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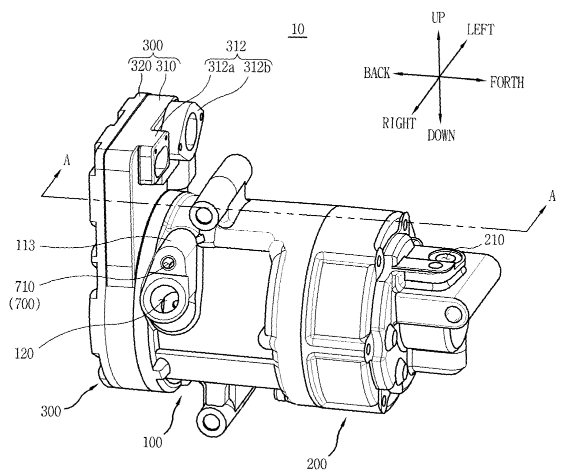
(54) MOTOR OPERATED COMPRESSOR

(57) Disclosed is about a motor operated compressor. The motor operated compressor according to an embodiment of the present disclosure is applied with a vapor injection method. In order to implement the vapor injection method, a vapor refrigerant is supplied to the motor operated compressor.

The vapor refrigerant flows along a vapor refrigerant passage formed inside a wall portion of a main housing. The vapor refrigerant passage is in communication with a scroll inner passage formed in a fixed scroll. The scroll inner passage communicates with a compression chamber, so that the vapor refrigerant introduced in is flowed into the compression chamber.

Accordingly, the vapor injection method may be applied without having a separate member to form a passage in an inner space of the main housing. Therefore, a utilization of the inner space of the main housