of the present disclosure, and FIG. 2 is a view schematically illustrating the path of cold air flow between the door and the cabinet.

[0040] As illustrated, the refrigerator 1 according to an embodiment of the present disclosure may include a cabinet 10 forming a storage space and a door 20 opening and closing the storage space.

[0041] The cabinet 10 may be divided into upper and lower storage spaces. The storage space may include a refrigerating compartment 11 and a freezing compartment 12 disposed in a vertical direction. For example, the freezing compartment 12 may be a first storage chamber, and the freezing compartment 12 may be a second storage chamber. Additionally, an evaporator 14 that cools the refrigerating compartment 11 and the freezing compartment 12 may be disposed in the freezing compartment 12.

[0042] The door 20 may include a refrigerating compartment door 21 that opens and closes the refrigerating compartment 11 and a freezing compartment door 22 that opens and closes the freezing compartment 12. For example, the refrigerating compartment door 21 may be a first door, and the freezing compartment door 22 may be a second door.

[0043] The refrigerating compartment door 21 may be connected to the cabinet 10 by hinges 131 and 132 and

may be a rotary door that opens and closes the refrigerating compartment 11 by rotation. Additionally, a pair of the refrigerating compartment doors 21 may be disposed on both left and right sides, and the refrigerating compartment 11 may be opened and closed by the pair of refrigerating compartment doors 21. Additionally, the freezing compartment door 22 may be configured to be pulled in and out in a drawer style to open and close the freezing compartment. Of course, the freezing compartment door 22 may be composed of a pair of doors that rotate on both left and right sides, like the refrigerating compartment door 21.

[0044] Meanwhile, an ice-making compartment 23 may be formed in one of the refrigerating compartment doors 21. Additionally, a dispenser 24 for dispensing water or ice may be provided on the front surface of the refrigerating compartment door 21 where the ice-making compartment 23 is provided.

[0045] The ice-making compartment 23 is an insulated space and may be opened and closed by the ice-making compartment door 231. Additionally, cold air from the evaporator 14 may be supplied into the ice-making compartment 23. For this purpose, a cabinet duct 15 may be provided inside the cabinet 10, and an ice-making compartment duct 25 may be provided in the refrigerating compartment door 21. In addition, when the refrigerating compartment door 21 is closed, the cabinet duct 15 and the ice-making compartment duct 25 communicate with each other so that cold air from the evaporator 14 may be supplied to the ice-making compartment 23. Additionally, the air heat-exchanged in the ice-making compartment 23 may be discharged into the freezing compartment 12.

[0046] Meanwhile, the flow path of cold air supplied to the ice-making compartment 23 is not limited to the above-described examples and may be provided in various ways. For example, the evaporator 14 may be further provided in the refrigerating compartment 11, and a flow path may be configured to supply cold air from the evaporator disposed in the refrigerating compartment 11 to the ice-making compartment 23.

[0047] FIG. 3 is a view illustrating the inside of the ice-making compartment of the door, and FIG. 4 is a view illustrating a state where the mounting member, ice maker, and ice bank are separated from the door

[0048] As illustrated, the ice-making compartment 23 may be recessed by the door liner 211 that forms the rear surface of the refrigerating compartment door 21. In addition, the open rear surface of the ice-making compartment 23 may be opened and closed by the ice-making compartment door 231. Additionally, a cold air inlet 232 through which cold air flows in and a cold air outlet 233 through which cold air is discharged may be formed at the upper and lower portions of the ice-making compartment 23, respectively.

[0049] An ice maker 30 that makes ice may be installed at the upper portion of the ice-making compartment 23. Additionally, an ice bank 27 may be provided below the ice-making compartment 23 to store ice separated from

the ice maker 30.

[0050] A mounting member 26 may be provided on the inner surface of the ice-making compartment 23. The ice maker 30 and the ice bank 27 may be fixedly mounted on the mounting member 26. The mounting member 26 may be formed to be stronger than the door liner 211.

[0051] The mounting member 26 may form a portion of the front and lower surfaces of the ice-making compartment 23. Additionally, an ice maker mounting part 261 to which the ice maker 30 is coupled may be formed on the mounting member 26. The ice maker mounting part 261 may be formed in a position corresponding to the tray mounting part 43, which will be described below. For example, the ice maker mounting part 261 may be recessed into a corresponding shape so that the tray mounting part 43 may be inserted.

[0052] In addition, a screw 262 is fastened to pass through the ice maker mounting part 261 in front of the mounting member 26, and the screw 262 is fastened to the tray mounting part 43 so that the ice maker 30 may be installed in the ice-making compartment 23. At this time, since the screw 262 is fastened in front of the mounting member 26, it may be fundamentally prevented from flowing into the ice bank 27.

[0053] An ice chute 234 in communication with the dispenser 24 may be provided on the lower surface of the ice-making compartment 23. When the dispenser 24 is operated, ice stored in the ice bank 27 may be discharged to the dispenser 24 through the ice chute 234.

[0054] Meanwhile, in order to place the ice maker 30 and the ice bank 27 within the limited space of the ice-making compartment 23, the ice maker 30 may be required to have a compact structure.

[0055] In particular, due to the structural characteristics of the ice-making compartment 23 provided in the refrigerating compartment door 21, the size of the ice made by the ice maker 30 cannot be increased, and it has a structure for making a large number of small-sized ice.

[0056] Accordingly, the distance between the cells C where a plurality of ice is made is narrowed, and the operation path of the components constituting the ice maker 30 also becomes smaller, so precise operation between respective components may be required.

[0057] Accordingly, the components constituting the ice maker 30 may have an assembly structure that minimizes clearance, and may have a structure that prevents malfunction or unsatisfactory performance of each component due to clearance.

[0058] In order to secure the amount of ice, the remaining components of the ice maker 30, excluding the space where ice is made, must be kept simple. In addition, the structure for mounting the ice maker 30 may be simple and has a mounting structure that maintains a solid mounting state on the refrigerating compartment door 21 that is repeatedly opened and closed.

[0059] Hereinafter, the ice maker 30 will be described in detail with reference to the drawings.

[0060] FIG. 5 is a perspective view illustrating the ice

maker seen from one direction, and FIG. 6 is an exploded perspective view illustrating the ice maker.

[0061] As illustrated, the ice maker 30 may include a first tray 40 and a second tray 50 for making a plurality of spherical ice cubes. In addition, the ice maker 30 may include a cover 60 to guide the flow of cold air to the first tray 40. Additionally, the ice maker 30 may include a motor device 70 for rotating the second tray 50. In addition, the ice maker 30 may include a first ejector 80 for separating ice from the first tray 40 and a second ejector 90 for separating ice from the second tray 50.

[0062] Meanwhile, in the present embodiment, the structure in which the first tray 40 and the second tray 50 are disposed in the vertical direction is described as an example, but the present disclosure is not limited to this, and a variety of structures that may make and separate ice by the rotation of the second tray 50, round-tripping, or the like will be possible. For example, in a state where the first tray 40 is fixed, the second tray 50 is moved in one direction to receive water and then make ice, and the second tray 50 may have a structure of being moved in the other direction to separate ice. At this time, the second tray 50 may perform a linear reciprocating movement, for example, may be moved in the front and rear direction or in the vertical direction.

[0063] The first tray 40 may include a plurality of first cells 401. The first tray 40 may be referred to as an upper tray or a fixed tray. In addition, the first cell 401 may be referred to as an upper cell.

[0064] The first tray 40 engages with the second cell 512 of the second tray 50 to form a spherical cell C, thereby making spherical ice. As an example, the first cell 401 may have a hemispherical shape.

[0065] The first tray 40 is made of a high-strength metal material and may be firmly fixed to the door 21. Of course, the first tray 40 may be made of another material with excellent strength. In addition, the cover 60 provided with the first ejector 80 on the first tray 40, the second tray 50, the motor device 70, and the second ejector 90 may be coupled. In other words, multiple components are coupled based on the first tray 40, and each component maintains the aligned state when the ice maker 30 operates. The first tray 40 may be made of a metal material with high rigidity and no deformation. As an example, the first tray may be formed by die casting and forming an aluminum material. Accordingly, by allowing other components to be assembled around the first tray 40, operational reliability may be guaranteed when components coupled with the first tray are operated.

[0066] In addition, the overall structure of the ice maker 30 may be simplified by assembling a plurality of components based on the first tray 40, and the operation reliability of each component may be increased by simplifying the operation path.

[0067] In detail, if there is no standard component when assembling and installing each component of the ice maker, the number of components to connect them increases, and accordingly, there is a problem that the

clearance and accumulated clearance during operation increase.

[0068] However, by having a structure in which the motor device 70 for operation and the second tray 50 are directly or indirectly connected to each other based on the highly rigid first tray 40, the overall number of parts is reduced and the coupled structure is simplified, the number of accumulated clearances is reduced and the operation reliability is secured. For example, when the second tray 50 is rotated for ice-separation, the clearance of the second tray 50 may be minimized so that the second tray 50 may be rotated by a designed rotation amount, and the amount of deformation caused by contact with the lower ejector 90 is secured, and reliable ice-separation may be possible.

[0069] In particular, by having a structure which is connected so that the motor device 70 may rotate the second tray 50 using the first tray 40, the power transmission structure may be simplified and operation reliability may be improved.

[0070] As an example, a tray mounting part 431 may be formed on the first tray 40. In addition, a motor device mounting part 44 on which the motor device 70 is mounted may be formed on the first tray 40. Additionally, a first connection part 411 connected to the second tray 50 may be formed on the first tray 40. Additionally, a second ejector 90 may be mounted on the first tray 40.

[0071] The motor device 70 is connected to the full ice detection member 71 and may operate the full ice detection member 71. The full ice detection member 71 may determine whether ice is full by contacting the ice stored in the ice bank 27 when it is located at a set height or more.

[0072] Additionally, tray holders 72 may be provided on both sides of the first tray 40. The tray holder 72 may transmit the rotational force of the motor device 70 to the second tray 50.

[0073] A holder connection part 721 may be formed to protrude from the tray holder 72. The holder connection part 721 may pass through the first connection part 411 and be coupled to the second connection part 522. As an example, the holder connection part 721 may be rotatably mounted on the first connection part 411 by penetrating the bush 74 mounted on the first connection part 411. Additionally, the shaft 73 may be inserted into the holder connection parts 721 on both sides disposed in opposite directions, and the tray holders 72 on both sides may be connected by the shaft 73.

[0074] Among the tray holders 72 on both sides, a motor connection part 722 connected to the drive shaft 701 of the motor device 70 may be formed on one tray holder 72 closer to the motor device 70. Therefore, when the motor device 70 operates, the tray holder 72 connected to the motor device 70 rotates, and the tray holders 72 on both sides may be rotated simultaneously by the shaft 73. Accordingly, the second tray 50 may transmit rotational force to both the left and right sides simultaneously and rotate based on the shaft 73.

[0075] The tray holder 72 may include a holder arm 723 extending in a direction away from the rotation center of the tray holder 72. Additionally, an elastic member 75 may be connected to the end portion of the holder arm 723. For example, the elastic member 75 may be a spring. One end of the elastic member 75 may be fixed to the holder arm 723, and the other end thereof may be fixed to the tray supporter 52. In addition, the elastic member 75 may provide an elastic force to rotate the second tray 50 in the closing direction so that the first tray 40 and the second tray 50 are brought into closer contact when making ice.

[0076] A heater 48 and a heater cover 49 may be disposed on the upper surface of the first tray 40. The heater 48 may be operated to heat the first tray 40 to separate ice. The heater 48 may be disposed along the perimeter of the plurality of first cells 401. In addition, the heater cover 49 may shield and secure the heater 48.

[0077] The cover 60 may be coupled to the first tray 40 above the first tray 40. Additionally, the cover 60 may have a structure capable of guiding cold air and supplying water to the first tray 40. Additionally, the cover 60 may guide the first ejector 80 to move in the vertical direction.

[0078] The first ejector 80 may include an ejector body 81 extending toward both sides of the cover 60 and a first pin 82 extending downward from the ejector body 81. The first ejector 80 may be moved in the vertical direction while being guided by both sides of the cover 60.

[0079] In addition, links 76 connected to both sides of the second tray 50 may be coupled to both sides of the ejector body 81. The first ejector 80 may move in the vertical direction in conjunction with the rotation of the second tray 50.

[0080] A plurality of first fins 82 may be formed at positions corresponding to the first cell 401. Additionally, the first pin 82 may push and separate the ice inside the first cell 401 by passing through the cell extension part 422, which will be explained below.

[0081] The second tray 50 may include a tray member 51 on which a plurality of second cells 512 are formed, and a tray supporter 52 supporting the tray member 51. In addition, the second tray 50 may further include a tray cover 53. The second tray 50 may be referred to as a second tray assembly, lower tray, or movable tray.

[0082] In detail, a plurality of second cells 512 may be formed in the tray member 51. The second cell 512 may be referred to as a lower cell. The second cells 512 may be formed in numbers corresponding to positions corresponding to the first cells 401.

[0083] The tray member 51 may include a second tray body 511 formed in a planar shape, and the second cell 512 may be open at the upper surface of the second tray body 511. Additionally, the lower wall 513 may extend upward along the outer edge of the second cell 512. The lower wall 513 may protrude upward from the upper surface of the second tray body 511. The lower wall 513 may prevent water filled in the second cell 512 from overflowing to the outside of the second tray 50. In addition,

the second tray body 511 may be formed in a planar shape and may protrude further outward than the lower wall 513. The perimeter of the second tray body 511 may be fixed between the tray supporter 52 and the tray cover 53.

[0084] Additionally, the tray member 51 may be made of a soft material. As an example, the tray member 51 may be made of silicon material. Accordingly, the tray member 51 may be in close contact with the first tray 40 to make them airtight, and may be deformed when in contact with the second ejector 90 for ice-separation.

[0085] The tray supporter 52 may support the second tray 50 from below. Additionally, in order to reinforce the soft tray member 51, the tray supporter may be made of metal or plastic material. A plurality of supporter holes 521 may be formed in the tray supporter 52. The supporter hole 521 may be formed to allow the second cell 512 protruding downward to pass through. In other words, when the tray member 51 and the tray supporter 52 are coupled, the lower portion of the second cell 512 may protrude downward through the supporter hole 521.

[0086] The second connection part 522 may be formed on both left and right sides of the tray supporter 52, and the holder connection part 721 may be inserted. At this time, the inner surface of the second connection part 522 and the holder connection part 721 may be keyed, and therefore, the tray supporter 52 may be rotated when the tray holder 72 rotates. In addition, the tray member 51 fixed to the tray supporter 52 may be rotated together.

[0087] In addition, supporter protrusions 523 may be formed on both left and right sides of the tray supporter 52. The supporter protrusion 523 may be rotatably coupled to the lower end of the link 76.

[0088] A tray cover 53 may be provided on the upper surface of the tray member 51. The tray cover 53 may be formed along the edge of the tray member 51. In addition, the tray cover 53 may be formed with a cover opening 531 through which the upper end of the tray member 51 passes. The cover opening 531 may be formed along the perimeter of the second cell 512. Additionally, the lower wall 513 may pass through the cover opening 531 and protrude upward. The opened upper surfaces of the lower wall 513 and the second cell 512 are exposed through the cover opening 531, and are in contact with the first cell 401 when the tray member 51 is closed, and thus a spherical cell C may be formed.

[0089] Additionally, a cover coupling part 532 extending downward may be formed on the tray cover 53. The cover coupling part 532 may be coupled to the tray supporter 52. When the tray cover 53 and the tray supporter 52 are coupled, the tray member 51 may be disposed in a fixed state between the tray cover 53 and the tray supporter 52. Accordingly, the tray cover 53, the tray supporter 52, and the tray member 51 may be rotated together as one assembly in a coupled state.

[0090] A second ejector 90 may be provided below the first tray 40 and the second tray 50. The second ejector 90 may be coupled with the first tray 40. The second ejector

90 may include an ejector body 91 connected to the first tray 40 and a plurality of second pins 92 protruding from the ejector body 91.

[0091] Hereinafter, each component of the ice maker 30 will be described in more detail with reference to the drawings.

[0092] FIG. 7 is a perspective view illustrating the first tray viewed from above, and FIG. 8 is a perspective view illustrating the first tray viewed from below.

[0093] As illustrated, the first tray 40 may include a first part 41 in which a plurality of first cells 401 are formed. The first part 41 may be formed in a plate shape. The first part 41 may be called a first area or tray part.

[0094] The first cell 401 may be formed in a hemispherical shape with an open lower surface. The first cells 401 may be disposed in two rows in the front and rear direction. The first cells in the first row and the second row may be disposed in alternate directions, and the cell forming parts 42 forming the first cells 401 in the first row and the first cells 401 in the second row may be in contact with each other. Accordingly, the ice maker 30 may be compactly placed in the ice-making compartment 23 by minimizing the width of the first tray 40 in the front and rear direction.

[0095] A plurality of cell forming parts 42 may be formed in the first part 41. The cell forming part 42 may have the first cell 401 formed therein. Additionally, the upper portion of the cell forming part 42 may be recessed in the first part 41 to correspond to the shape of the first cell 401. Accordingly, the cell forming part 42 may maintain the same overall thickness, and cold air may be uniformly transmitted to the entire surface of the first cell 401.

[0096] The lower end of the cell forming part 42 may protrude downward from the first part 41. The lower portion of the cell forming part 42 protruding downward from the first part 41 may be referred to as an upper wall 421. The upper wall 421 may be accommodated inside the lower wall 513 formed on the second tray 50 when the second tray 50 rotates. In addition, the upper wall 421 and the lower wall 513 may be in contact with each other.

[0097] The cell extension part 422 may extend upward from the upper end of the first cell 401. The cell extension part 422 may be located above the first part 41. The cell extension part 422 may form a passage through which the first pin 82 may enter and exit.

[0098] In addition, when the amount of water supplied to the cell C is large, the water inside the cell C is allowed to freeze in the cell extension part 422, and thus it is also possible to prevent the space between the first tray 40 and the second tray 50 from widening due to the volume expansion of ice. The cell extension part 422 may be referred to as a buffer part.

[0099] Additionally, water for water supply may be supplied through one of the plurality of cell extension parts 422. Accordingly, a coupling part 423 for connecting to the water supply part 64 may be further formed in the cell extension part 422.

[0100] A heater groove 413 recessed along the edges of the plurality of cell forming parts 42 may be formed in the first part 41. The heater groove 413 may be formed along the outer edges of the first cells 401. In addition, the heater 48 may be disposed along the heater groove 413. The heater 48 may be in contact with the upper portion of the cell forming part 42 when mounted in the heater groove 413 and may be disposed to pass the area of the plurality of first cells 401. Therefore, when the heater 48 operates, the heat of the heater 48 may be evenly transmitted to the entire first cell 401, and the ice formed inside the first cell 401 may be heated to facilitate ice-separation.

[0101] Additionally, a sensor groove 414 may be formed on the upper surface of the first part 41. The temperature sensor 77 may be inserted into the sensor groove 414 while being mounted on the cover 60. Additionally, the temperature sensor 77 may measure the temperature that determines completion of ice-making by being in contact with the first tray 40 within the sensor groove 414.

[0102] Additionally, a terminal groove 415 may be formed on the upper surface of the first part 41. The terminal groove 415 may accommodate a terminal 78 connecting the heater 48 and the electric wire 781. Accordingly, the heater 48 and the terminal 78 provided in the first part 41 do not protrude from the tray body 41 and do not interfere with the flow of cold air.

[0103] Additionally, a tray rib 416 may be formed on the upper surface of the first part 41. The tray rib 416 is formed along a position corresponding to the lower end of the cover 60 and may be in contact with the lower end perimeter of the cover 60 when the cover 60 is installed. In addition, a recessed electric wire guide part 417 may be formed in the tray rib 416 to allow the electric wire 781 connected to the heater 48 to pass. The electric wire 781 may be guided to the outside of the cover 60 through the electric wire guide part 417.

[0104] In addition, fastening bosses 418 to which screws 616 penetrating the cover 60 are fastened may be formed on both left and right sides of the upper surface of the first part 41. The cover may be fixed to the first tray 40 by the fastening bosses 418.

[0105] The tray mounting part 43 may be formed on the first tray 40. The tray mounting part 43 may be formed at the front end of the first part 41. The tray mounting part 43 may protrude further outward than the cover 60.

[0106] In detail, the tray mounting part 43 may include a first extension part 431 extending forward and a second extension part 432 extending upward from the front end of the first extension part 431. The second extension part 432 may be coupled to the ice maker mounting part 261 of the mounting member 26. In addition, a screw hole 433 into which a screw 262 penetrating the ice maker mounting part 261 is fastened may be formed in the second extension part 432. The second extension part 432 may be formed in a shape corresponding to the recessed shape of the ice maker mounting part 261.

[0107] A plurality of tray mounting parts 43 may be spaced apart from each other. As an example, the tray mounting part 43 may be formed on both left and right ends of the first part 41, respectively. Therefore, the ice maker 30 may be more firmly fixed to the door 21, and in particular, each component of the above ice maker 30 may maintain a solid mounting state without moving even when subjected to a rotational moment that occurs during rotational motion.

[0108] The first tray 40 may be equipped with a cover 60 on which the first ejector 80 is mounted, a second tray 50, a motor device 70, and a second ejector 90. In addition, while all of these components are coupled to the first tray 40, the entire ice maker 30 may be mounted on or separated from the door 21 at once by fastening or separating the screw 262.

[0109] The first tray 40 may be formed with an ejector mounting part 45 to which the second ejector 90 is coupled. The ejector mounting part 45 may be formed at the front end of the first part 41. A plurality of ejector mounting parts 45 may be spaced apart from each other along the front end of the first part 41. Additionally, the ejector mounting part 45 may be disposed between the tray mounting parts 43. Additionally, the ejector mounting part 45 may be connected to the tray mounting part 43 as one body. Accordingly, the strength of the tray mounting part 43 and the ejector mounting part 45 may be further strengthened.

[0110] The ejector mounting part 45 may be seated on the ejector coupling part 93 formed in the second ejector 90, and a screw 932 penetrating the ejector mounting part 45 may be fastened to the ejector coupling part 93.

[0111] The ejector mounting part 45 may include an upper surface 451 of the mounting part extending rearward and an extension surface 455 of the mounting part extending downward. Additionally, a screw hole 452 into which the screw 932 is fastened may be formed on the upper surface 451 of the mounting part. Accordingly, the screw 932 may be fastened from the top to the bottom to the second ejector 90, and it may be prevented that the screw 932 is loosened to flow into the ice bank 27.

[0112] The extension surface 455 of the mounting part may include a first extension surface 454 and a second extension surface 453. In detail, the first extension surface 454 may extend downward from the front end of the first part 41. Additionally, the upper surface 451 of the mounting part may protrude forward from the first extension surface 454. At this time, the first extension surface 454 may extend further downward than the upper surface 451 of the mounting part.

[0113] A fixing protrusion 456 extending in the vertical direction may be formed on the first extension surface 454. The fixing protrusion 456 protrudes toward the second extension surface 453 and may extend in the vertical direction along the first extension surface 454. In addition, it may be inserted into the fixing groove 912 of the second ejector 90. In addition, a reinforcing rib 457 formed on the rear side of the second extension surface

453. The reinforcing rib 457 may connect the lower surface of the first part 41 and the rear surface of the second extension surface 453. A plurality of reinforcing ribs 457 may be formed.

[0114] A second extension surface 453 extending downward may be formed at the front end of the upper surface of the mounting part 451. The second extension surface 453 may extend in a direction opposite to the tray mounting part 43. In addition, the front surface of the second extension part 432 may be in contact with the mounting member 26. Therefore, when the ice maker 30 is installed, the second extension part 432 is supported on the door 21 together with the tray mounting part 43, thereby maintaining a more stable support and installation state.

[0115] Meanwhile, the first connection part 411 may be formed on the lower surface of the first part 41. The first connection part 411 is located on both left and right sides of the first part 41 and may be formed further outside the tray mounting part 43 and the ejector mounting part 45.

[0116] The first connection part 411 may be formed at a position corresponding to the second connection part 522. The first connection part 411 may have an upper opening 4111 through which the holder connection part 721 passes. An upper groove 4112 may be formed on one side of the upper opening 4111.

[0117] The boss 74 is inserted into the upper opening 4111, and the boss protrusion protruding from the outer surface of the boss 74 is inserted into the upper groove 4112 so that the boss 74 may be fixed inside the upper opening 4111. In addition, the holder connection part 721 may pass through the boss 74. The holder connection part 721 may penetrate the inside of the boss 74 and be rotatably disposed. Accordingly, the holder connection part 721 may freely rotate about the first connection part 411 as an axis.

[0118] The first connection part 411 may be located rearward of the first cell 401. In other words, the ice maker 30 may have a structure in which the cell C opens and closes when the second tray 50 rotates about the first connection part 411 and the second connection part 522.

[0119] The first tray 40 may further include a motor device mounting part 44. In other words, the motor device mounting part 44 may be formed integrally with the first tray 40. The motor device mounting part 44 may protrude laterally from one of the left and right sides of the first part 41.

[0120] The motor device mounting part 44 secures the motor device 70 to the first tray 40. The motor device 70 may transmit power to the second tray 50 while being mounted on the motor device mounting part 44.

[0121] The motor device mounting part 44 may include a second part 441 coupled to the motor device 70 and a third part 442 connecting between the first part 41 and the second part 441. The second part 441 may be referred to as a second area or unit coupling part 441. In addition, the third part 442 may be referred to as a third area or unit extension part 442.

[0122] As an example, the first tray 40 may further include the second part 441. Additionally, the first tray 40 may further include the third part 442. As another example, the bent third part 442 may be omitted, and the second part 441 may be directly connected to the first part 41.

[0123] The second part 441 is coupled to the upper portion of the motor device 70, and therefore may be positioned higher than the upper surface of the first part 41. The second part 441 may include an upper surface 443 of the coupling part and an edge of the coupling part 444. The upper surface 443 of the coupling part may be formed in a size corresponding to the upper surface of the motor device 70 and may be seated on the upper surface of the motor device 70.

[0124] The edge 444 of the coupling part may extend downward along at least a portion of the outer end of the upper surface 443 of the coupling part. For example, the edge 444 of the coupling part includes a first edge part 4441 formed along the front and rear ends of the edge 444 of the coupling part, and a second edge part 4442 formed along a side end of the edge 444 of the coupling part and connecting the end portion of the first edge part 4441. The second edge part 4442 may be connected to the third part 442.

[0125] The motor device 70 is inserted into the second part 441 from the side and may be in contact with the upper surface 443 of the coupling part and the edge 444 of the coupling part, respectively. Therefore, when the motor device 70 is mounted, it may be guided to be disposed in the correct position by the upper surface 443 of the coupling part and the edge 444 of the coupling part.

[0126] The second edge part 4442 may be configured to have a pair of ribs spaced apart from each other. In addition, one side of the pair of ribs that is farthest from the third part 442 may be in contact with the side of the motor device 70. Additionally, the third part 442 may be connected to both of the pair of ribs. Accordingly, the strength of the second part 441 connected to the third part 442 may be strengthened, and the coupled strength of the second part 441 and the third part 442 may also be further strengthened.

[0127] A coupling hole 445 for coupling with the motor device 70 may be formed in the motor device mounting part 44. The coupling hole 445 may be formed to penetrate the second edge part 4442. The coupling hole 445 may be formed at a corner portion of the second edge part 4442 and the upper surface 443 of the coupling part. A plurality of coupling holes 445 may be provided, may be disposed to be spaced apart from each other, and may be formed at a position corresponding to the coupling protrusion 702 formed on the motor device 70.

[0128] Additionally, a mounting part groove 446 may be formed in the motor device mounting part 44. The mounting part groove 446 is formed at an end portion of the upper surface 443 of the coupling part and may be recessed to allow the fastening protrusion 703 of the

motor device 70 to be inserted. Additionally, a screw fastening part 4461 may be further formed on the motor device mounting part 44. The screw fastening part 4461 may be formed to protrude from the mounting part groove 446.

[0129] Meanwhile, the third part 442 may be formed by continuous bending to connect the side end of the first part 41 and the side end of the second part 441. The third part 442 may be connected to the second part 441 disposed on the side and above the first part 41. In addition, the third part 442 may have coupling part reinforcement ribs 4421 formed on the upper and lower surfaces of the third part 442 and extending in a direction intersecting the third part 442. Therefore, the strength of the third part 442 may be strengthened, and deformation of the motor device mounting part 44 is prevented, so that the mounting position of the motor device 70 may be maintained even during repeated operations of the ice maker 30, and power transmission performance may be guaranteed.

[0130] Hereinafter, each component coupled with the first tray 40 will be described in more detail with reference to the drawings.

[0131] FIG. 9 is an exploded perspective view illustrating the coupled structure of the first tray and the cover, FIG. 10 is a plan view illustrating a state where the first tray and cover are coupled, and FIG. 11 is a cross-sectional view taken along line 11-11 of FIG. 10.

[0132] As illustrated, the cover 60 may be mounted on the upper surface of the first tray 40. The cover 60 may form the upper portion of the ice maker 30 when coupled with the first tray 40.

[0133] The cover 60 may include a cold air guide part 62 that guides cold air to the first tray 40. The cold air guide part 62 may form a portion of the cover 60 and may include a guide surface 621 that guides cold air forward. The guide surface 621 may have a slope that becomes lower as it gets closer to the first cell 401. In addition, a guide part edge 622 may be formed along the perimeter of the guide surface 621, and the guide part edge 622 may be in contact with the upper surface of the first part 41 to form a cold air flow passage 600.

[0134] Additionally, the cold air guide part 62 may include a duct part 63 protruding laterally. The duct part 63 may be extended to communicate with the cold air inlet 232. When the ice maker 30 is installed, the duct part 63 comes into contact with one side of the ice-making compartment 23 where the cold air inlet 232 is formed.

[0135] Therefore, the cold air supplied through the cold air inlet 232 flows into the inside of the cold air guide part 62 through the duct part 63, and, while flowing backward along the guide surface 621, passes through the cold air flow passage 600. The cold air passing the guide surface 621 and heading backward cools the first tray 40 while passing the upper surface of the first tray 40.

[0136] In detail, the cover 60 may include a cover part 61 spaced apart from the upper surface of the first tray 40. The cover part 61 may be located above the first cell 401

and may be spaced apart from the upper surface of the first tray 40 to form the cold air flow passage 600.

[0137] Additionally, a plurality of cover holes 611 may be formed in the cover part 61. Then, the cell extension part 422 may be inserted into the cover hole 611. The cell extension part 422 may be disposed to pass the cold air flow passage 600 through which cold air flows. Accordingly, the cell extension part 422 may be cooled by being in contact with cold air passing through the cold air flow passage. The cooled heat of the cell extension part 422 may be conducted and transferred into the first cell 401, and the plurality of first cells 401 may be evenly cooled.

[0138] Cold air flowing through the cold air flow passage 600 passes the outer surface of the cell extension part 422 and the upper surface of the cell forming part 42. Since the first tray 40 is made of a metal material, cold air in contact with the upper portion of the first cell 401 and the cell extension part 422 may cool all of the plurality of first cells 401. Accordingly, the water inside the first cell 401 may be cooled evenly, and ice may be created at a uniform rate in each of the cells C.

[0139] In particular, the first tray 40 is made of a metal material with excellent thermal conductivity, such as aluminum, and is configured to effectively transfer heat to each cell C where ice-making is performed, so that the amount of ice-making may be increased.

[0140] Additionally, the first tray 40 may be cooled by cold air even before the ice-making operation is performed. Due to the nature of the material, the first tray 40 is cooled by cold air, so preheating efficiency may be increased. Therefore, ice-making efficiency may be further improved during water supply and ice-making operations.

[0141] Additionally, heat may be transferred throughout the first tray 40 by conduction, and heat may be evenly transferred throughout the plurality of cells C. Therefore, it is possible to reduce the difference in ice-making speed between the plurality of cells C. In addition, the shape and size of the ice inside the cell C may be made uniform, and in particular, the height difference of the ice protruding into the cell extension part 422 may be reduced.

[0142] The cover part 61 may be equipped with a temperature sensor 77 to detect the temperature of the first tray 40.

[0143] In addition, a screw hole 615 into which a screw 616 is fastened may be formed in the cover part 61. The screw 616 passes through the screw hole 615 from above and may be fastened to the fastening boss 418 of the first tray 40 to couple the cover 60 and the first tray 40.

[0144] The cover 60 may be provided with a water supply part 64. The water supply part 64 is for supplying water to the cell C, and may be configured to receive water supplied from the water supply pipe 640 protruding inside the ice-making compartment 23. A portion of the water supply part 64 may be connected to any one of the cell extension parts 422, and water may be supplied to the cell extension part 422 through the water supply port 644 formed in the water supply part 64.

[0145] Meanwhile, a cover fastening part 623 extending downward may be formed at the front end of the cover part 61. The cover fastening part 623 may extend through the tray coupling port 439 of the first tray 40. The tray coupling port 439 may be formed between the tray mounting part 43 and the ejector mounting part 45. Additionally, the cover fastening part 623 has an extended end portion formed in a hook shape so that it may be locked with the first tray 40. Therefore, the cover 60 and the first tray 40 have a primary coupling structure by the cover fastening part 623 and may have a secondary coupling structure by fastening screws fastened in the vertical direction.

[0146] Meanwhile, a cover side 65 and a cover rear surface 66 extending upward may be formed on both left and right ends and the rear end of the cover part 61. The cover side 65 and the cover rear surface 66 may be referred to as a cover edge. The first ejector 80 may be provided inside the space formed by the cover side 65 and the cover rear surface 66.

[0147] An ejector guide part 650 may be formed on the cover side 65 to guide the movement of the first ejector 80. The ejector guide part 650 may be formed on both left and right sides of the cover 60. The ejector guide part 650 may be formed in the shape of a slot cut in the vertical direction on the cover side 65. Additionally, both ends of the ejector body 81 may pass through the ejector guide part 650. Accordingly, the first ejector 80 may be moved in the vertical direction along the ejector guide part 650.

[0148] When the first ejector 80 is mounted to pass through the ejector guide part 650, both ends of the ejector body 81 may protrude further outward than the ejector guide part 650, and may be connected to the upper end of the link 76. Additionally, the lower end of the link 76 may be rotatably connected to the tray supporter 52. Accordingly, as the second tray 50 rotates, the link 76 moves in the vertical direction and the first ejector 80 may be moved in the vertical direction.

[0149] Additionally, a cover discharge port 661 may be formed at the lower end of the cover rear surface 66. The cover discharge port 661 may communicate with the space between the cover part 61 and the upper surface of the first tray 40. Accordingly, cold air flowing between the cover part 61 and the upper surface of the first tray 40 may be discharged rearward through the cover discharge port 661.

[0150] The cold air discharged through the cover discharge port 661 passes the ice bank 27 inside the ice-making compartment 23 and heads to the freezing compartment 12 through the cold air outlet 233.

[0151] FIG. 12 is a partial perspective view illustrating a state where the motor device is coupled to the first tray, and FIG. 13 is a front view illustrating the coupled structure of the first tray, the second tray, and the motor device.

[0152] As illustrated in the drawing, the motor device 70 is comprised of a combination of multiple gears and motors. Additionally, the drive shaft 701 protruding from the motor device 70 may be connected to the second tray

50 through the tray holder 72. Accordingly, the second tray 50 may be rotated forward and backward at a set angle by the motor device 70.

[0153] A coupling protrusion 702 and a fastening protrusion 703 are formed on the motor device 70 and may be mounted on the motor device mounting part 44. In detail, the device coupling protrusion 702 may be inserted into the coupling hole 445. A pair of coupling protrusions 702 may be formed on both left and right sides. When the coupling protrusion 702 is moved laterally to be inserted into the coupling hole 445, the upper surface of the motor device 70 is in contact with the upper surface 443 of the coupling part, and the coupling unit edge 444 is in contact with the peripheral surface of the motor device 70 to support the motor device 70.

[0154] Additionally, a fastening protrusion 703 may protrude from the upper surface of the motor device 70. Additionally, the fastening protrusion 703 may be inserted into the mounting part groove 446 and be in contact with the screw fastening part 4461. In this state, the screw 704 passes through the fastening protrusion 703 and is fastened to the screw fastening part 4461, thereby fixing the motor device 70 more firmly.

[0155] Meanwhile, while the motor device 70 is mounted on the motor device mounting part 44, the drive shaft 701 of the motor device 70 may be connected to the tray holder 72.

[0156] The protrusion direction of the coupling protrusion 702 and the protrusion direction of the drive shaft 701 may extend in the same manner. Therefore, when the motor device 70 is laterally moved to be mounted on the motor device mounting part 44, the coupling of the coupling protrusion 702 and the coupling hole 445 and the coupling of the drive shaft 701 and the tray holder 72 may occur simultaneously. In addition, the screw 704 is fastened in the same direction as the insertion direction of the motor device 70, and therefore, when the screw 704 is fastened, the coupling of the coupling protrusion 702 and the coupling hole 445 and the coupling between the drive shaft 701 and the tray holder 72 may be made more secure.

[0157] FIG. 14 is a perspective view illustrating the ice maker with the second tray open, as seen from below, FIG. 15 is a cross-sectional view taken along line 15-15 of FIG. 13, and FIG. 16 is a cross-sectional view taken along line 16-16 of FIG. 13.

[0158] As illustrated in FIGS. 13 to 18, the drive shaft 701 of the motor device 70 is connected to the motor connection part 722 of the tray holder 72 on the closer side of the tray holders 72 on both sides, and thus power may be transmitted to the tray holder 72 and the second tray 50.

[0159] The second tray 50 may be connected to the first tray 40 and the tray holder 72, and may be rotated about the shaft 73 as a axis. In other words, the first tray 40 is maintained in a fixed state, and the second tray 50 is rotated according to the driving of the motor device 70 to open and close the cell C, and the operation of ice-

making and ice-separation may be performed.

[0160] In detail, the second connection part 522 is aligned with the first connection part 411 and may be disposed further outside the first connection part 411. At this time, at least a portion of the boss 74 mounted on the first connection part 411 may protrude further outward than the first connection part 411 and may be in contact with the second connection part 522.

[0161] The boss 74 may be made of a wear-resistant lubricant material such as engineering plastic. Therefore, both surfaces of the second connection part 522 and the first connection part 411 are supported by the boss 74, and it may be guaranteed that the second tray 50 does not move in the left and right direction but rotates while maintaining the correct placement position. Additionally, rotation of the holder connection part 721 penetrating the boss 74 may also be performed smoothly.

[0162] In addition, the tray holders 72 disposed on both sides of the second tray 50 rotate both sides of the second tray 50. In detail, the holder connection part 721 of the tray holder 72 passes through the second connection part 522 and is simultaneously coupled to the second connection part 522 so that it may be rotated together with the second tray 50. In addition, the holder connection part 721 may pass through the second connection part 522 and be inserted into the first connection part 411, that is, the boss 74.

[0163] In addition, both ends of the shaft 73 may be inserted into the holder connection parts 721 formed on the tray holder 72 of both sides, respectively. The shaft 73 may be formed to have a polygonal cross-section. Accordingly, the tray holders 72 on both sides connected by the shaft 73 are rotated simultaneously without slipping.

[0164] Meanwhile, a connection part protrusion 7211 for power transmission may be formed on the outer surface of the holder connection part 721. The connection part protrusions 7211 may be formed on both sides facing based on the center of the holder connection part 721.

[0165] In addition, a lower hole 5221 may be formed on the inner surface of the second connection part 522, and the connection part protrusion 7211 may be inserted into the lower hole 5221. At this time, a connection groove 5222 into which the connection part protrusion 7211 is inserted may be formed on the inner surface of the lower hole 5221. Therefore, when the holder connection part 721 rotates due to rotation of the drive shaft 701, the second tray 50 may be rotated together by the combination of the connection part protrusion 7211 and the connection groove 5222.

[0166] Meanwhile, the connection groove 5222 may be formed to be somewhat larger than the connection part protrusion 7211. Accordingly, when the second tray 50 is closed, the second tray 50 may be pressed by the elastic force of the elastic member 75 and further rotated in the closed direction. At this time, the second tray 50 may be further rotated in the closing direction due to elastic deformation of the tray member 51.

[0167] FIG. 17 is a perspective view illustrating the

second ejector of the ice maker, and FIG. 18 is a cross-sectional view illustrating the coupled structure of the first tray and the second ejector.

[0168] As illustrated, the second ejector 90 may include a second ejector body 91 coupled to the first tray and a second pin 92 protruding from the second ejector body 91. The upper end of the second ejector body 91 may be coupled to the first tray 40. In addition, the second ejector body 91 may be extended downwards further than the lowest end of the rotation radius of the above second tray 50.

[0169] The front surface of the second ejector body 91 may be supported by the inner surface of the ice-making compartment 23 or the mounting member 26. The front surface of the second ejector body 91 is formed with a plurality of body ribs 912 that intersect each other, and the strength of the second ejector body 91 may be reinforced by the body ribs 912.

[0170] Additionally, the upper surface of the body of the second ejector 90 may be coupled to the ejector mounting part 45. An ejector coupling part 93 coupled to the ejector mounting part 45 may be formed on the second ejector body 91. The ejector coupling part 93 may be formed on the front and upper surfaces of the second ejector body 91. Additionally, the ejector coupling part 93 may be spaced apart from both left and right sides of the second ejector body 91. Additionally, a screw hole 931 into which the screw 932 is fastened may be formed on the upper surface of the ejector coupling part 93.

[0171] The upper end of the second ejector body 91 on which the ejector coupling part 93 is formed may be inserted into and fixed to the ejector mounting part 45. In detail, the front and rear sides of the ejector coupling part 93 may be inserted between the first extension surface 454 and the second extension surface 453. Additionally, the upper surface of the ejector coupling part 93 may be in contact with the upper surface of the mounting part 451. Accordingly, the first extension surface 454, the second extension surface 453, and the upper surface 451 of the mounting part may be fixed in contact with each surface of the upper portion of the second ejector 90.

[0172] Meanwhile, a fixing groove 912 may be formed on the rear side of the ejector coupling part 93. The fixing groove 912 may extend downward from the upper end of the second ejector 90. In addition, when the second ejector 90 moves upward and is coupled to the ejector mounting part 45, the fixing protrusion 456 protruding from the first extended surface 454 may be inserted into the fixing groove 912.

[0173] Additionally, the screw 932 may be fastened to the upper surface of the ejector coupling part 93. The screw 932 is fastened to the screw hole 931 so that the second ejector 90 is coupled to the ejector mounting part 45.

[0174] Accordingly, the second ejector 90 is prevented from moving in the left and right direction by inserting the fixing protrusion 456 into the fixing groove 912, and when the second ejector 90 is installed, it is guided to the

correct position and thus the screw holes 452, 931 may be aligned. Additionally, the second ejector 90 and the first tray 40 may be more firmly coupled by fastening the screw 932. In addition, the screw 932 has a structure that is fastened from the top to the bottom, which may prevent the screw 932 from loosening and flowing into the ice bank 27.

[0175] A body inclined surface 911 may be formed on the rear surface of the ejector body 91. The body inclined surface 911 extends from the top to the bottom of the ejector body 91 and may be formed to be inclined to face forward as it extends downward.

[0176] Meanwhile, a screw boss 914 (in FIG. 20) may be further formed on the front surface of the ejector body 91. The screw boss 914 may be formed so that a screw 915 (in FIG. 20) fastened to the front of the mounting member 26 is fastened when the ice maker 30 is mounted. Accordingly, the ice maker 30 may be more firmly fixed by the screw boss 74 in addition to the tray mounting part 43.

[0177] The second fin 92 may be provided on the body inclined surface 911 and may protrude rearward. At this time, the second fins 92 may be formed in a number corresponding to the positions corresponding to the second cells 512. In addition, when the second tray 50 is completely rotated, the second cell 512 may be deformed by pressing the lower portion of the second cell 512. Additionally, the second pin 92 may protrude to have a curvature or inclination corresponding to the rotation trajectory of the second tray 50. Accordingly, the plurality of second pins 92 may each contact the entire second cell 512 when the second tray 50 is rotated to the maximum open state, and separate the ice inside the second cell 512.

[0178] Below, we will look at the assembly structure of the ice maker having the above structure.

[0179] FIG. 19 is a perspective view illustrating the ice maker seen from another direction, and FIG. 20 is an exploded perspective view illustrating the coupled structure of other components based on the first tray of the ice maker.

[0180] As illustrated, the ice maker 30 may be equipped with multiple components based on the first tray 40. For this purpose, the first tray 40 may be formed of a material. In addition, the first connection part 411, the motor device mounting part 44 and the ejector mounting part 45 may be formed integrally with the first tray 40. In addition, the tray mounting part 43 may be also formed integrally on the first tray 40.

[0181] In detail, the cover 60 may be mounted on the upper surface of the first tray 40. The cover 60 may be coupled to the first tray 40 by engaging the screws 616. In addition, the cover 60 is coupled to the first ejector 80, and the first ejector 80 may be disposed in a movable state along the ejector guide part 650 of the cover 60. there is. Accordingly, the first ejector 80 may also be viewed as being disposed on the first tray 40.

[0182] In addition, the second tray 50 may be disposed

below the first tray 40. At this time, the first connection part 411 and the second connection part 522 may be aligned with each other, and the tray holders 72 disposed on both sides pass through the first connection part 411 to be inserted into the second connection part 522. Then, the tray holders 72 on both sides are coupled so that both ends of the shaft 73 are inserted and rotated together. In addition, both ends of the elastic member 75 may be connected to the tray holder 72 and the tray supporter 52. In addition, the link 76 may be connected to the first ejector 80 and the tray supporter 52.

[0183] In addition, the motor device 70 may be mounted on the motor device mounting part 44. The motor device 70 may be fastened to the screw fastening part 4461 by inserting the coupling protrusion 702 into the coupling hole 445 and passing the screw 704 through the fastening protrusion 703.

[0184] When the motor device 70 is mounted, the drive shaft 701 protruding in the same direction as the mounting direction of the motor device 70 may be connected to the motor connection part 722 of the tray holder 72. Accordingly, the second tray 50 may be rotated by the operation of the motor device 70, and the first ejector 80 may be operated in conjunction with the rotation of the motor device 70.

[0185] Additionally, the second ejector 90 may be mounted on the ejector mounting part 45. With the ejector coupling part 93 disposed on the ejector mounting part 45, the screw 932 may be fastened to couple the ejector mounting part 45 and the ejector coupling part 93.

[0186] In this way, the ice makers 30 may all be coupled based on the first tray 40. The assembled ice maker 30 may be mounted on the door 21. The screw 262 fastened to the rear of the mounting member 26 may be fastened to the tray mounting part 43 to fix the ice maker 30. In addition, the additional screw 915 fastened to the rear of the mounting member 26 may be fastened to the screw boss 74 of the second ejector 90 to ensure that the ice maker 30 is more firmly coupled.

[0187] Hereinafter, the operation of the ice maker 30 having the above structure will be described with reference to the drawings.

[0188] FIG. 21 is a cross-sectional view illustrating a state where water is supplied to the ice maker.

[0189] As illustrated in the drawing, in order to make ice in the ice maker 30, water is supplied to the cell C. Water supplied from the water supply pipe 640 may be supplied to the water supply part 64, pass the cell extension part 422 through the water supply port 644, and then be supplied into the cell C.

[0190] Meanwhile, while water is being supplied, the second tray 50 may be open at a set angle. The water supply part 64 supplies water to the second tray 50 through one of the plurality of first cells 401, and when the second tray 50 is open, water may move sequentially from one cell C to another neighboring cell C and be filled therein.

[0191] In addition, in a state where the water supplied

when the second tray 50 is open completely fills the second cell 512, even if the water is further supplied thereto, the water supplied does not overflow by the lower wall 513 and is filled in the second tray 50.

[0192] When the set flow rate of water is supplied to the second tray 50, the second tray 50 is rotated clockwise and closed for ice-making. Then, when the second tray 50 is closed, the upper wall 421 is inserted into the lower wall 513 and is in contact with each other, and the water inside the lower wall 513 flows into each of the upper walls 421 to fill all of the cell C.

[0193] FIG. 22 is a cross-sectional view illustrating the ice maker when it is in an ice-making state.

[0194] As illustrated, when the water supply to the second tray 50 is completed, the second tray 50 is rotated clockwise, and the second tray 50 is in contact with the first tray 40 and thus, as illustrated in FIG. 22, the operation for ice-making may be started.

[0195] The second tray 50 may be in close contact with the first tray 40 by the elastic force of the elastic member 75 mounted on the tray holder 72. In addition, the first cell 401 and the second cell 512 are in contact with each other to create spherical ice inside the cell C.

[0196] When the ice-making operation starts, cold air may be supplied to the ice maker 30 through the cold air inlet 232 of the ice-making compartment 23. In detail, cold air may flow into the cold air guide part 62 through the duct part 63 in communication with the cold air inlet 232. In addition, the cold air is discharged from the front to the rear through the cold air guide part 62, and after passing through the upper portion of the plurality of first cells 401, it may be discharged through the cover discharge port 661 at the rear surface of the ice maker 30.

[0197] In addition, as cold air passes the cold air flow passage 600, the upper surface of the first part 41 is cooled. When the upper portion of the first cells 401 and the cell extension part 422 are cooled, the inside of each first cell 401 is also cooled by conduction. Accordingly, the entire inside of the first cell 401 formed in the first tray 40 may be cooled evenly, and the water contained in the cell C may be frozen at a uniform rate.

[0198] Meanwhile, the cold air discharged through the cover discharge port 661 is discharged to the rear of the ice maker 30 and is directed to the ice bank 27 disposed below the ice maker 30. In addition, it may be recovered to the freezing compartment 12 or the evaporator 14 through the cold air outlet 233 of the ice-making compartment 23.

[0199] The supply of cold air through the cold air guide part 62 may be continuously performed while ice-making is taking place. In addition, when the temperature detected by the temperature sensor 77 is below the set temperature, it is determined that ice-making is complete.

[0200] The second tray 50 remains closed until ice-making is completed. In addition, the first ejector 80 is maintained in a state of being positioned at the uppermost position of the guide slot 652, and the first pin 82 is

maintained in a state of being positioned higher than the cover hole 611 and the cell extension part 422.

[0201] When the ice-making operation is completed, the heater 48 may be operated. The heat generated from the heater 48 heats the upper portion of the first cell 401 and is evenly transmitted to the entire surface of the first cell 401 so that ice may be easily separated from the first cell 401.

[0202] FIG. 23 is a cross-sectional view illustrating the ice maker when it is in a separating state.

[0203] As illustrated, during ice-separation operation, the cell C is opened as the second tray 50 is rotated counterclockwise by the driving of the motor device 70. The second tray 50 may be fully rotated as illustrated in FIG. 23. Additionally, while the second tray 50 is rotated, the ice I attached to the first tray 40 and the second tray 50 may separate and fall downward.

[0204] In detail, when ice I is attached to the first tray 40, the ice may be separated by the first ejector 80. When the second tray 50 rotates counterclockwise, the link 76 moves downward, and the first ejector 80 connected to the link 76 moves from upward to downward. At this time, the plurality of first pins 82 are simultaneously inserted into the first cell 401 by the downward movement of the first ejector 80, thereby separating ice I attached to the first cell 401 downward.

[0205] As another example, when the output of the heater 48 is sufficiently large, the surface of the first cell 401 is heated by the operation of the heater 48 during ice-separation, so that the frozen ice is not attached to the first cell 401. In this case, the first ejector 80 is unnecessary, and therefore the first ejector 80 and ejector guide part 650 structures may be omitted.

[0206] When ice I is attached to the second tray 50, the ice may be separated by the second ejector 90. When the second tray 50 rotates counterclockwise, the second pin 92 of the second ejector 90 and the lower surface of the second tray 50 is in contact with each other.

[0207] At this time, since the second tray 50 is formed of an elastically deformable material, the second tray 50 rotates further counterclockwise when the second pin 92 and the second tray 50 are in contact with each other, the second pin 92 presses on the second cell 512 to deform it. The ice I may be separated from the second cell 512 by deforming the second cell 512. Additionally, the plurality of second pins 92 may simultaneously deform the plurality of second cells 512 so that all of the ice I attached to the plurality of second cells 512 is separated.

[0208] The ice I separated from the ice maker 30 may fall downward and be stored in the ice bank 27. In addition, when the second tray 50 rotates, the full ice detection member 71 rotates to check whether the ice bank 27 is full of ice therein. When the full ice detection member 71 determines that the ice inside the ice bank 27 is full, water supply to the ice maker 30 and ice-making operations are stopped.

[0209] If the inside of the ice bank 27 is not full of ice, the second tray 50 returns to the state illustrated in FIG. 21,

and water supply for ice-making may begin. Additionally, ice may be continuously made by performing the ice-making operation and the ice-separation operation again.

[0210] Meanwhile, the present disclosure may be possible in various other embodiments in addition to the above-described embodiments. Hereinafter, another embodiment of the present disclosure will be described in detail with reference to the drawings. In addition, since configurations not described below are the same as the above-described embodiments, detailed descriptions or illustrations thereof may be omitted to prevent duplication of description, and the same reference numerals will be used for description. In other words, hereinafter, only the configuration that differs from the above-described embodiment will be described in detail.

[0211] FIG. 24 is an exploded perspective view illustrating the coupling structure of the first tray according to the second embodiment of the present disclosure.

[0212] As illustrated, the ice maker 30 according to the second embodiment of the present disclosure may have the same configuration as the first embodiment described above except for the first tray 40a. Additionally, the first tray 40a in the assembled state may have an overall outer appearance identical to that of the first embodiment described above.

[0213] The first tray 40a according to the second embodiment may be configured such that the first part 41a and the motor device mounting part 44a are molded separately and then coupled with each other. Additionally, both the first part 41a and the motor device mounting part 44a may be formed of the same metal material.

[0214] A plurality of first cells 401 and cell extension parts 422 may be formed in the first part 41a. Additionally, a sensor mounting part 414 and a terminal mounting part 415 may be further formed on the first part 41a. Additionally, a tray rib 416 may be formed on the first part 41a. Additionally, a tray mounting part 43 may be formed at the front end of the first part 41a. Additionally, an ejector mounting part 45 may be formed at the front end of the first part 41a.

[0215] The motor device mounting part 44a may be coupled to the side of the first part 41a. The tray first coupling part 419 may be formed at a side end of the first part 41a. Additionally, a screw hole 4191 may be formed in the tray first coupling part 419. The first coupling part 419 may be formed in a shape corresponding to the second coupling part 449 formed on the motor device mounting part 44a. For example, the first coupling part 419 may be recessed into a shape corresponding to the second coupling part 449.

[0216] The motor device mounting part 44a may include the second part 441 and the third part 442. In other words, the first tray 41a may include the second part 441 and the third part 442.

[0217] A second coupling part 449 protruding toward the first part 41 may be formed at an end portion of the third part 442. The second coupling part 449 may be

formed in a shape corresponding to the first coupling part 419 and may be inserted into the first coupling part 419. Additionally, a screw hole 4491 may be formed in the second tray coupling part 449.

[0218] While the second coupling part 449 is inserted into the first coupling part 419 and primarily fixed, the screw 4192 may be fastened by passing through the screw holes 4191 and 4491 from above the second coupling part 449. A plurality of screws 4192 may be fastened.

[0219] The first tray 40 may be assembled by firmly coupling the first coupling part 419 and the second coupling part 449. In addition, in a state where the first tray 40 is assembled, the cover 60, the second ejector 90, the motor device 70, and the second ejector 90 may be coupled to the first tray 40.

[0220] FIG. 25 is an exploded perspective view illustrating the coupling structure of the first tray according to the third embodiment of the present disclosure.

[0221] As illustrated, the ice maker 30 according to the third embodiment of the present disclosure may have the same configuration as the above-described first embodiment except for the first tray 40b. In addition, the first tray 40b in the assembled state may have an overall outer appearance identical to that of the first embodiment described above.

[0222] The first tray 40b according to the third embodiment may be configured such that the cell part 41b' and the mounting part 41b" are molded separately and then coupled with each other. In other words, the first tray 40b may include a tray part 41b, and the tray part 41b may be formed by coupling a cell part 41b' and a mounting part 41b". The tray part 41b may be referred to as the first part.

[0223] At least one of the cell part 41b' and the mounting part 41b" may be formed of a metal material. As an example, the mounting part 41b", on which multiple components are mounted and which functions to mount the ice maker 30, may be made of a metal material. Additionally, the cell part 41b' may be formed of a plastic material. Of course, the cell part 41b' may also be formed of a metal material.

[0224] A plurality of first cells 401 and cell extension parts 422 may be formed in the cell part 41b'. Additionally, a sensor mounting part 414 may be further formed on the cell part 41b'.

[0225] A tray rib 416 may be formed on the mounting part 41b". Additionally, the terminal mounting part 415 may be formed on the mounting part 41b". Additionally, a tray mounting part 43 may be formed at the front end of the mounting part 41b". Additionally, an ejector mounting part 45 may be formed at the front end of the mounting part 41b". Additionally, the first connection part 411 may be formed on the lower surface of the mounting part 41b". Additionally, the motor device mounting part 44 may be formed on a side of the mounting part 41b".

[0226] Meanwhile, a third coupling part 4193 protruding forward may be formed at the front end of the cell part 41b'. A plurality of screw holes 4194 may be formed in the

third coupling part 4193. Additionally, a fourth coupling part 4195 coupled to the third coupling part 4193 may be formed at the rear end of the mounting part 41b". A plurality of screw holes 4196 may be formed in the fourth coupling part 4195.

[0227] The fourth coupling part 4195 may be formed in a shape corresponding to the third coupling part 4193. For example, the fourth coupling part 4195 may be recessed into a shape corresponding to the third coupling part 4193. The third coupling part 4193 may be inserted into the fourth coupling part 4195.

[0228] In a state where the third coupling part 4193 is inserted into the fourth coupling part 4195 and is primarily fixed, a screw 4197 may be fastened to pass through the screw holes 4194 and 4196 from above the third coupling part 4193. A plurality of screws 4197 may be fastened.

[0229] The first tray 40b may be assembled by firmly coupling the third coupling part 4193 and the fourth coupling part 4195. In addition, in a state where the first tray 40b assembled, the cover 60, the second ejector 90, the motor device 70, and the second ejector 90 may be coupled to the first tray 40b.

[0230] FIG. 26 is an exploded perspective view illustrating the coupled structure of the first tray and the motor device according to the fourth embodiment of the present disclosure, and FIG. 27 is a cross-sectional view illustrating the coupled state of the first tray and the motor device.

[0231] The refrigerator 1 according to the fourth embodiment of the present disclosure may include an ice maker 30. The overall structure of the ice maker 30 is the same as the first embodiment described above, with only slight differences in the structures of the first tray 40c and the motor device 70c.

[0232] As illustrated, the first tray 40c includes a first part 41, and a plurality of first parts 41 which may, respectively, include a first cell 401 that forms the upper portion of the ice-making cell C. The first cell 401 opens downward. A cell extension part 422 extending upward from the first part 41 may be formed at the upper end of the first cell 401. The first ejector 80 enters into and exits from the cell extension part 422, and the cell extension part 422 may serve as a buffer by flowing into the cell extension part when an amount of water is large at the time of being frozen.

[0233] A tray mounting part 43 may be formed at one end of the first tray 40c. The tray mounting part 43 is coupled to one side of the ice-making compartment 23 and fixes the ice maker 30. Additionally, an ejector mounting part 45 on which the second ejector 90 is mounted may be formed at one end of the first tray 40c on which the tray mounting part 43 is formed. Additionally, a first connection part 411 protruding downward may be formed on the lower surface of the first part 41. The second tray 50 may be rotatably connected to the first connection part 411. As the second tray 50 rotates, the first tray 40c and the second tray 50 may be coupled to form a cell C for making ice. The second tray 50 may rotate according to

ice-making and ice-separation operations.

[0234] A motor device mounting part 44c on which the motor device 70c is mounted may be formed at one end of the first tray 40c. The motor device mounting part 44c may extend downward from the side end of the first part 41.

[0235] In detail, the motor device mounting part 44c may include a second part 441c coupled to the motor device 70c, and a third part 442c connecting between the first part 41 and the second part 441c. In other words, the first tray 40c may further include the second part 441c and the third part 442c.

[0236] The motor device mounting part 44c may be molded integrally with the first tray 40c. In addition, as in the second and third embodiments described above, at least some of the motor device mounting parts 44c may have a structure of being formed separately from the first tray 40c and then being coupled to each other.

[0237] The second part 441c is coupled to the lower portion of the motor device 70c, and therefore may be located lower than the upper surface of the first part 41. The second part 441c may include a coupling part lower surface 443c in contact with the lower surface of the motor device 70c, and an edge 444 of the coupling part in contact with the peripheral surface of the motor device 70c.

[0238] The edge 444 of the coupling part may extend upward along the outer end of the coupling part lower surface 443c. In addition, the edge 444 of the coupling part may be formed on the remaining portion of the circumference of the coupling part lower surface 443c except for one end where the motor device 70c is inserted.

[0239] A coupling hole 445c may be formed in the motor device mounting part 44c for coupling with the motor device 70c. The coupling hole 445c may be formed to penetrate the edge 444 of the coupling part. A plurality of coupling holes 445c may be provided and may be disposed to be spaced apart from each other. Additionally, the coupling hole 445c may be formed at a position corresponding to the coupling protrusion 702c formed on the motor device 70c.

[0240] Additionally, a screw fastening part 446c into which the fastening protrusion 703c of the motor device 70c is inserted and coupled may be formed to protrude from the motor device mounting part 44c.

[0241] The third part 442c may extend downward from the side end of the first part 41. The third part 442c may extend below the motor device 70c and may extend up to the second part 441c. An extension part opening 447c through which the drive shaft 701 of the motor device 70c passes may be formed in the third part 442c. Accordingly, while the motor device 70c is mounted on the motor device mounting part 44c, the drive shaft 701 may pass through the extension part opening 447c and be connected to the tray holder 72. Additionally, the drive shaft 701 of the motor device 70c may be located lower than the first part 41.

[0242] The lower portion of the motor device 70c may be mounted on the motor device mounting part 44c. Additionally, the coupling protrusion 702c may be formed on one end of the lower surface of the motor device 70c. The coupling protrusion 702c may extend toward the coupling hole 445c. Additionally, a fastening protrusion 703c may be formed on the other end of the lower surface of the motor device 70c. The fastening protrusion 703c may protrude downward at a position corresponding to the mounting part groove 446c.

[0243] When the motor device 70c is mounted on the motor device mounting part 44c, the coupling protrusion 702c is inserted into the coupling hole 445c, and at the same time, the fastening protrusion 703c may be inserted into the screw fastening part 446c. In addition, the screw 704c passes through the fastening protrusion 703c and is fastened to the screw fastening part 446c, so that the motor device 70c may be fixedly mounted on one side of the first tray 40c.

[0244] FIG. 28 is a perspective view illustrating the first tray according to the fifth embodiment of the present disclosure.

[0245] The refrigerator 1 according to the fifth embodiment of the present disclosure may include an ice maker 30. The overall structure of the ice maker 30 is the same as the first embodiment described above, with only a slight difference in the structure of the first tray 40e.

[0246] As illustrated, the first tray 40e includes a first part 41e, and a cell forming part 42 may be formed on the first part 41. The cell forming part 42 may form a first cell 401 that forms the upper portion of the ice-making cell C, and may have a somewhat recessed shape on the upper surface of the first part 41e. In addition, the cell forming part 42 exposed to the upper surface of the first part 41e may be formed to be rounded to correspond to the shape of each first cell 401.

[0247] Additionally, the cell forming part 42 may include an upper wall 421 extending downward, and the first cell 401 may be formed inside the upper wall 421. The first cell 401 opens downward. Additionally, the cell forming part 42 may include a cell extension part 422. The cell extension part 422 is formed at the upper end of the first cell 401 and may extend upward from the first part 41e.

[0248] The first part 41e may be formed to have a width that allows the plurality of cell forming parts 42 disposed in two rows to be formed. Accordingly, the width of the first tray 40e in the front and rear direction may be smaller than that of the first trays of the above-described embodiments. Accordingly, cold air supplied to the first tray 40e may be directed directly to the first part 41e.

[0249] A tray mounting part 43 may be formed at the front end of the first part 41e. The tray mounting part 43 is coupled to one side of the ice-making compartment 23 and fixes the ice maker 30. Additionally, an ejector mounting part 45 on which the second ejector 90 is mounted may be formed at one end of the first tray 40e on which the tray mounting part 43 is formed. Additionally, a first connection part 411e protruding downward may be formed

on the lower surface of the first part 41e. The second tray 50 may be rotatably connected to the first connection part 411e.

[0250] A motor device mounting part 44e on which the motor device 70 is mounted may be formed at one end of the first tray 40e. The motor device mounting part 44e may extend laterally from the side end of the first part 41. The structure of the motor device mounting part 44e may be the same as that of the first embodiment described above. However, the motor device mounting part 44e may be located on the side of the first part 41e, that is, on the side of the first cell 401. For example, the motor device mounting part 44e may be disposed on the same extension line as the disposition direction of the plurality of first cells 401 formed in the first part 41e.

[0251] In addition, the motor device mounting part 44e is formed to have a size equal to or smaller than the width of the first tray 40e in the front and rear direction, so that the ice maker 30 may have an overall compact structure. Accordingly, the ice maker 30 may be disposed in the ice-making compartment 23 with limited space in the front and rear direction, and the overall thickness of the refrigerating compartment door 21 may be prevented from increasing.

[0252] FIG. 29 is a perspective view illustrating the first tray according to the sixth embodiment of the present disclosure, and FIG. 30 is a view illustrating the cold air flow state in the ice maker according to the sixth embodiment of the present disclosure.

[0253] The refrigerator 1 according to the sixth embodiment of the present disclosure may include an ice maker 30. The overall structure of the ice maker 30 is the same as the first embodiment described above, with only a slight difference in the structure of the first tray 40f.

[0254] As illustrated, the first tray 40f includes a first part 41f, and a cell forming part 42 may be formed on the first part 41f. The cell forming part 42 may form a first cell 401 that forms the upper portion of the ice-making cell C, and may have a somewhat recessed shape on the upper surface of the first part 41. In addition, the cell forming part 42 exposed to the upper surface of the first part 41 may be formed to be rounded to correspond to the shape of each first cell 401.

[0255] Additionally, the cell forming part 42 may include an upper wall 421 extending downward, and the first cell 401 may be formed inside the upper wall 421. The first cell 401 opens downward.

[0256] Additionally, the cell forming part 42 may include a cell extension part 422f. The cell extension part 422f is formed at the upper end of the first cell 401 and may extend upward from the first part 41. The cell extension part may be formed to allow the first ejector to pass through. Additionally, the cell extension part may serve as a buffer to accommodate some of the water when there is a large amount of water during ice-making.

[0257] A tray mounting part 43 may be formed at the front end of the first part 41f. The tray mounting part 43 is coupled to one side of the ice-making compartment 23

and fixes the ice maker 30. Additionally, an ejector mounting part 45 on which the second ejector 90 is mounted may be formed at one end of the first tray 40f where the tray mounting part 43 is formed. Additionally, a first connection part 411e protruding downward may be formed on the lower surface of the first part 41f. The second tray 50 may be rotatably connected to the first connection part 411e.

[0258] A motor device mounting part 44 on which the motor device 70 is mounted may be formed at one end of the first tray 40f.

[0259] Additionally, the cover 60 may be mounted on the upper surface of the first tray 40f. The structure and shape of the cover 60 may be the same as those of the first embodiment described above. The cover 60 may include a cover part 61 in which a plurality of cover holes 611f are formed, and a cold air guide part 62 that guides cold air so that the cold air passes the plurality of cell extension parts 422f. Additionally, a duct part 63 may be formed at a side end of the cold air guide part 62 to form a passage through which cold air flowing into the ice-making compartment 23 flows

[0260] A plurality of cover holes 611 into which the cell extension part 422f is inserted may be formed through the cover part 61. Additionally, a cold air flow passage may be formed between the cover part 61 and the first part 41. Additionally, a cover discharge port 661 may be formed on the rear surface of the cover 60. Accordingly, cold air passing the duct part 63, the cold air guide part 62, and the cover part 61 may be discharged backward through the cover discharge port 661.

[0261] Cold air passing between the cover part 61 and the first part 41 may flow while contacting the outer surface of the cell extension part 422f. Accordingly, the cell extension part 422f may be cooled by being in contact with cold air passing the first tray 40f. The first tray 40f may be made of a metal material, and the water inside the first cell 401 may be frozen more effectively through heat conduction. Additionally, the cell extension part 422f is disposed on the cold air flow passage and may guide the flow of cold air.

[0262] To this end, the outer surface of the cell extension part 422 f may include at least one inclined surface. As an example, a first inclined surface 4221f may be formed on both sides of the front of the outer surface of the cell extension part 422 f, and a second inclined surface 4222f may be connected to the rear end of the first inclined surface 4221f. The cell extension part may form a hexagonal shape when viewed from above due to the first inclined surface 4221f and the second inclined surface 4222f. Of course, the number and disposition of the inclined surfaces may have different structures according to the flow pattern of cold air.

[0263] The first inclined surface 4221f and the second inclined surface 4222f may guide the cold air guided through the cold air guide part 62 of the cover to be discharged toward the front cover outlet 661. To this end, the first inclined surface 4221f and the second

inclined surface 4222f may have the set slope.

[0264] For example, the first inclined surfaces 4221f may have an inclination that becomes farther away from each other as it extends from front to back, and the second inclined surfaces 4222f may have an inclination that becomes closer to each other as it extends from front to back. Of course, the inclined surfaces 4221f and the second inclined surfaces 4222f on both sides may be formed to have different slopes.

[0265] Additionally, the plurality of cell extension parts 422f may be disposed to have different inclinations. In other words, the plurality of cell extension parts 422f may be rotated and disposed with different rotation amounts based on each cell extension part 422f. As an example, some of the cell extension parts 422f (area A in FIG. 30), which are located in a position far from the duct part 63 and located in the front, may have a structure which is disposed at a more inclined angle compared to other cell extension parts 422f.

[0266] Accordingly, the cold air flowing along the cold air guide part 62 may flow more smoothly as the cold air is guided by the outer surface of the cell extension part 422f, and is evenly distributed so that it is possible to enable discharge through the cover discharge port 661 to occur more smoothly. Additionally, the tilt angles of the cell extension parts 422f may also be different. The number and tilt angle of the inclined cell extension parts 422f as illustrated in FIG. 30 are only examples and are not limited thereto.

[0267] FIG. 31 is an exploded perspective view illustrating the second tray according to the seventh embodiment of the present disclosure, and FIG. 32 is a cross-sectional view illustrating an ice maker according to the seventh embodiment of the present disclosure.

[0268] The refrigerator 1 according to the seventh embodiment of the present disclosure may include an ice maker 30. The overall structure of the ice maker 30 is the same as the first embodiment described above, with only some differences in the structure of the second tray 50g and the disposition of the heater 54.

[0269] As illustrated, the second tray 50g may include a tray member 51 on which a plurality of second cells 512 are formed, and a tray supporter 52 supporting the tray member 51. In addition, the second tray 50 may further include a tray cover 53.

[0270] The tray member 51 may include the second tray body 511 in which a plurality of second cells 512 are formed. Additionally, a lower wall 513 may extend upward around the tray member. Additionally, the tray member 51 may be made of a soft material. For example, the tray member 51 may be made of silicon material. Accordingly, the tray member 51 may be in close contact with the first tray 40 to make them airtight, and may be deformed when in contact with the second ejector 90 for ice-separation.

[0271] The tray supporter 52 may support the second tray 50 from below. A plurality of supporter holes 521 may be formed in the tray supporter 52. The supporter hole 521 may be formed to allow the second cell 512 protrud-

ing downward to pass through.

[0272] Meanwhile, the perimeter of the supporter hole 521 may be formed to surround a portion of the outer surface of the second cell 512. Additionally, the tray supporter 52 may be provided with a heater 54. Since the heater 54 heats the second cell 512, it may be referred to as a lower heater. The heater 54 may be disposed along the perimeter of the supporter hole 521.

[0273] As an example, a recessed heater groove 5241 may be formed along the perimeter of the supporter hole 521. The heater grooves 5241 may be formed continuously to pass areas corresponding to the plurality of second cells 512. Then, the heater 54 may be inserted into the heater groove 5241. In addition, when the tray supporter 52 and the tray member 51 are coupled, the heater 54 may be in contact with the outer surface of the tray member 51.

[0274] The heater 54 may be operated during the ice-making process, and the ice maker 30 may be used to create transparent ice without bubbles. In addition, ice may be made into a sphere by the shape of the cell c formed by the first cell 401.

[0275] In order to make transparent spherical ice, the heater 54 may be driven while cold air for ice-making is supplied after water supply. At this time, the heater 54 may be turned on and off periodically. By heating the second tray 50g by the heater 54, freezing may begin from the upper portion of the cell C and gradually progress downward. Therefore, the air bubbles generated during freezing inside the cell C may be concentrated at the lower end of the second tray 50g, that is, at the lower end of the second cell 521, and it is possible to make the remaining part of the ice except for a portion of the lower end of the ice where the air bubbles are concentrated as the transparent ice.

[0276] The location of the heater 54 is not limited to the above example, and may be disposed in various positions where heat may be transferred to the second cell 521.

[0277] In addition, when the heater 54 is provided, the heater 48 that heats the first tray 40 of the above-described first embodiment may be omitted. Of course, the heaters 48 and 54 may be provided on both the first tray 40 and the second tray 50g.

[0278] Meanwhile, the heater 54 may also be operated when the frozen ice is separated. The heater may be operated for ice-separation when ice-making is completed. When the heater 54 is turned on, the second cell 512 may be heated to melt the surface of the ice. When the second tray 50g rotates while the surface of the ice is sufficiently melted and the tray member 51 is deformed by the second ejector 90, the ice may be more easily separated from the second cell 512.

[0279] As another example, if the output of the heater 54 is sufficiently large, the surface of the ice may be sufficiently melted and separation from the second cell 512 may be ensured. Accordingly, if the output of the heater 54 is sufficiently large, the second ejector 90 may

be omitted.

[0280] The second connection part 522 may be formed on both left and right sides of the tray supporter 52 and may be connected to the tray holder 72. Therefore, when the tray holder 72 rotates, the tray supporter 52 and the tray member 51 may rotate together. In addition, supporter protrusions 523 may be formed on both left and right sides of the tray supporter 52.

[0281] A tray cover 53 may be provided on the upper surface of the tray member 51. The tray cover 53 is formed with a cover opening 531 through which the upper end of the tray member 51 passes, and the lower wall 513 may pass through the cover opening 531. A cover coupling part 532 is formed on the tray cover 53 so that it may be coupled to the tray supporter 52.

[0282] Meanwhile, in the above-described embodiments, an example in which the rotating second tray is disposed below the fixed first tray has been described for convenience of understanding of the present disclosure, but the present disclosure is not limited thereto.

[0283] In other words, the present disclosure may be applied to various other structures in which ice is made and separated by a second tray that is moved based on a fixed first tray, regardless of the positions and movement methods of the first tray and the second tray.

Claims

1. A refrigerator comprising:

a cabinet (10) having a storage space;
a door (20) configured to open and close the storage space; and
an ice maker (30) provided in the door,
wherein the ice maker (30) includes:

a first tray (40) made of metal material, fixed to the door, and having a plurality of first cells (401);
a second tray (50) made of a different material from the first tray (40) and having a plurality of second cells (512) that open and close the first cells (401) to form a space in which ice is made; and
a motor device (70) configured to open and close the second tray (50), and
wherein the first tray (40) includes:

a first part (41) on which the first cell is formed; and
a second part (441) on which the motor device (70) is mounted.

2. The refrigerator of claim 1,

wherein a cover (60) is mounted on the first tray (40) to shield at least a portion of the first part

(41), and

wherein the cover (60) is spaced apart from the first part (41) to form a cold air flow passage (600) that guides cold air supplied for ice-making to pass the first part (41).

3. The refrigerator of claim 2, wherein a tray mounting part (43) which protrudes outside the cover (60) and is fastened with a screw that is fixed to the door (20) is formed on the first tray (40).

4. The refrigerator of claim 3,

wherein the door (20) includes an ice-making compartment (23) that accommodates the ice maker (30), and a mounting member (26) that forms at least a portion of the ice-making compartment (23), and
wherein the screw penetrates the mounting member (26) to be fastened to the tray mounting part (43), and fixes the ice maker (30) to the ice-making compartment (23).

5. The refrigerator of claim 2,

wherein a first ejector (80) for separating ice from the first cell (401) is disposed at the cover (60),
wherein a plurality of cell extension parts (422) are formed in the first tray (40), which communicate with the inside of each first cell (401) and extend toward the first ejector (80), and
wherein the first ejector (80) passes through the cell extension part (422) to separate ice from the first cell (401).

6. The refrigerator of claim 5,

wherein ejector guide parts (560) are formed on both sides of the cover (60), and
wherein the first ejector (80) includes:

an ejector body (81) configured to move along the ejector guide part (560); and
a plurality of ejector pins (82) extending from the ejector body (81) and inserted into the plurality of cell extension parts (422).

7. The refrigerator of claim 1,

wherein the first tray (40) includes a tray mounting part (43) provided in the first part (41) and configured to fix the first tray (40) to the door (20), and
wherein the tray mounting part (43) protrudes in a direction intersecting the second part (441) based on the first part (41).

8. The refrigerator of claim 7,

Wherein the second part (441) is located above or below the first part (41), and wherein the first tray (40) further includes a third part (442) configured to connect the first part (41) and the second part (441).

9. The refrigerator of claim 8,

wherein the first part (41), second part (441), and third part (442) are integrally formed of the same material.

10. The refrigerator of claim 1,

wherein the motor device (70) is formed with a drive shaft (701) coupled to the second tray (50) and a plurality of device coupling protrusions (702) protruding in the same direction as the drive shaft (701), wherein a device coupling hole (445) into which the device coupling protrusion (702) is inserted is formed in the second part (441), and wherein the drive shaft (701) is connected to the second tray (50) when the device coupling protrusion (702) is inserted into the device coupling hole (445).

11. The refrigerator of claim 7,

wherein first connection parts (411) protruding toward the second tray (50) are formed on both sides of the first part spaced apart from each other, and wherein a second connection part (522) protruding to be aligned with the first connection part (411) and configured to transmit the rotational force of the motor device (70) is formed on the second tray (50).

12. The refrigerator of claim 11, further comprising:

tray holders (72) fastened to pass through the first connection part (411) on both sides of the first tray (40) and coupled to rotate with the second connection part (522); and a shaft (73) connecting the tray holders (72) on both sides and rotates together, wherein one of the tray holders (72) on both sides is connected to the drive shaft (701) of the motor device (70) and rotates.

13. The refrigerator of claim 1,

wherein the second tray (50) includes; a tray member (51) formed of a deformable soft material and forming the second cell (512); and a tray supporter (52) configured to support the

tray member (51) and formed with a second connection part (522) connected to the motor device (70), and wherein a supporter hole (521) is formed in the tray supporter (52) to expose the second cell (512).

14. The refrigerator of claim 13,

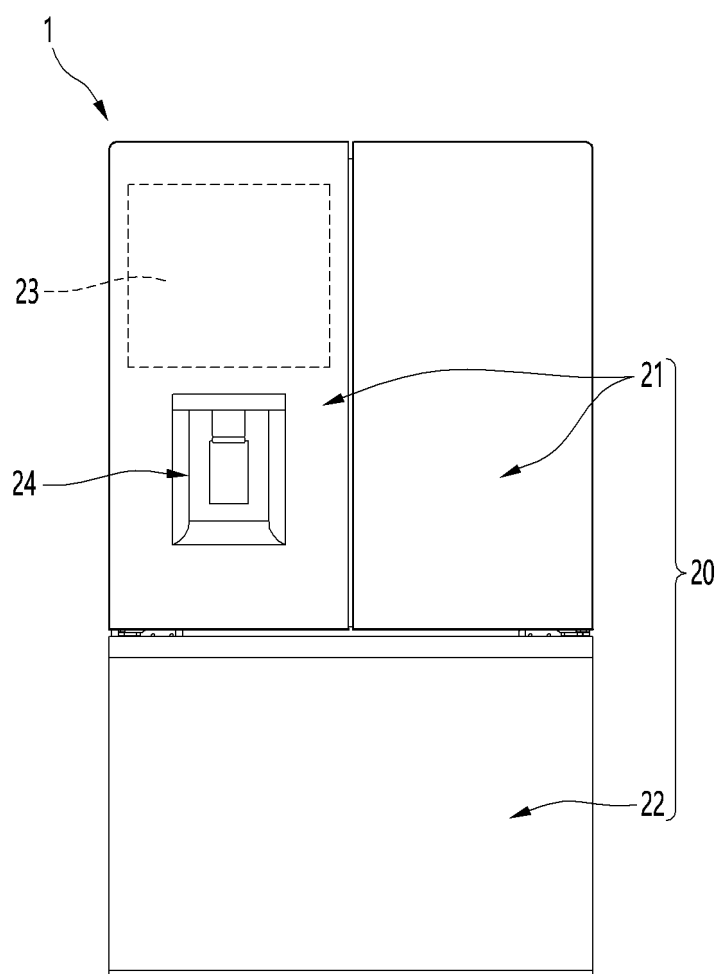
wherein a second ejector (90) that is in contact with the second cell (512) when the second tray (50) rotates and separates the ice in the second cell (512) is mounted at the first tray (40), and wherein the second ejector (90) includes:

a second ejector body (91) mounted on the first tray (40) and extending to be disposed at a rotation radius of the second tray (50); and a plurality of second fins (92) that protrude from the second ejector body (91) and deform the plurality of second cells (512) when the second tray (50) rotates to separate ice.

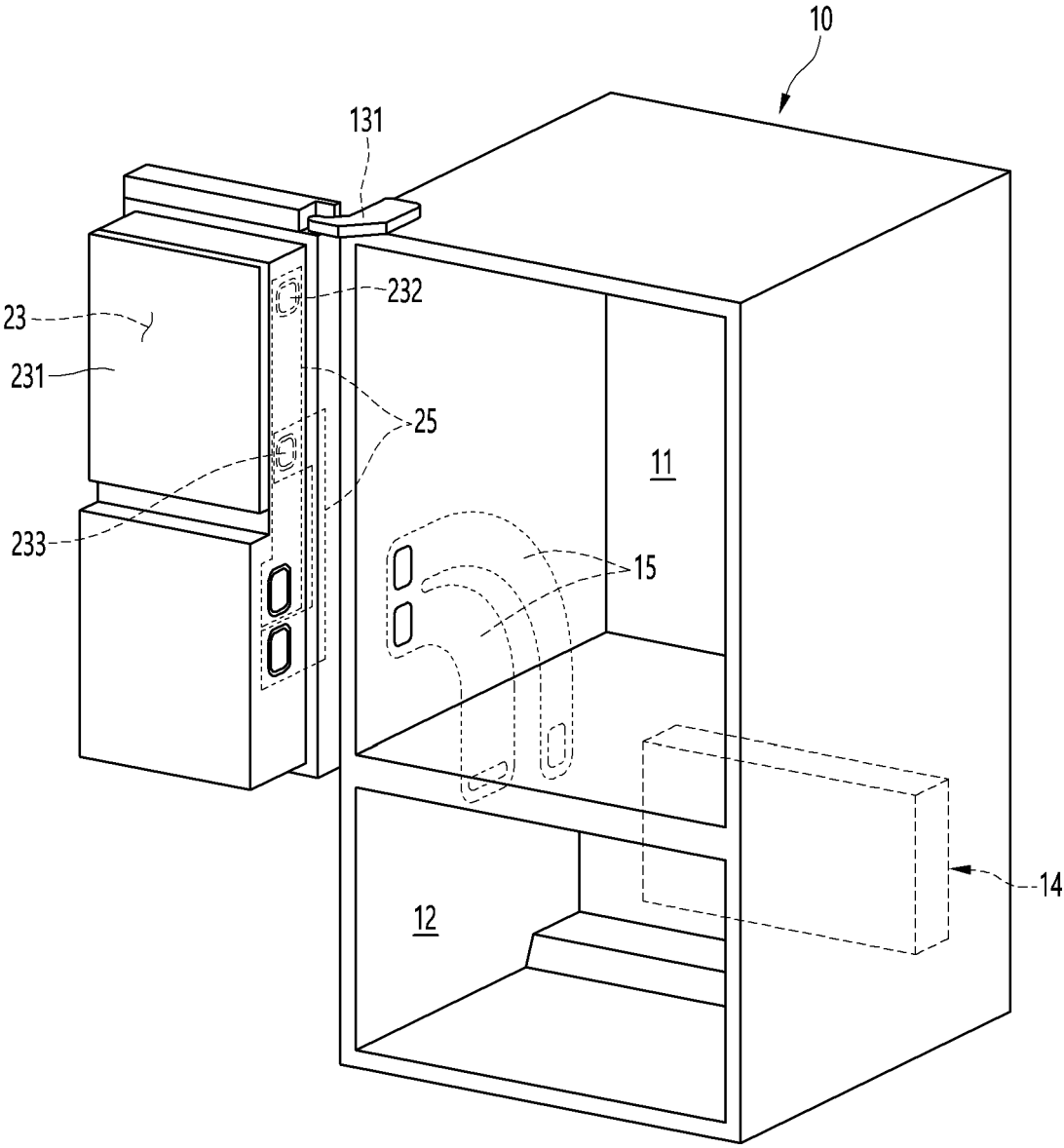
15. The refrigerator of claim 14,

wherein an ejector mounting part (45) extending downward and coupled to the second ejector body (91) is formed on the first tray (40), wherein the second ejector body (91) is supported on the inner surface of the door (20) in a state where the second ejector body (91) is coupled to the ejector mounting part (45).

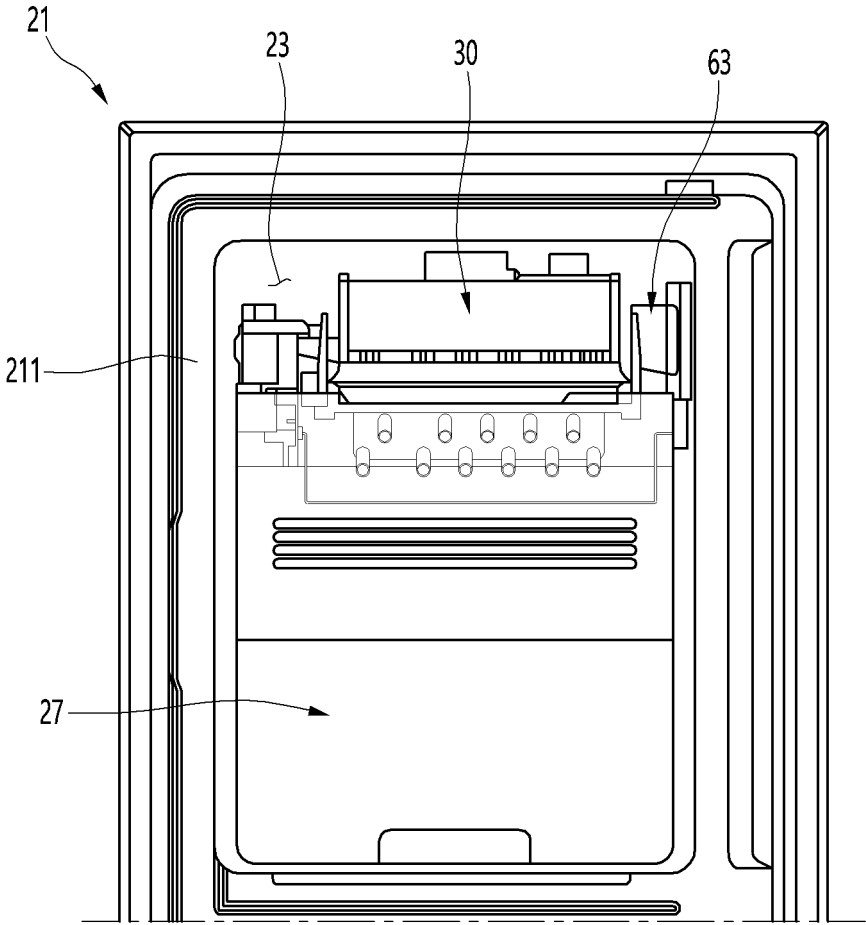
[Fig. 1]



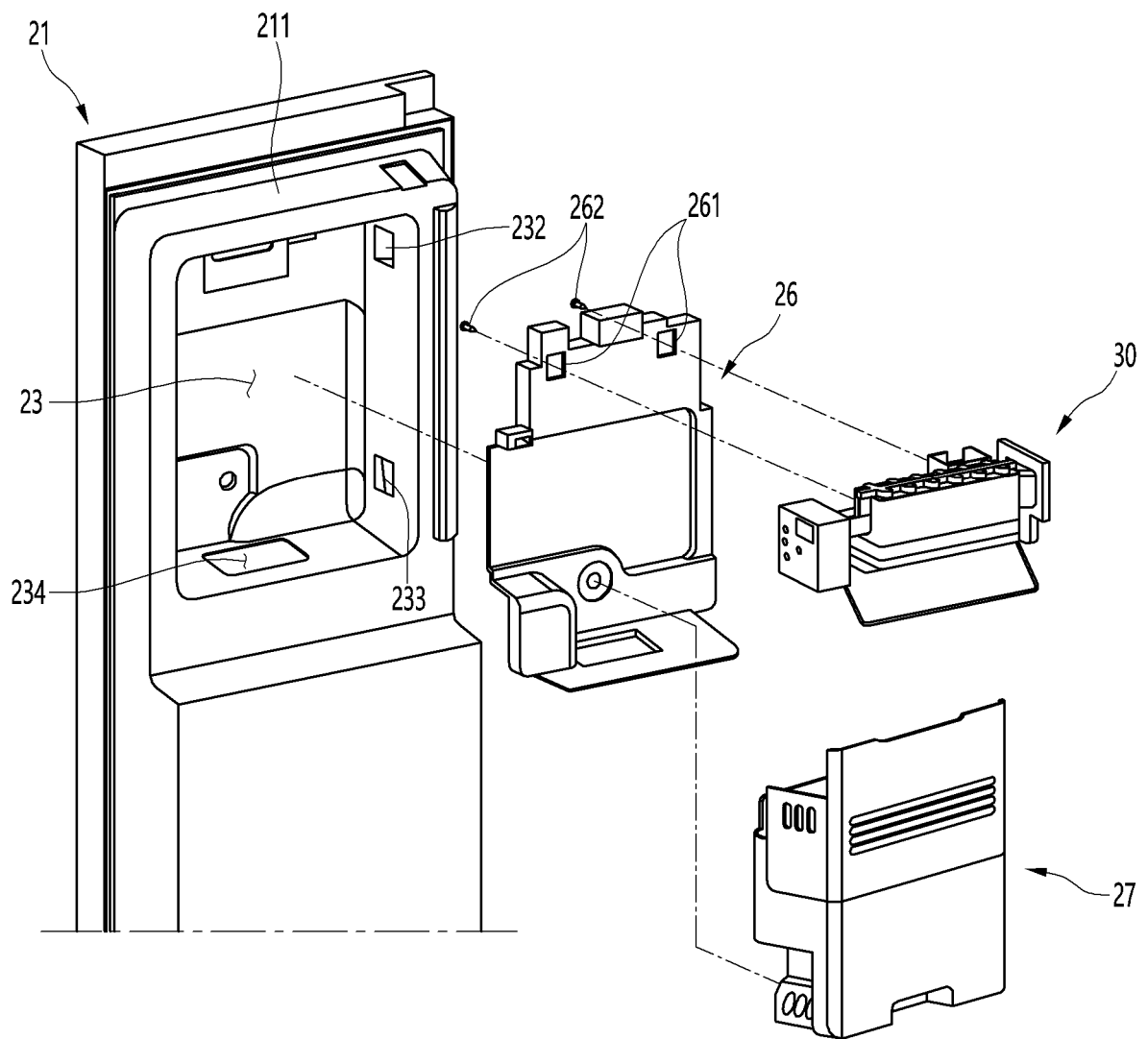
[Fig. 2]



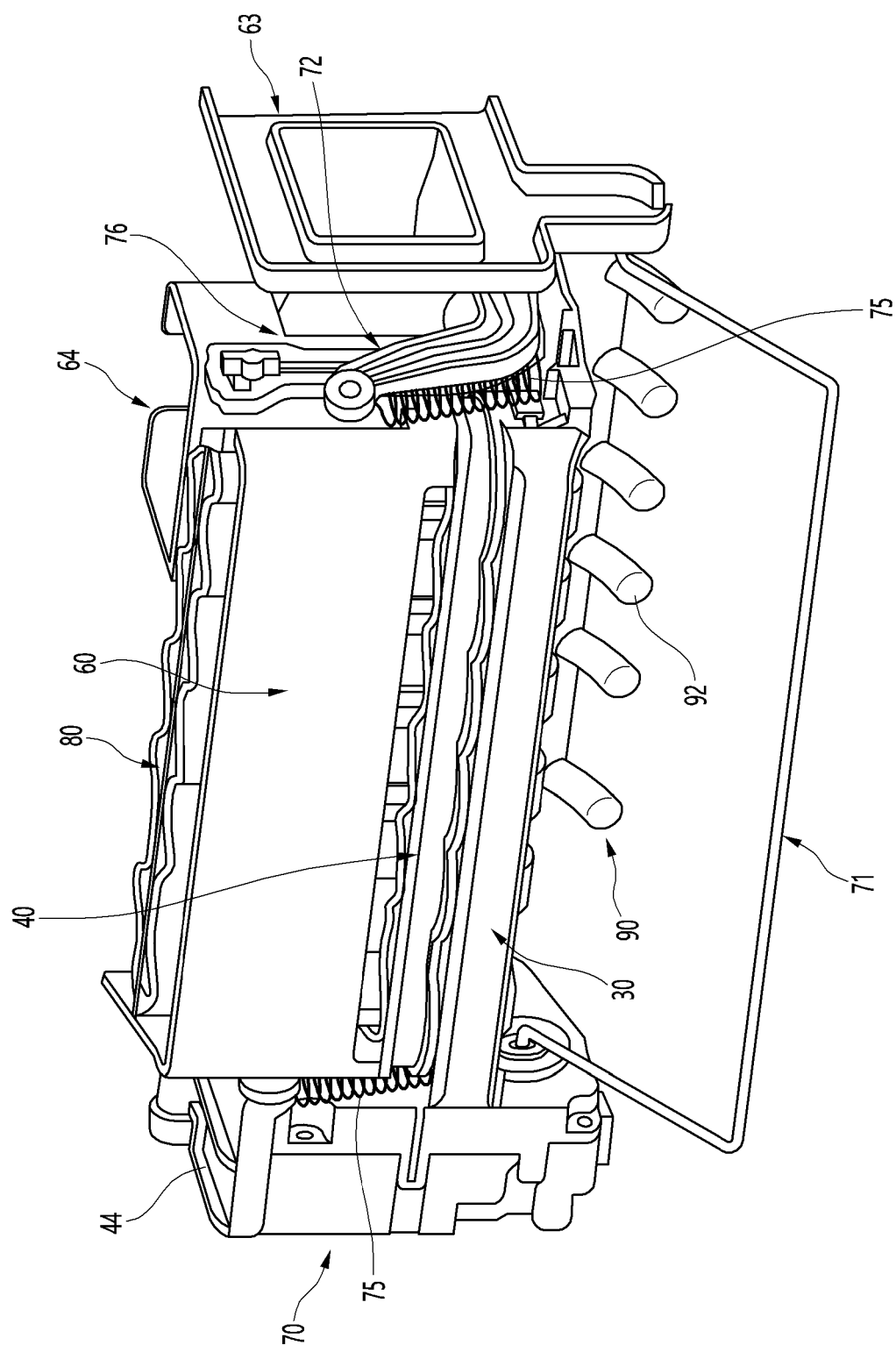
[Fig. 3]



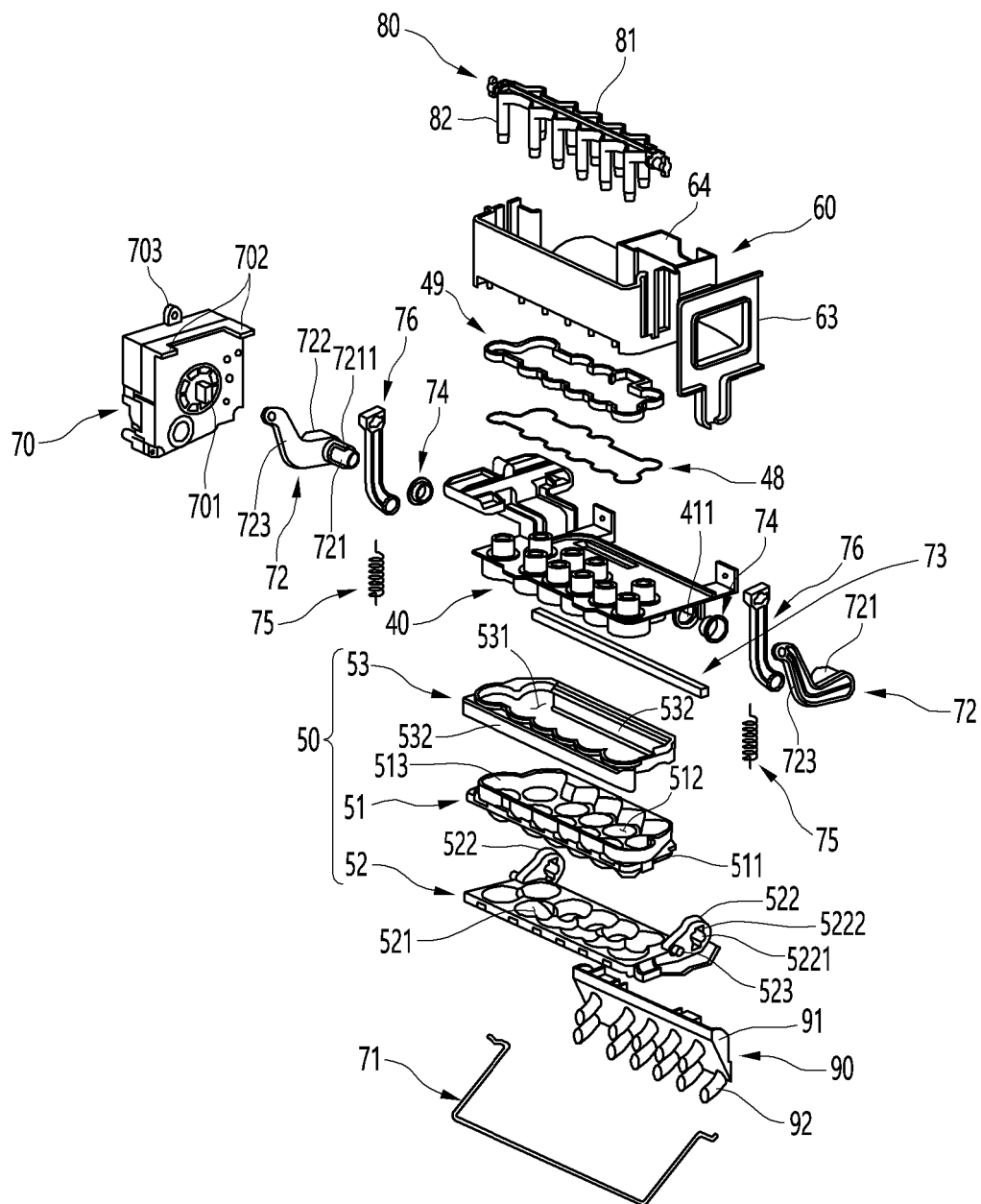
[Fig. 4]



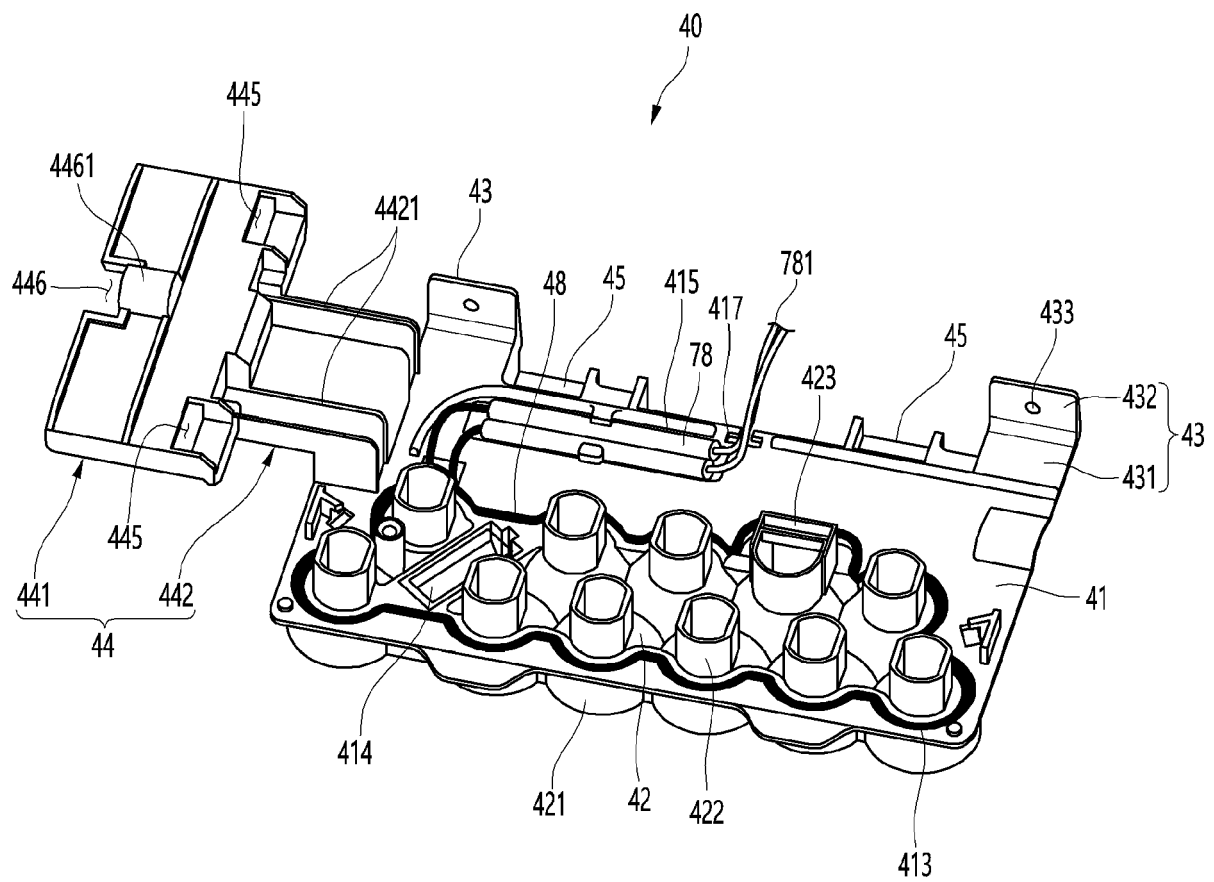
[Fig. 5]



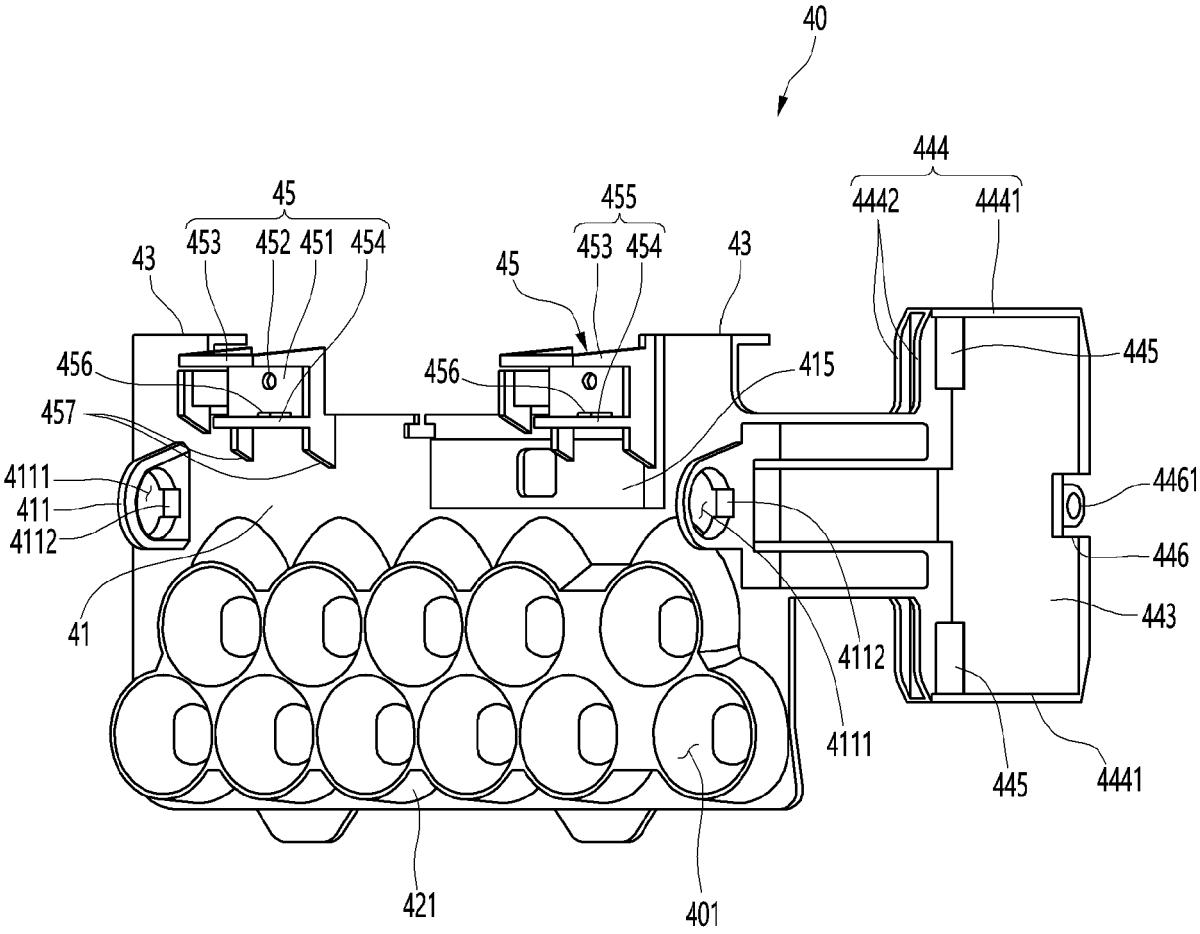
[Fig. 6]



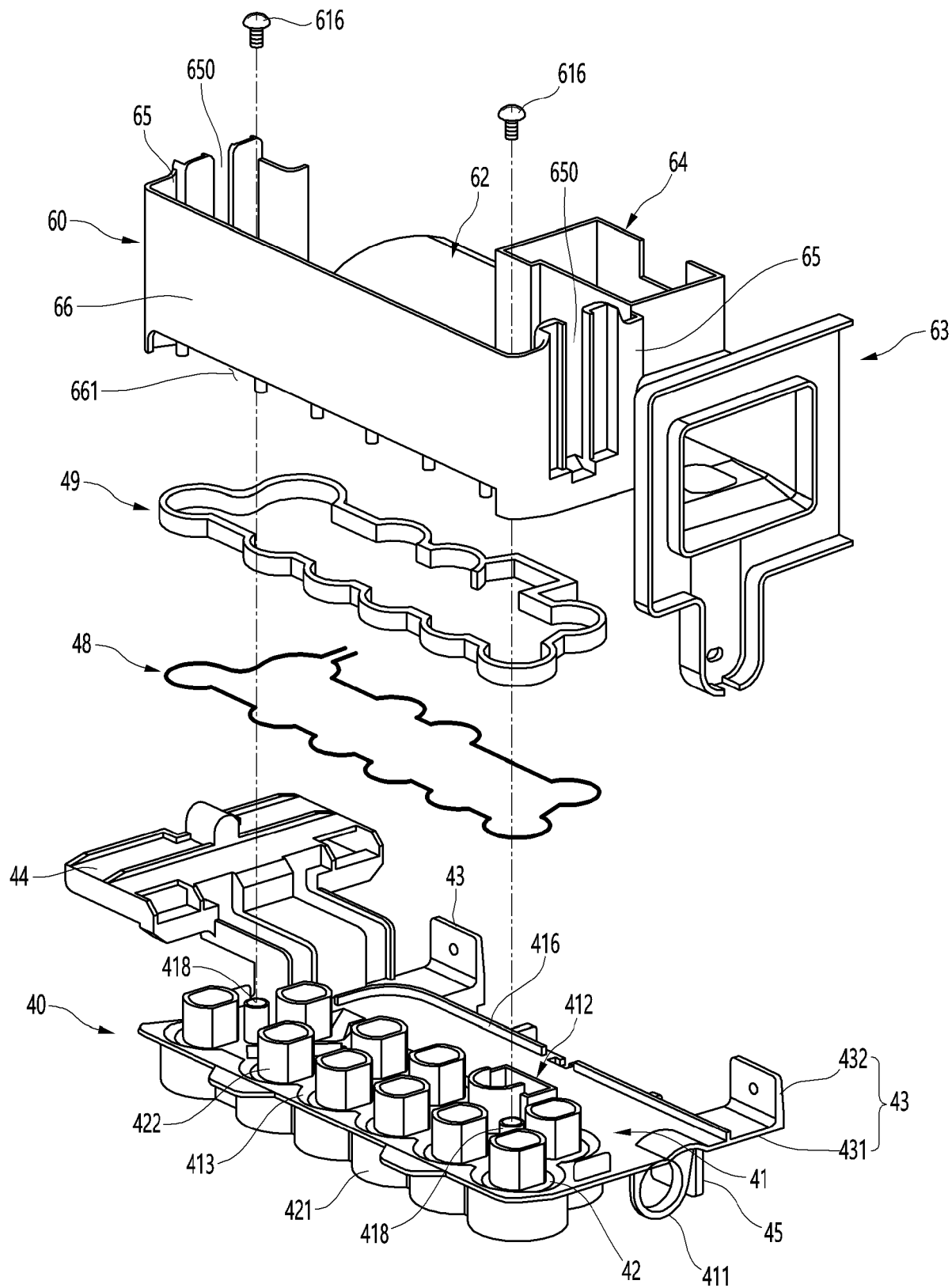
[Fig. 7]



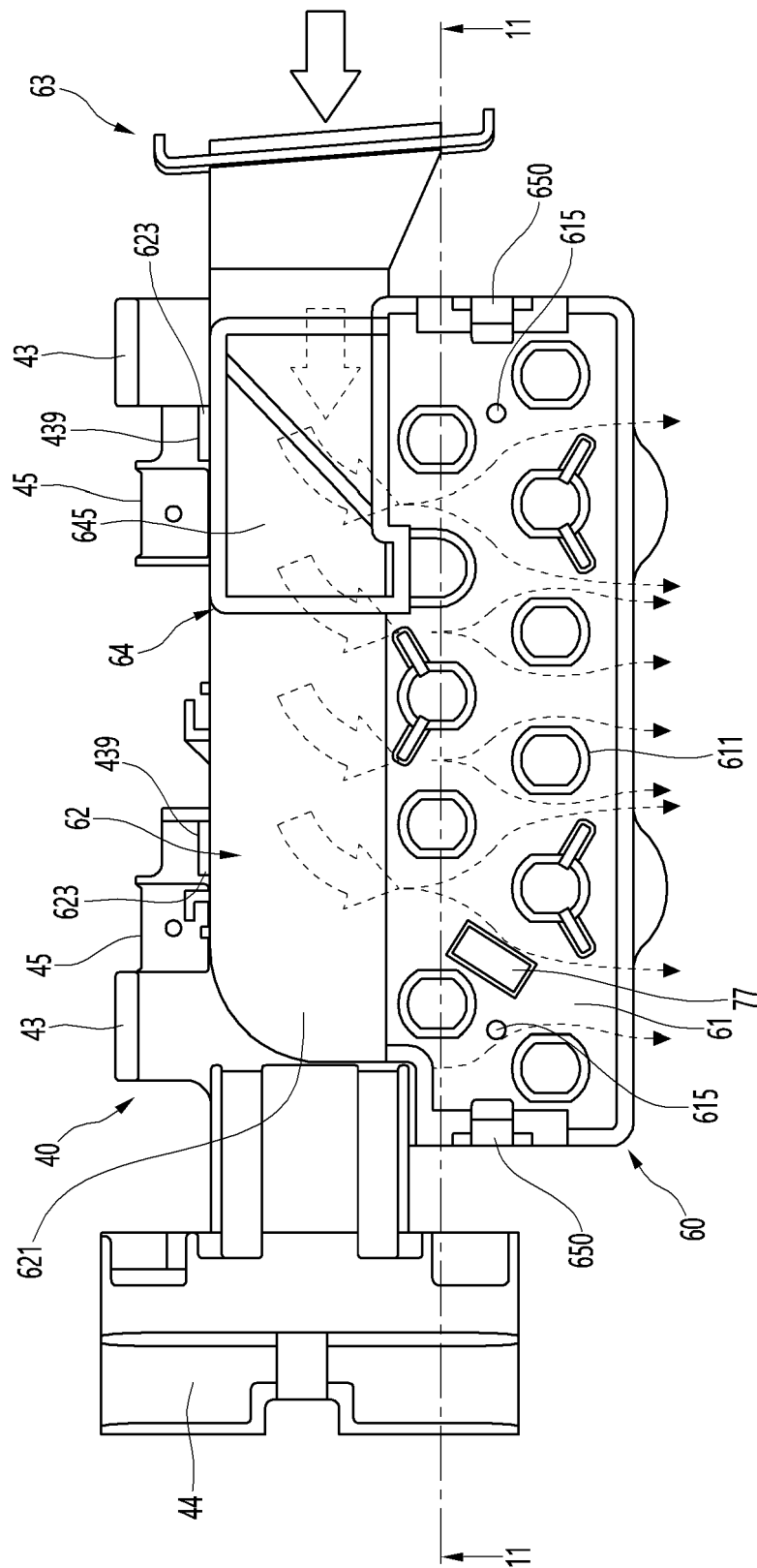
[Fig. 8]



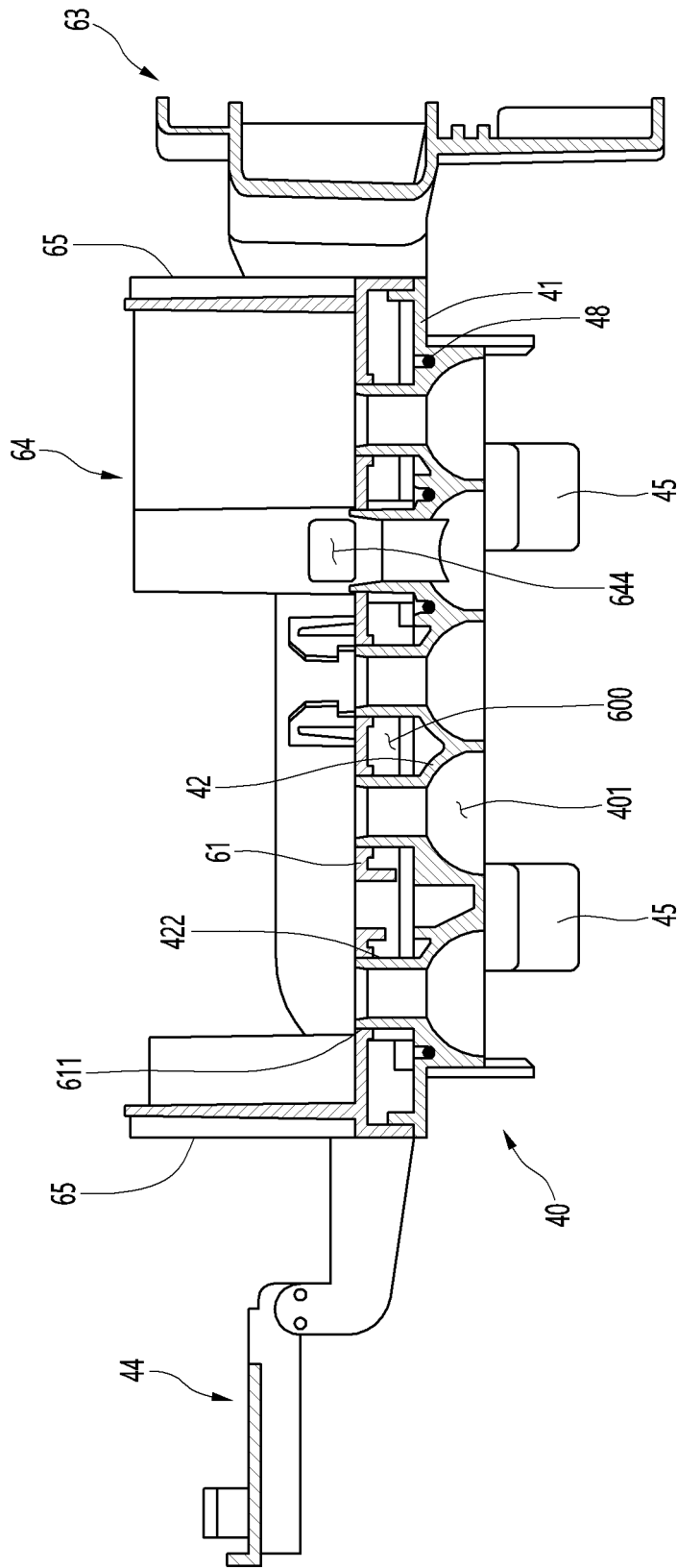
[Fig. 9]



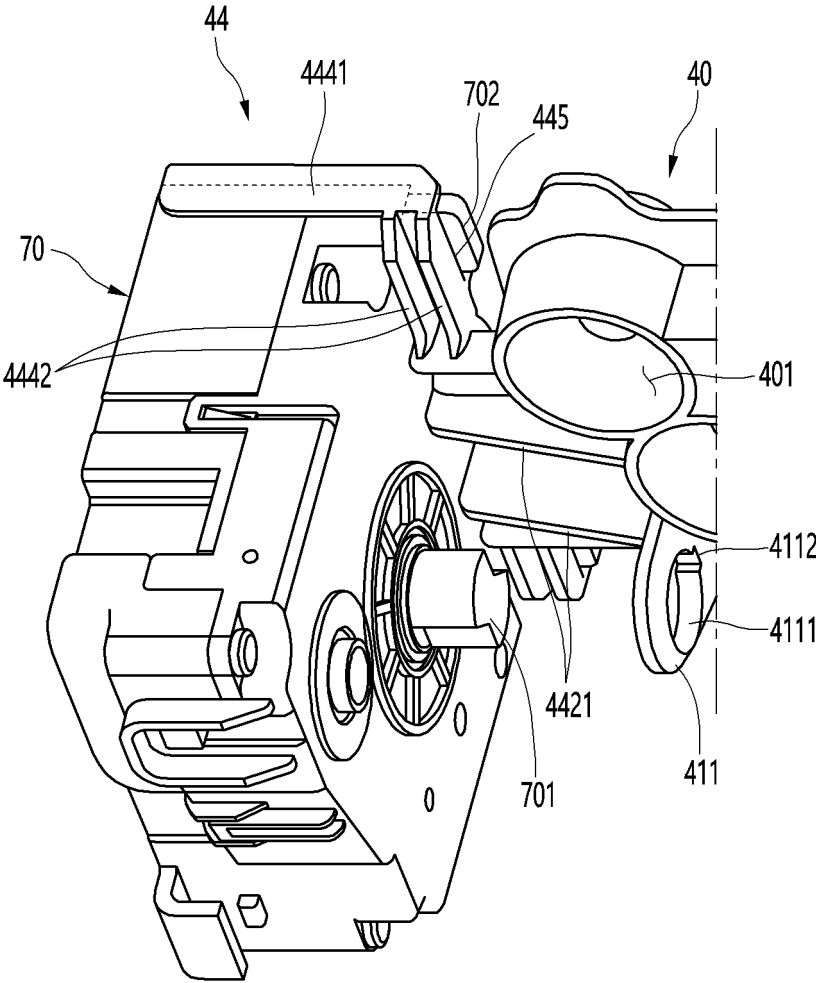
[Fig. 10]



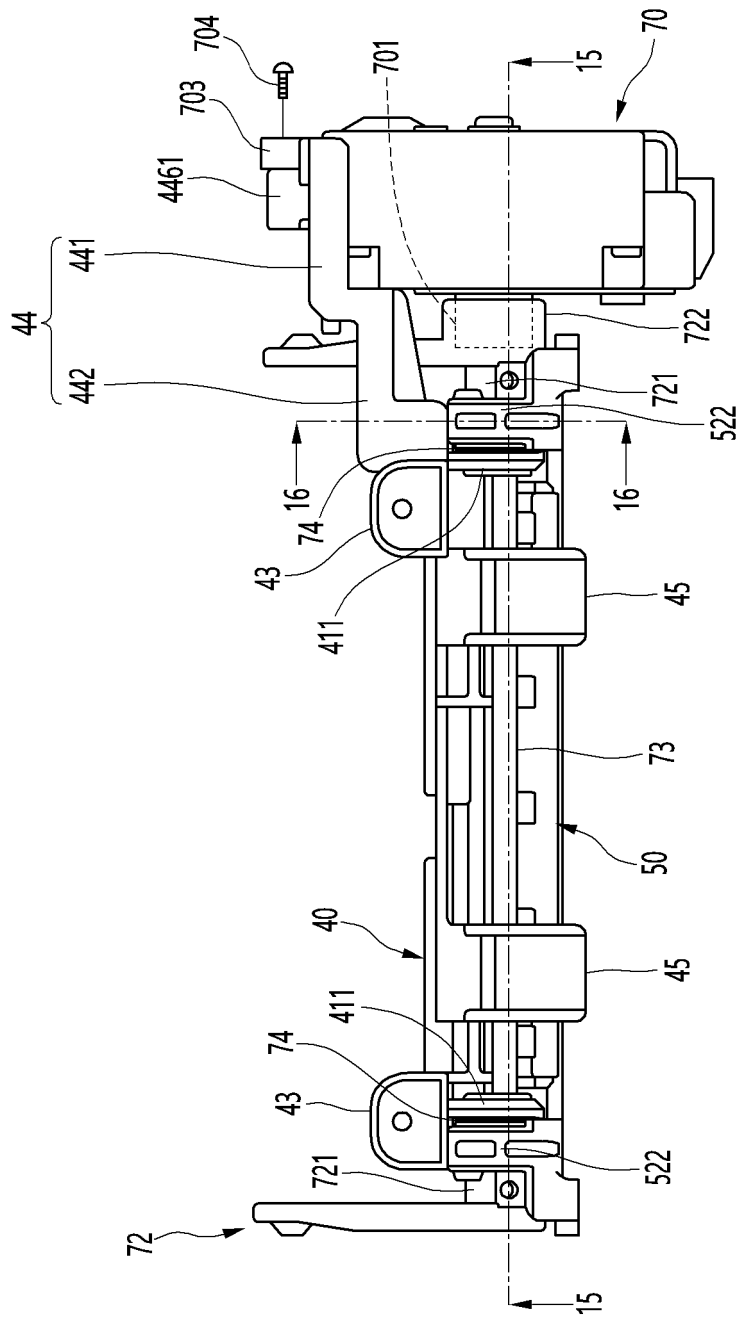
[Fig. 11]



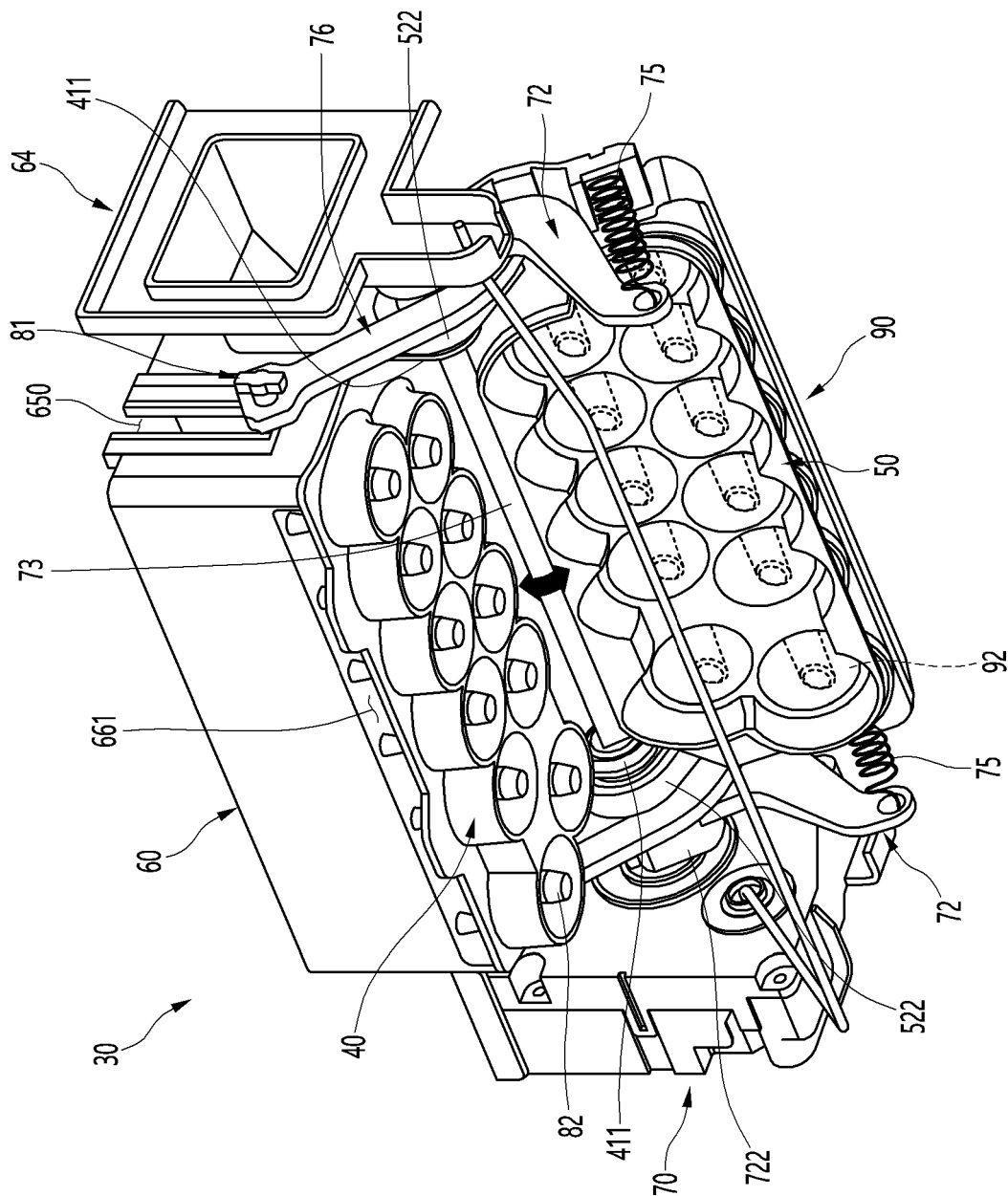
[Fig. 12]



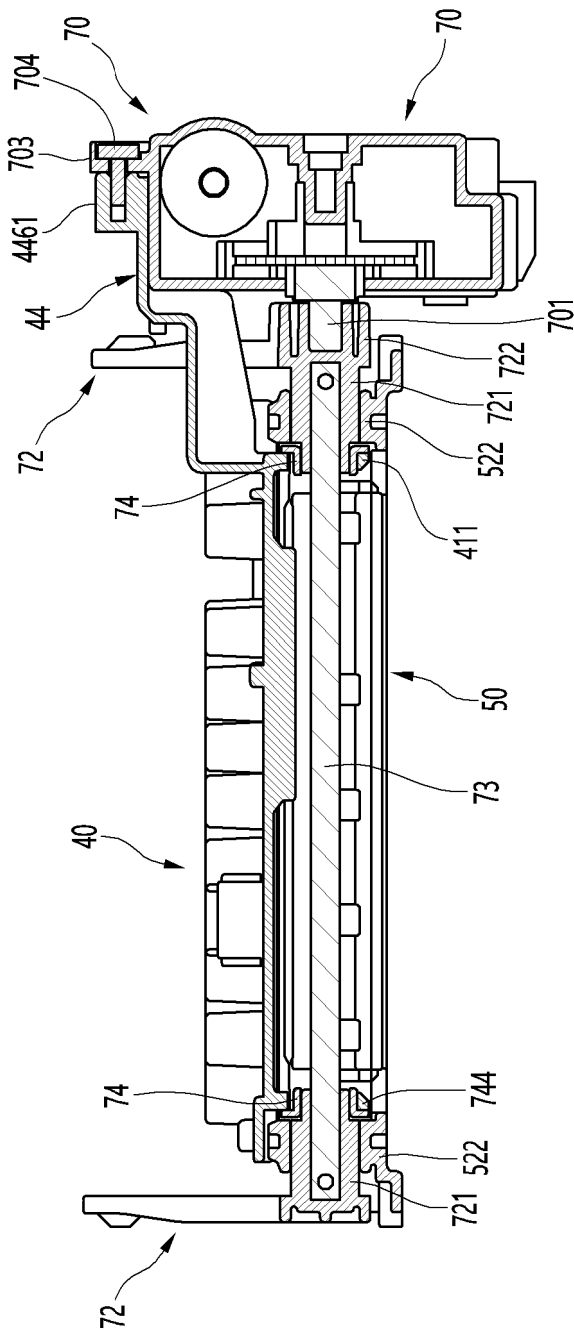
[Fig. 13]



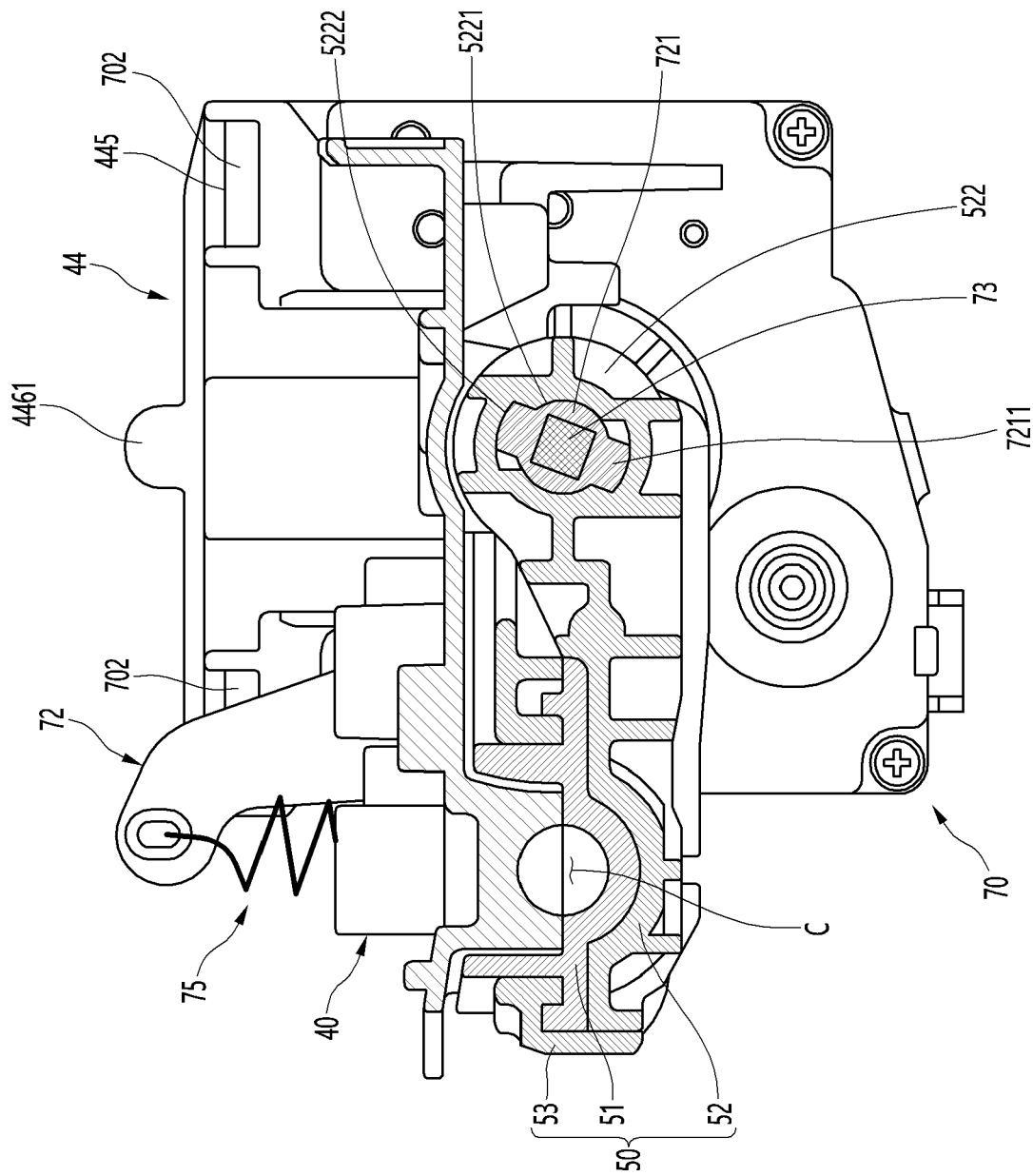
[Fig. 14]



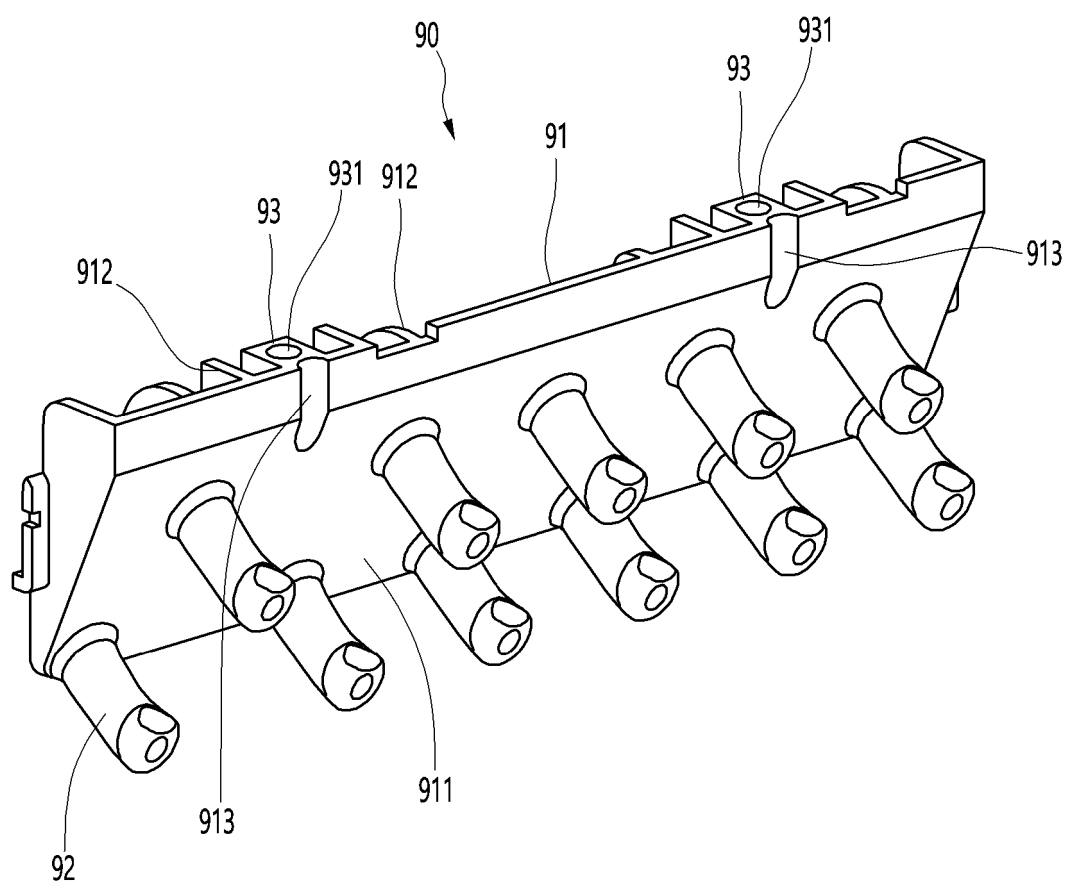
[Fig. 15]



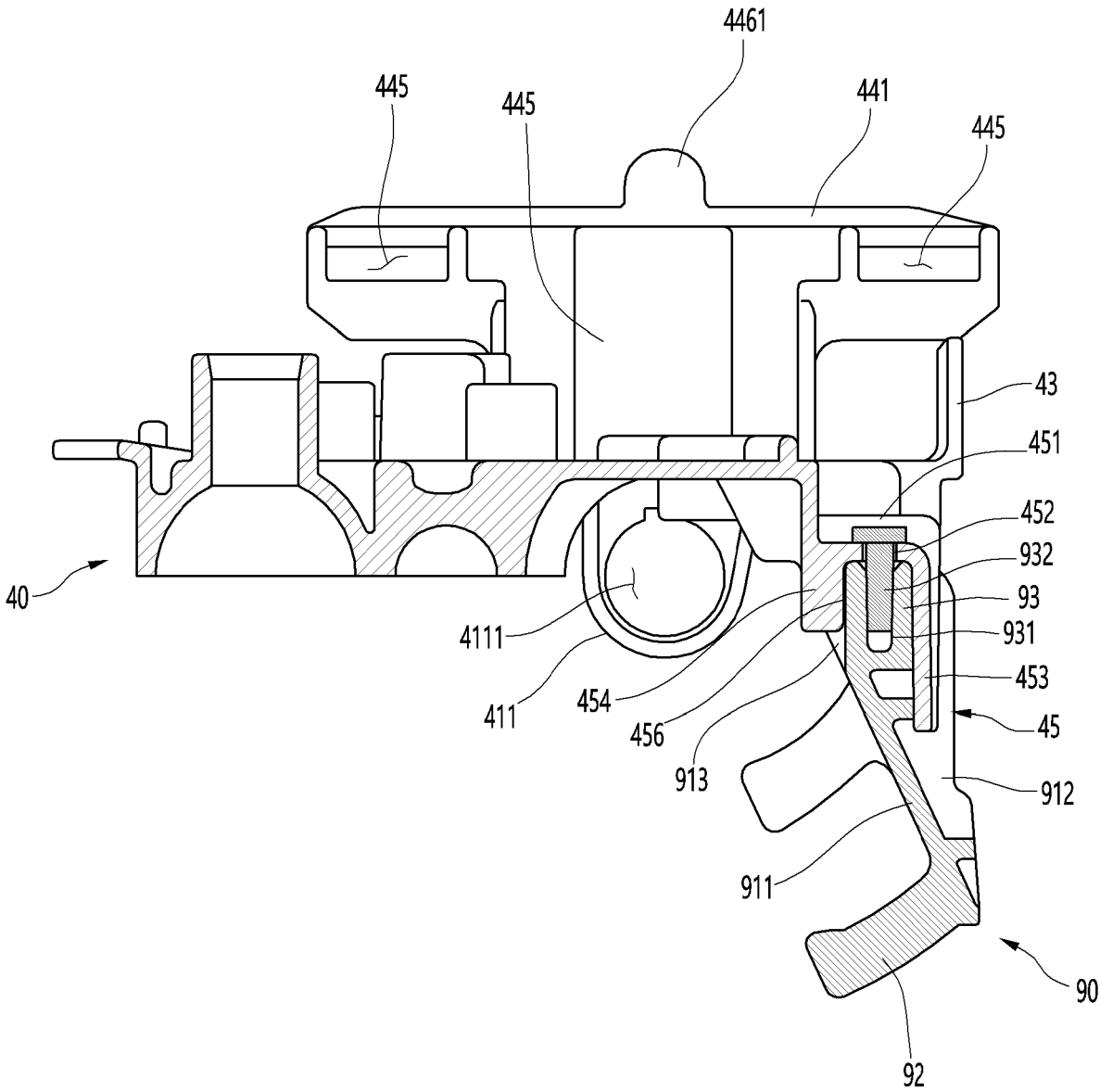
[Fig. 16]



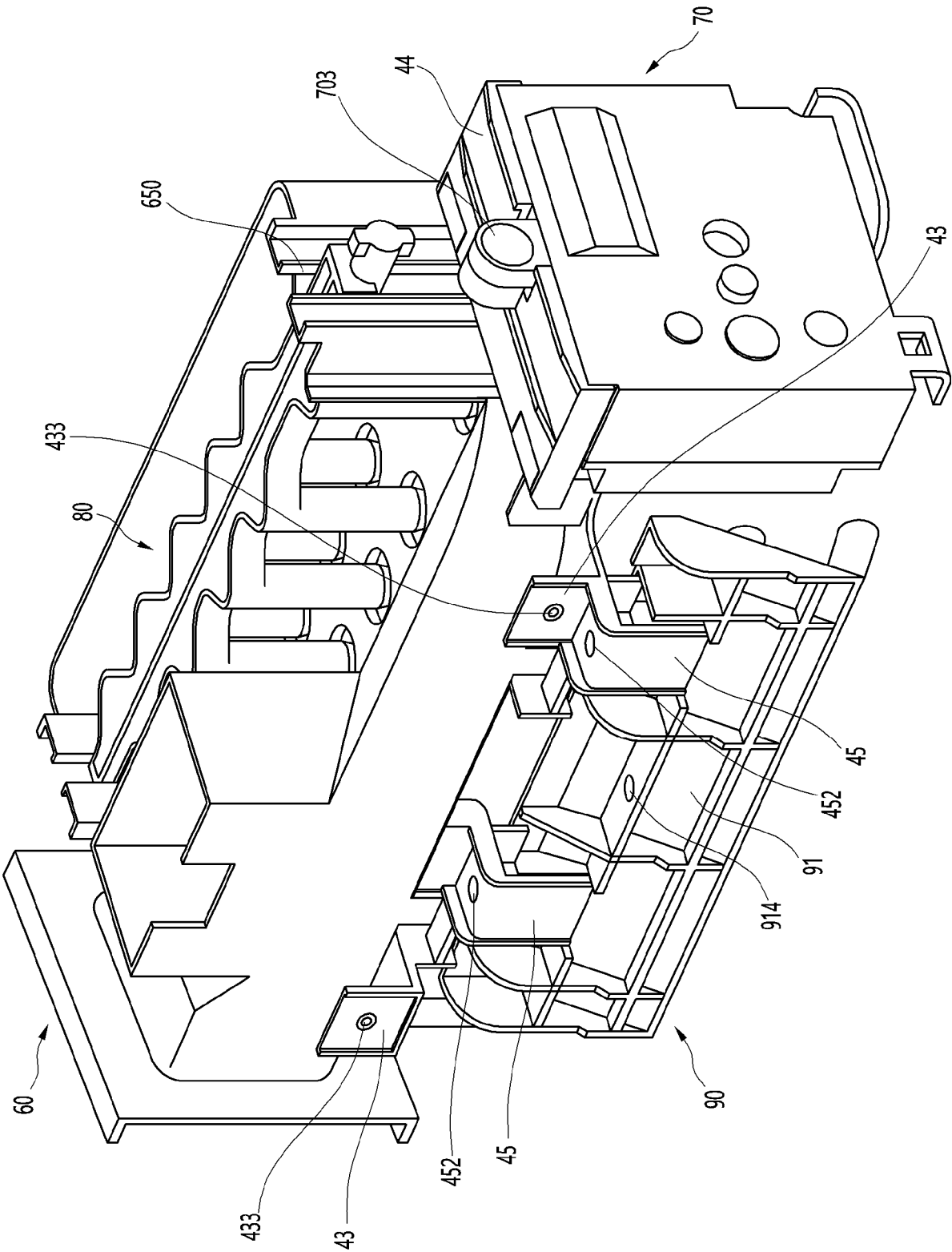
[Fig. 17]



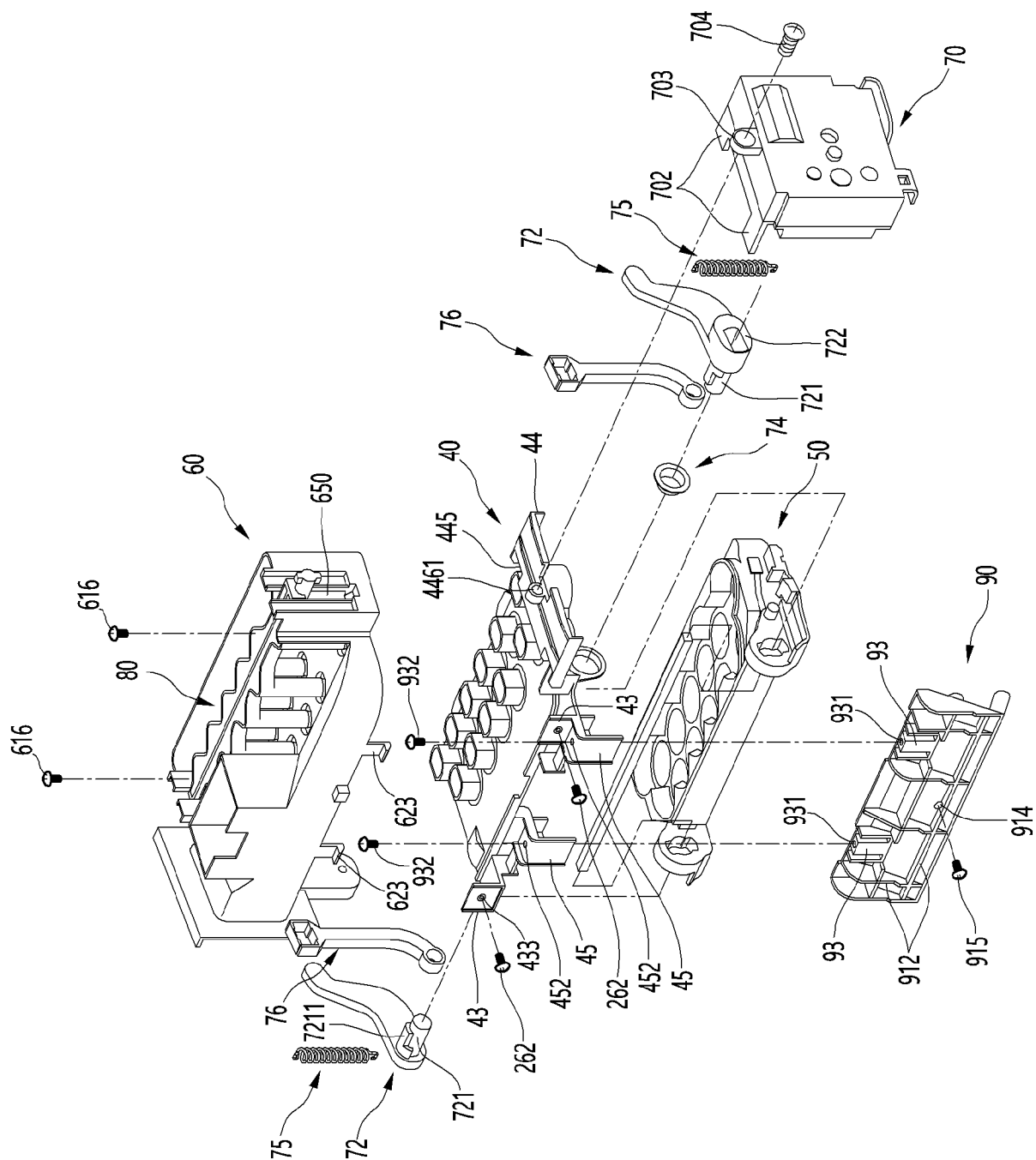
[Fig. 18]



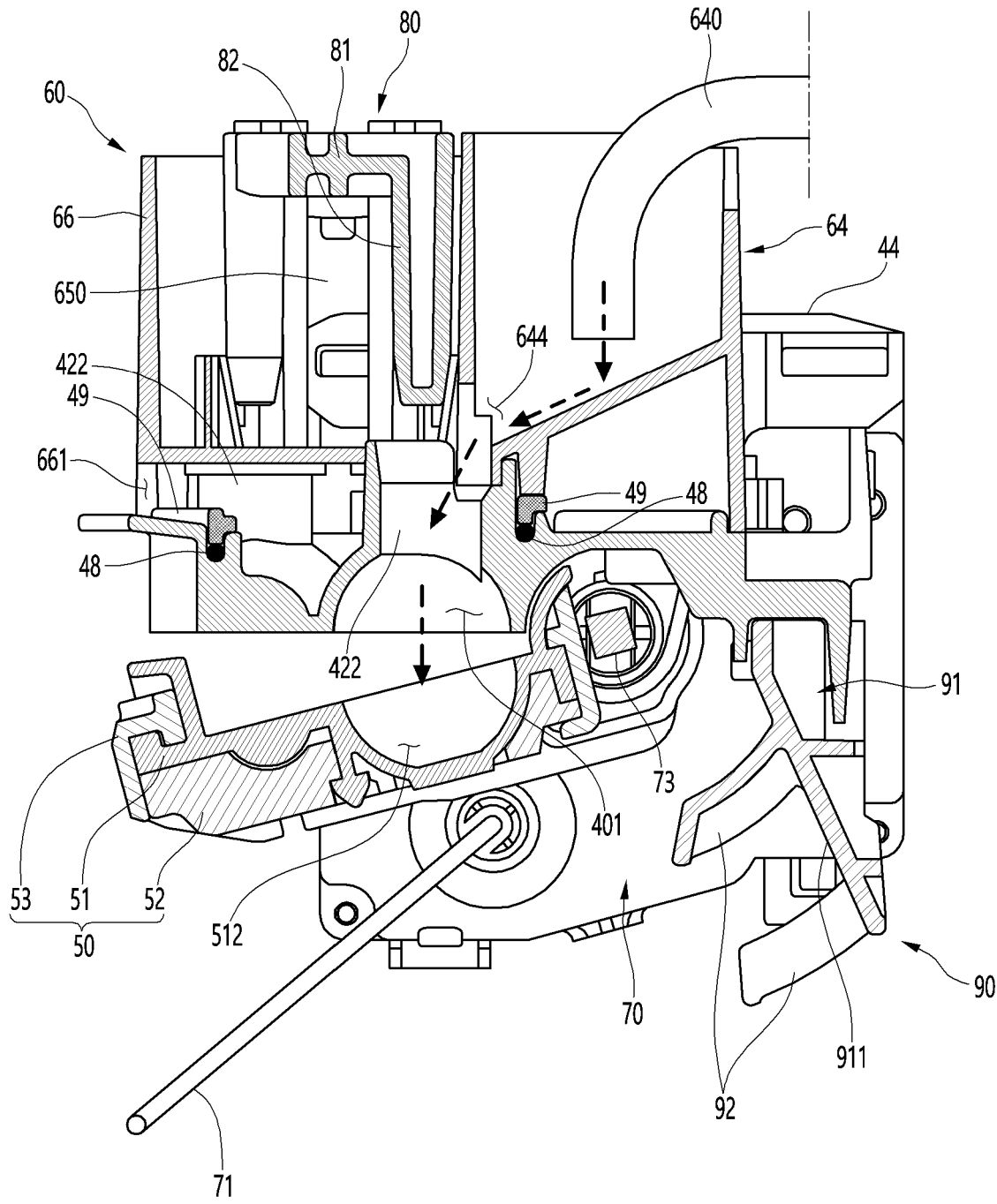
[Fig. 19]



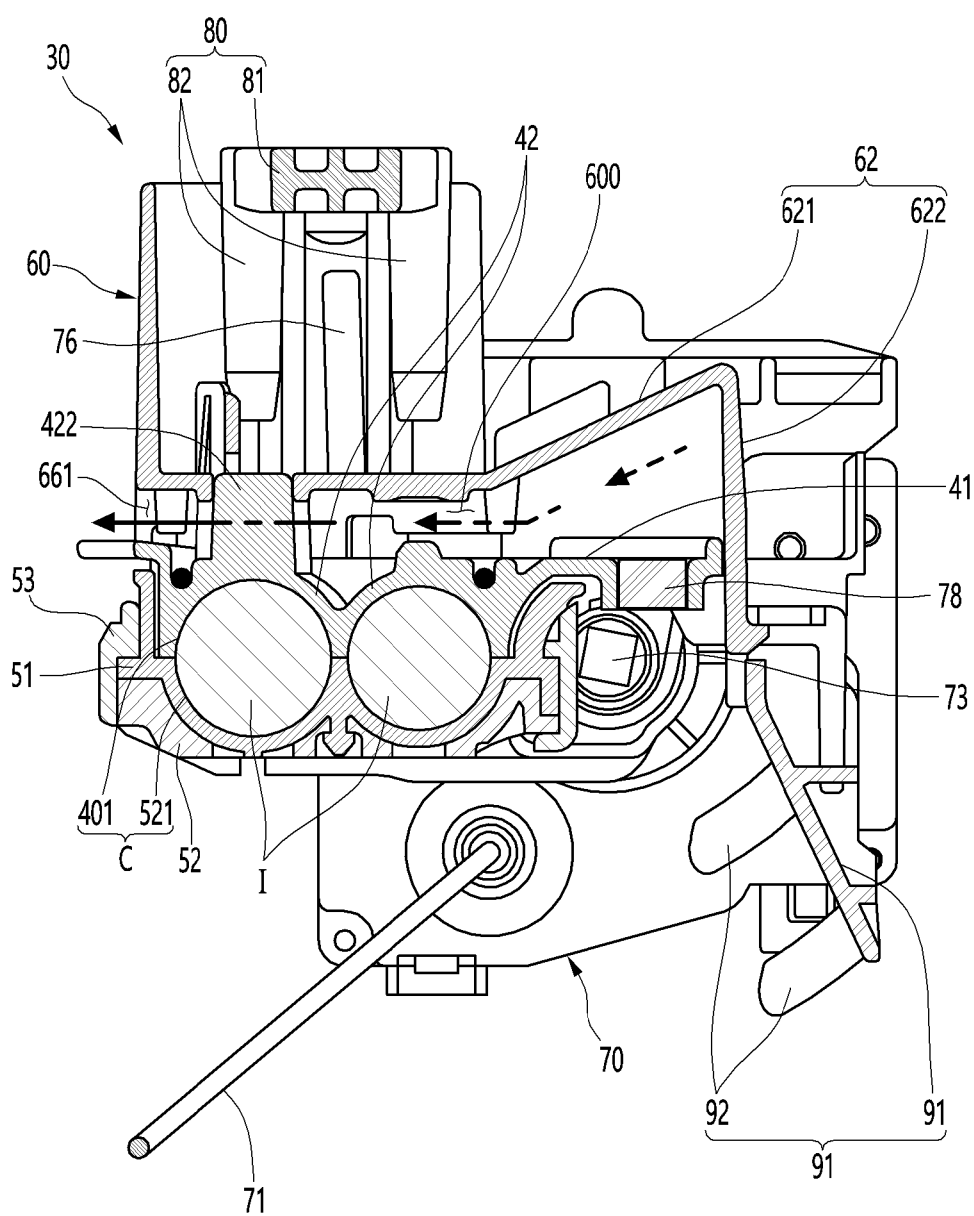
[Fig. 20]



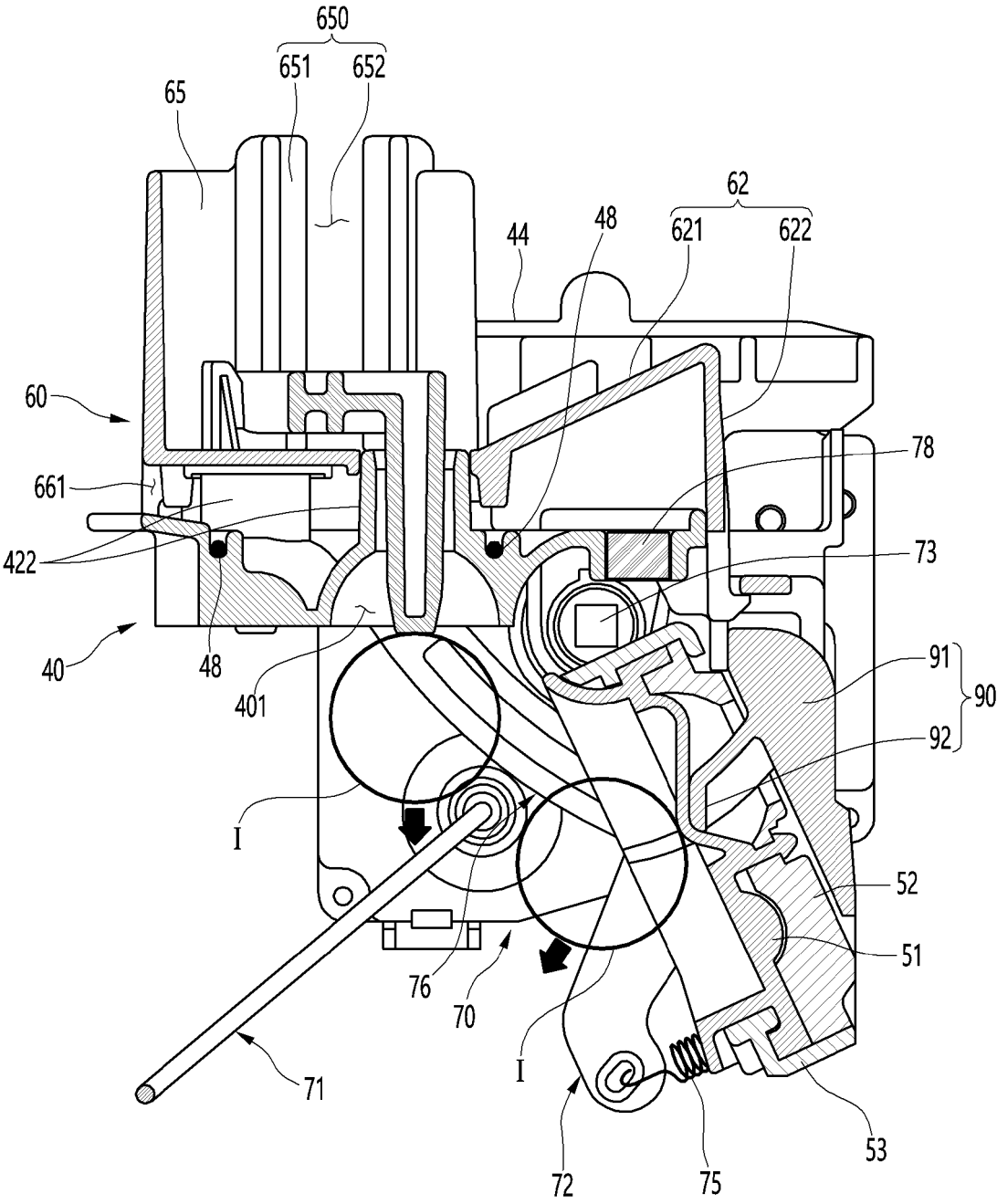
[Fig. 21]



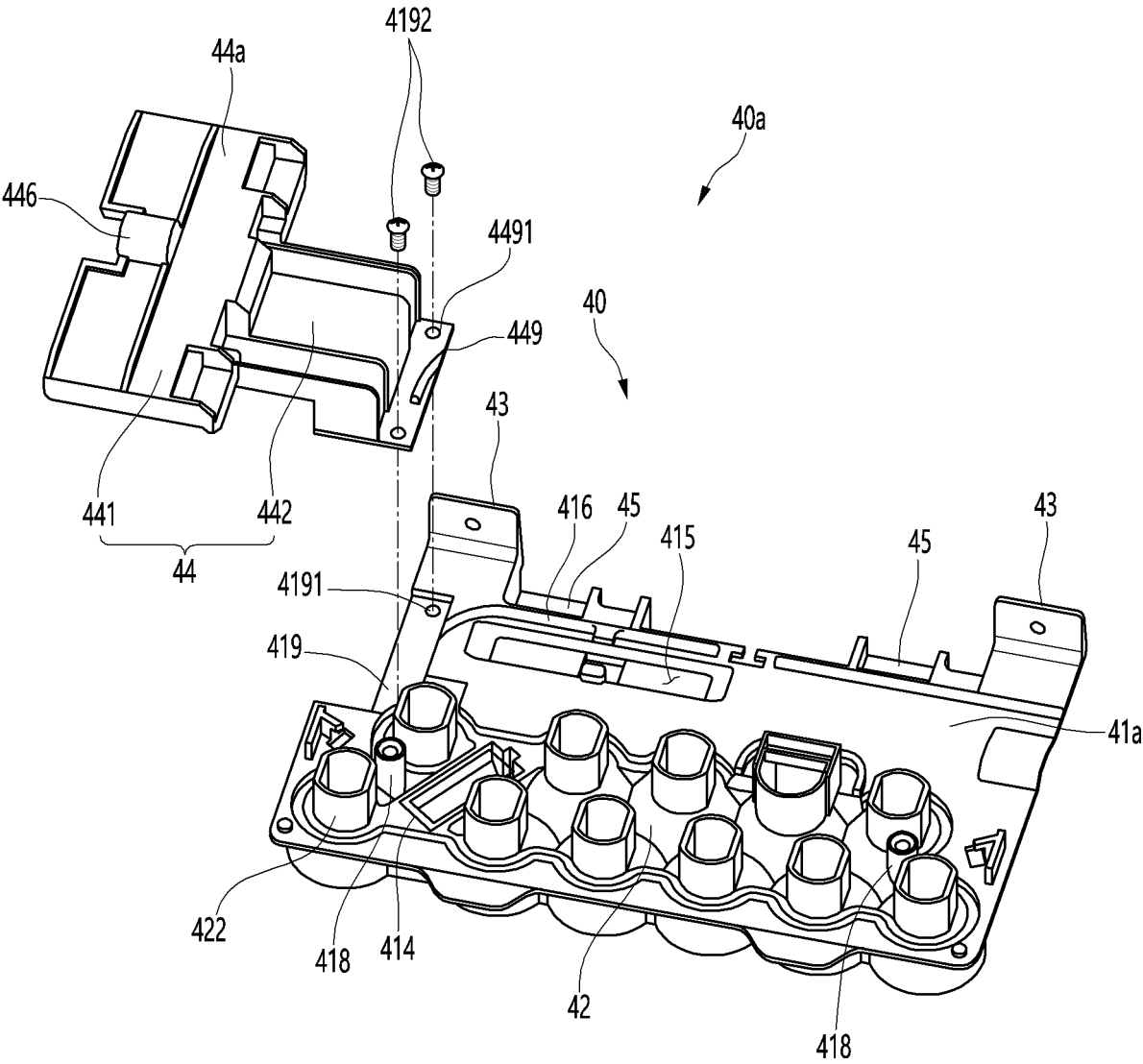
[Fig. 22]



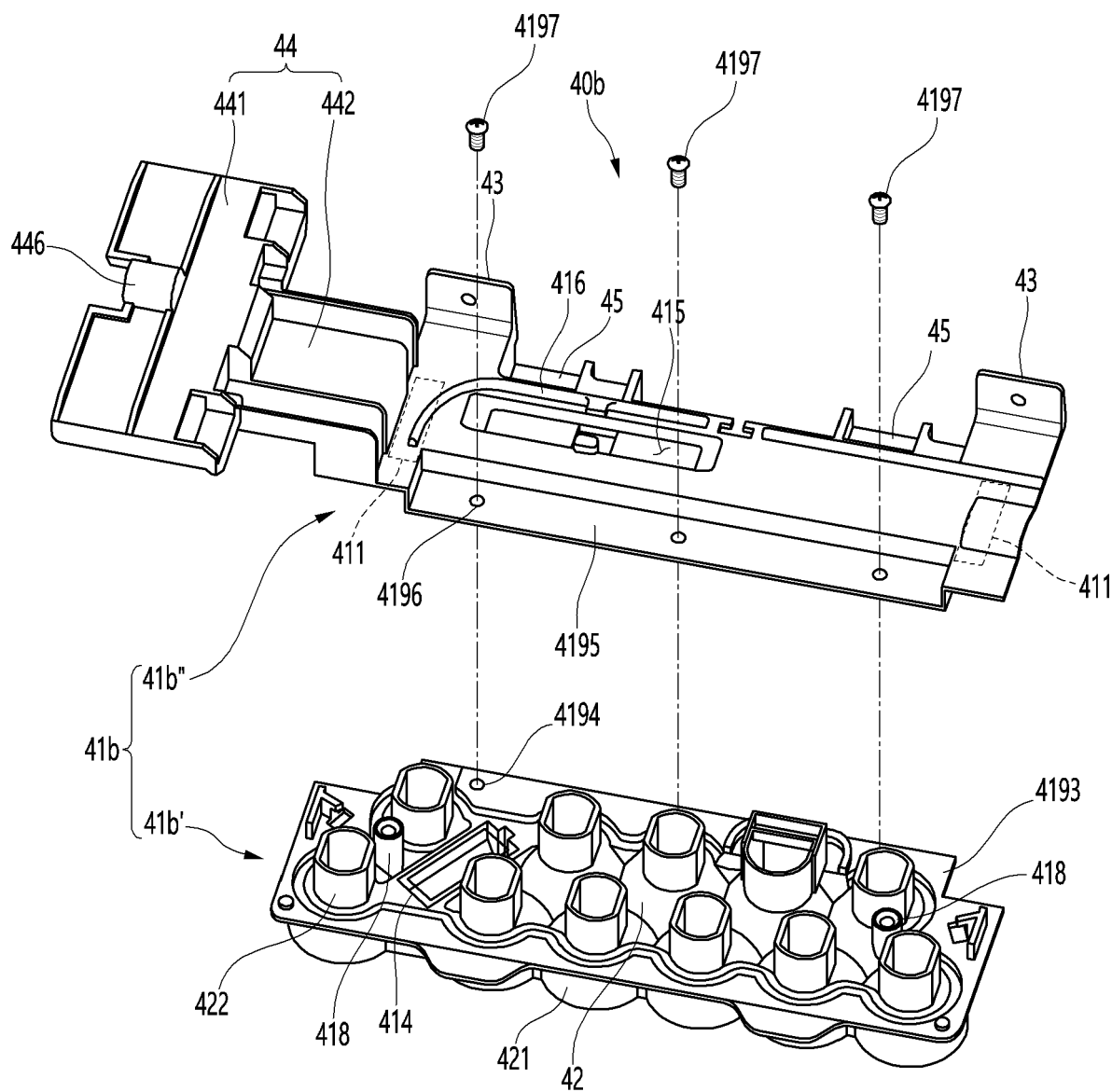
[Fig. 23]



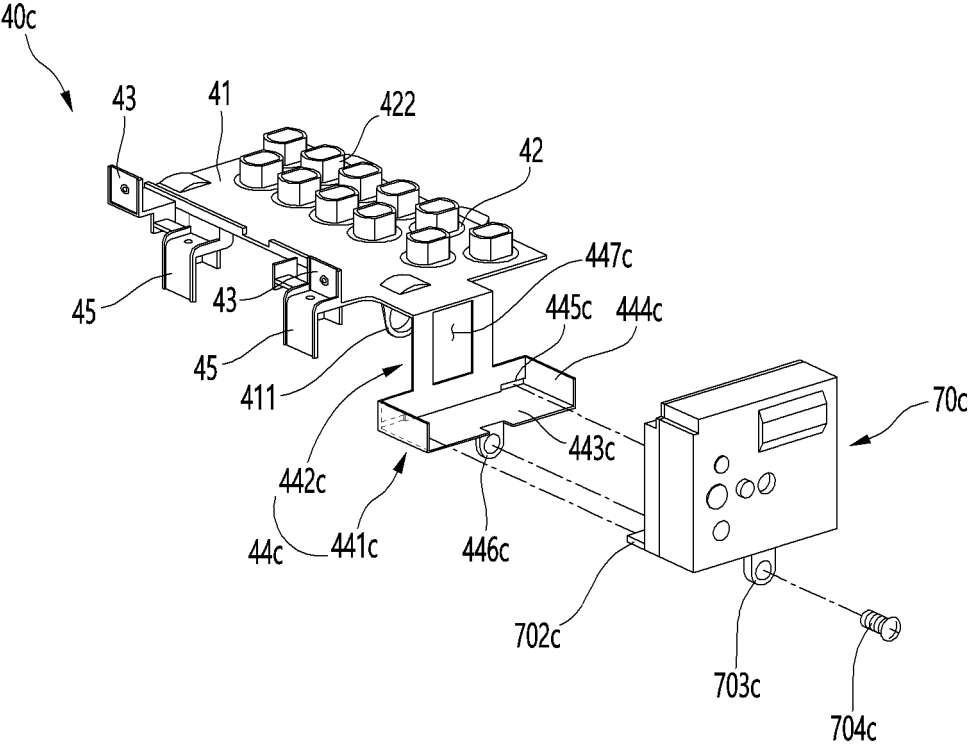
[Fig. 24]



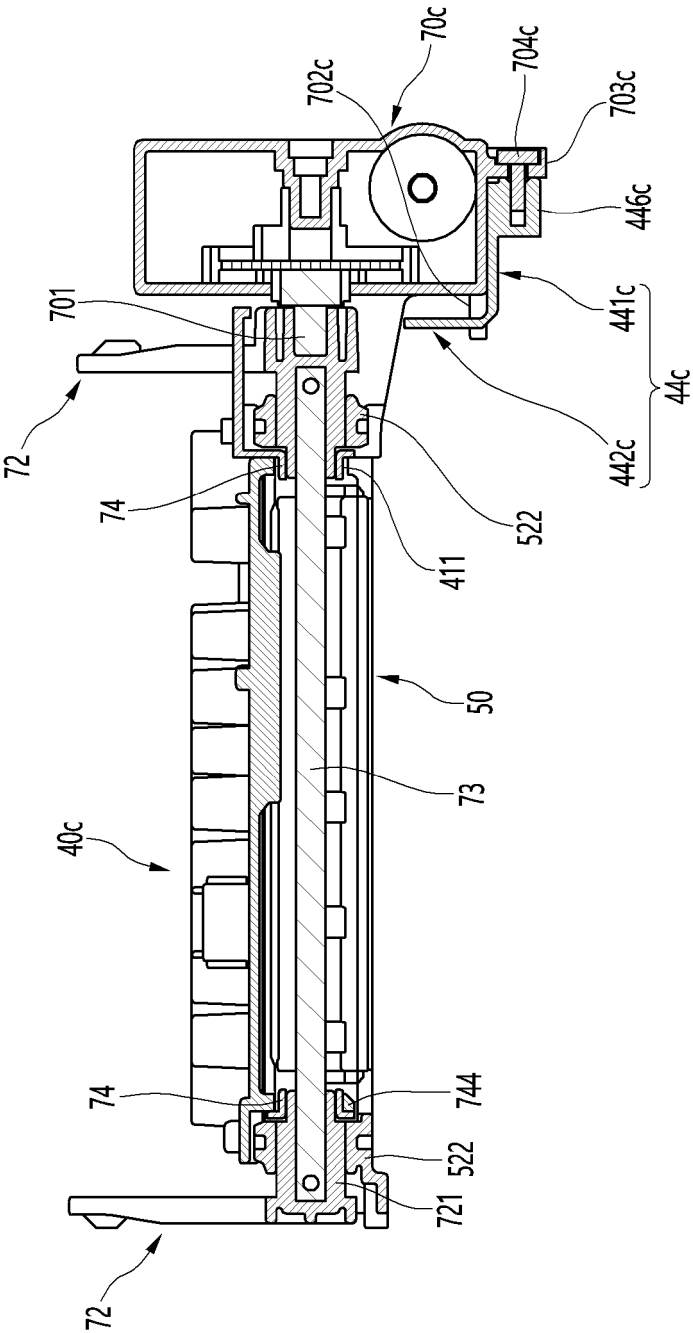
[Fig. 25]



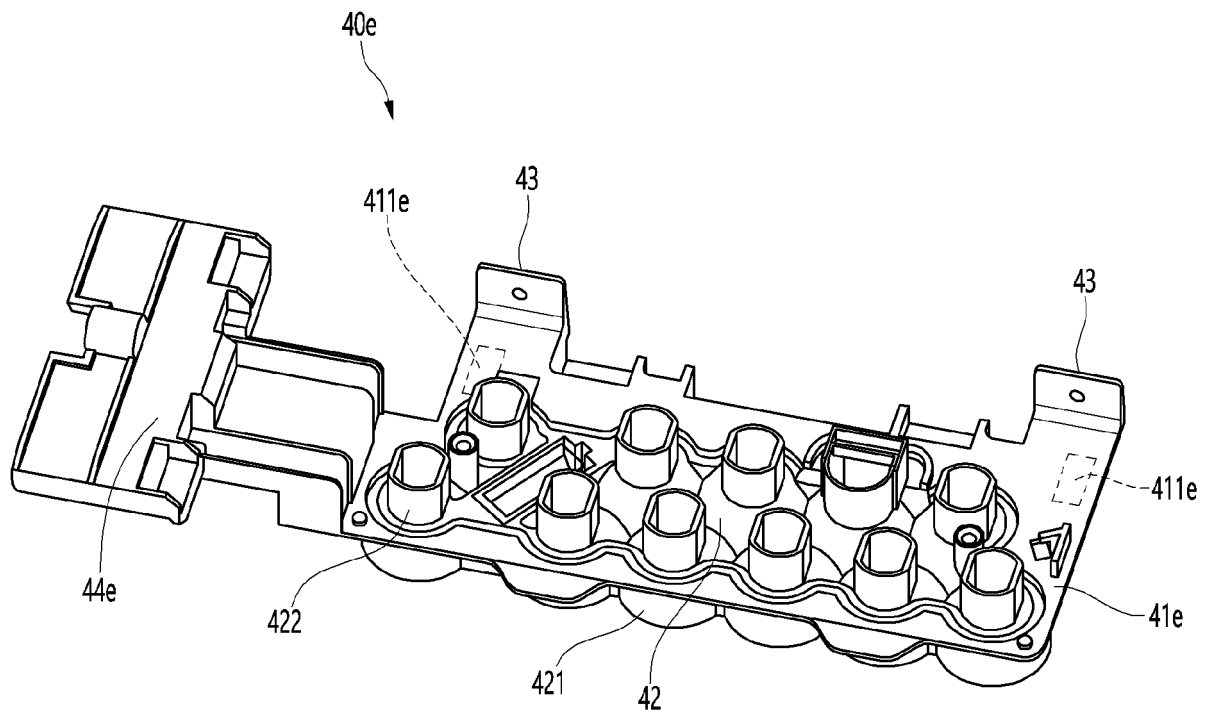
[Fig. 26]



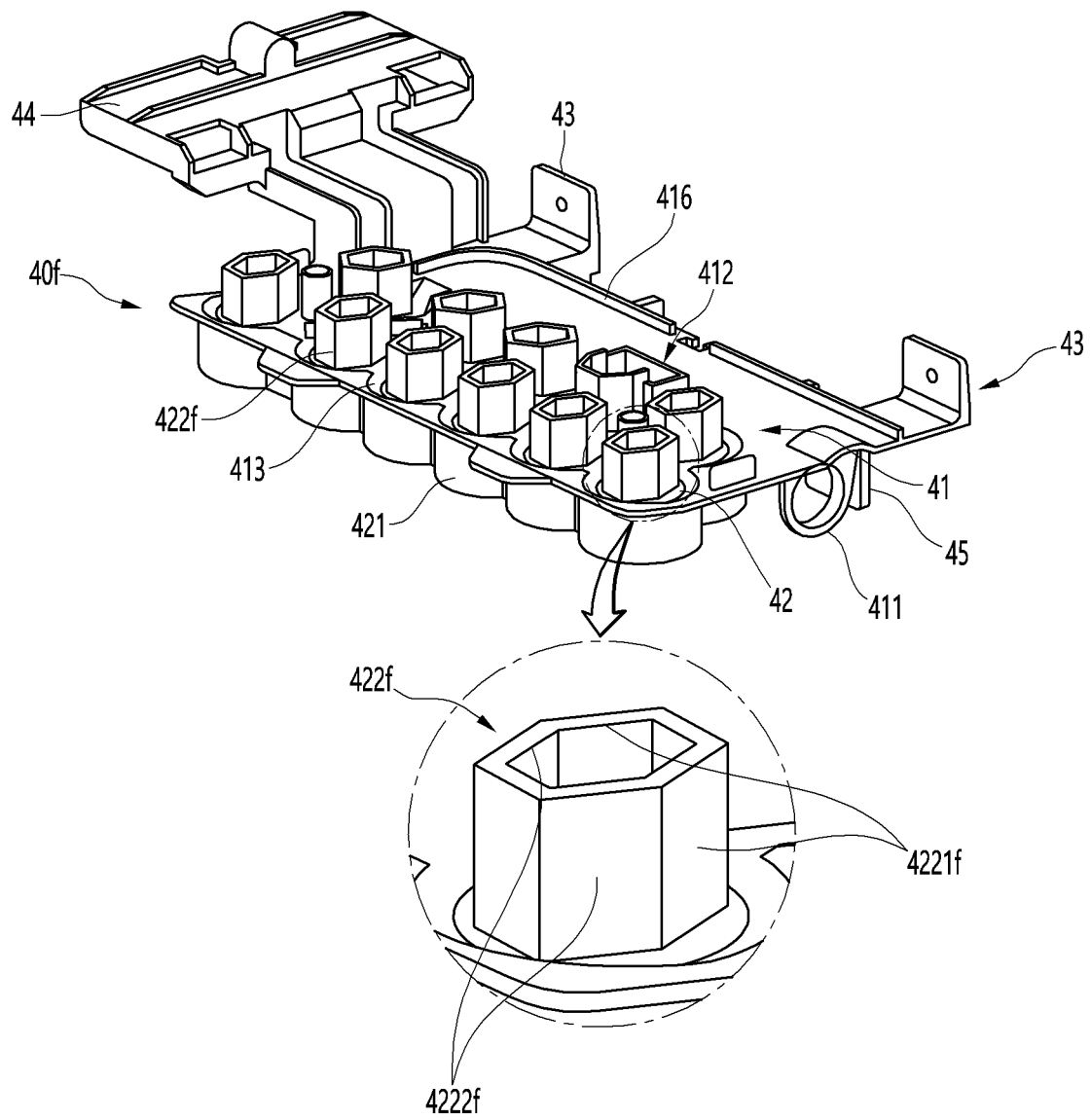
[Fig. 27]



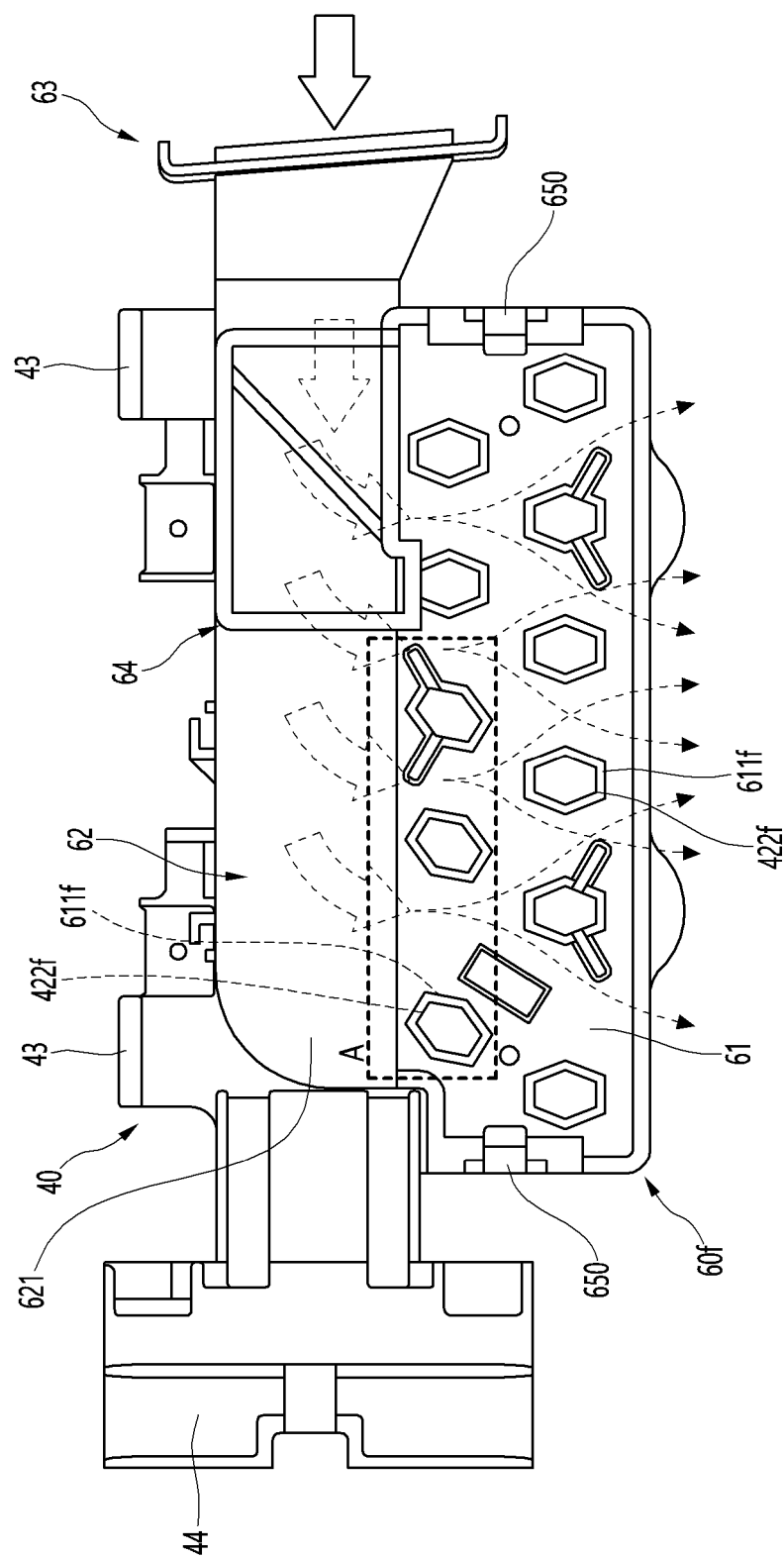
[Fig. 28]



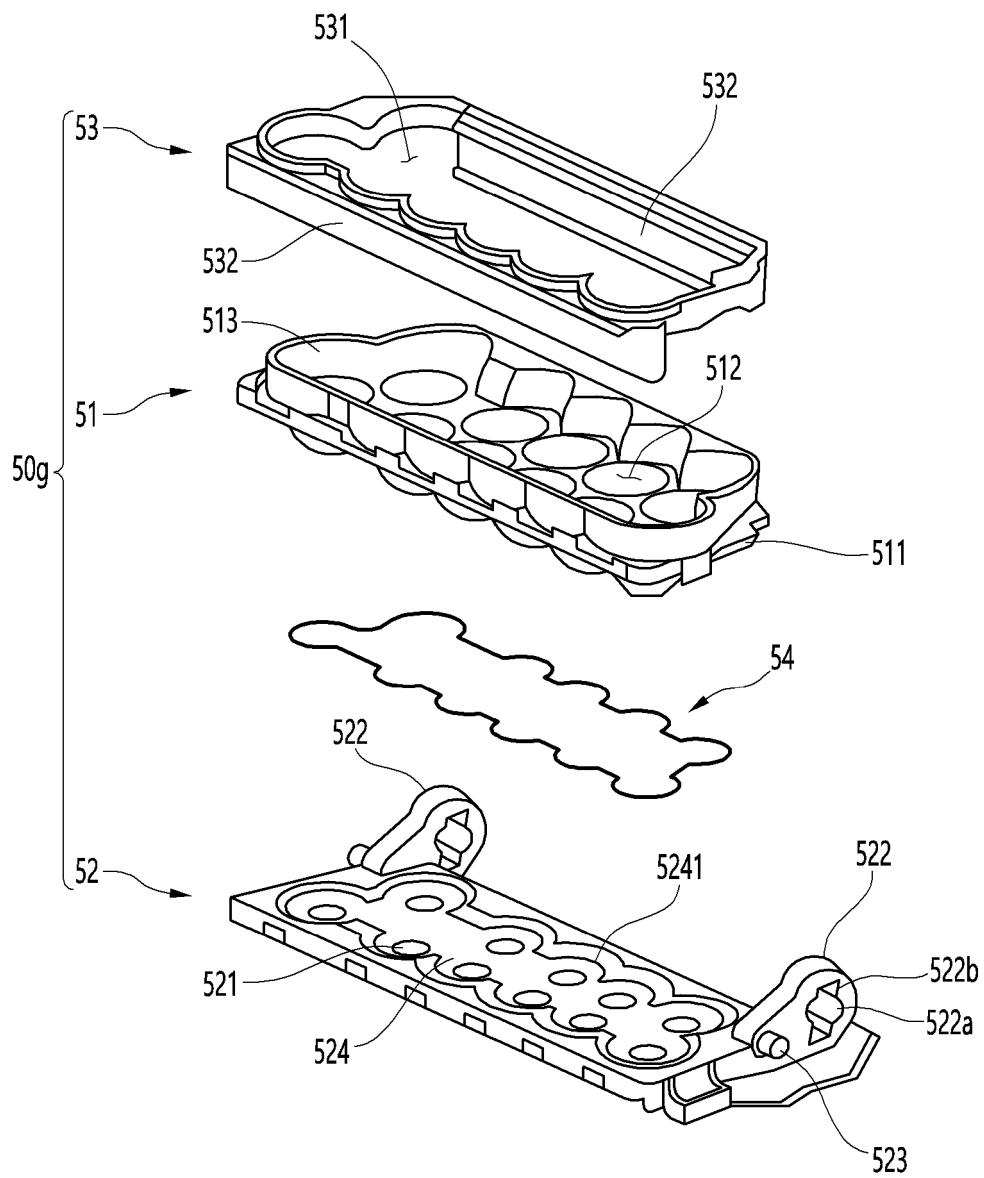
[Fig. 29]

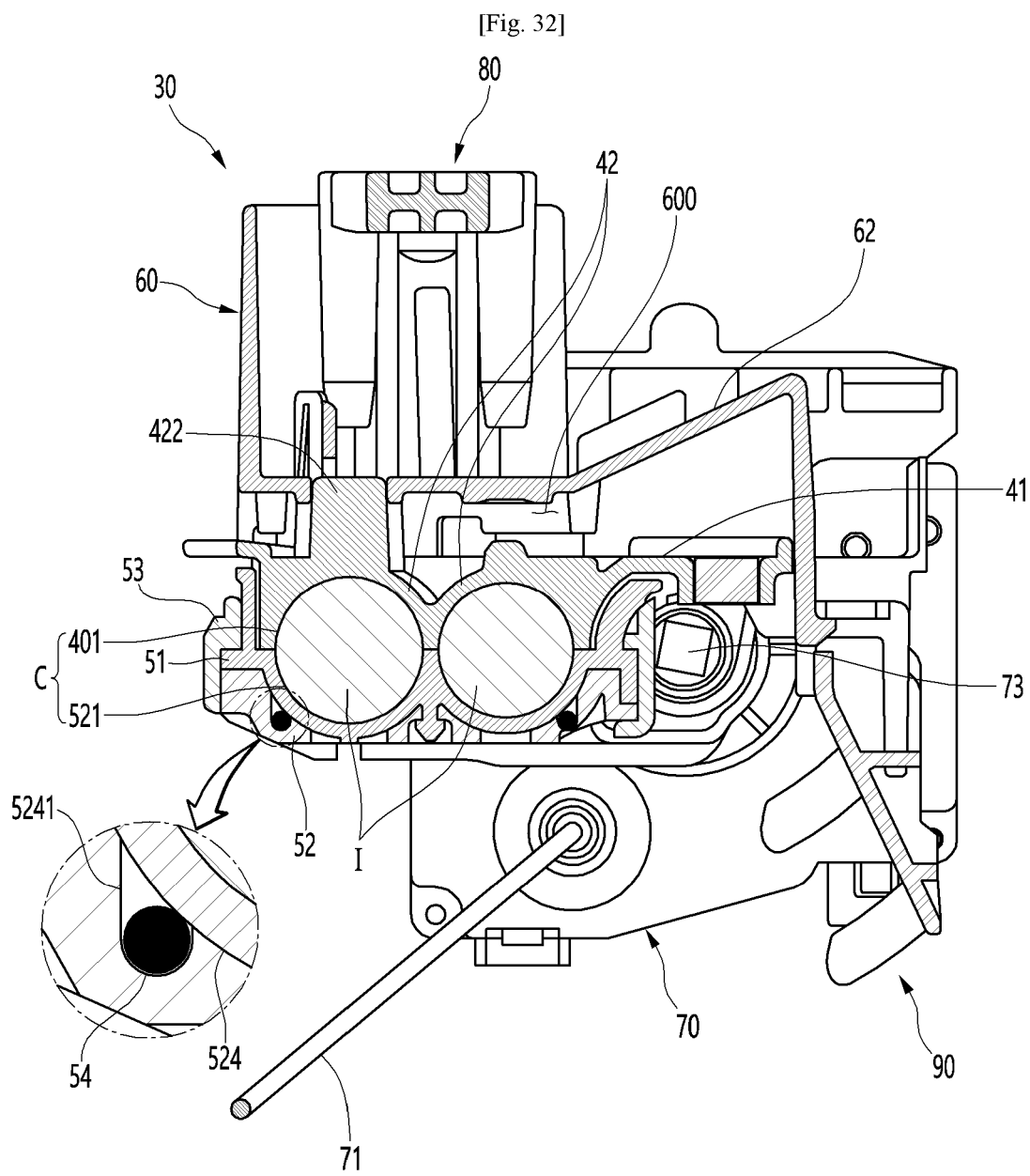


[Fig. 30]



[Fig. 31]







EUROPEAN SEARCH REPORT

Application Number

EP 24 20 0519

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* figures 1-29 * * paragraphs [0199], [0202], [0213] * -----		
X	KR 2022 0053322 A (LG ELECTRONICS INC [KR]) 29 April 2022 (2022-04-29)	1-5, 7-10, 13-15 6,11,12	
A	* figures 1-27 * -----		
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 January 2025	Examiner Dezso, Gabor
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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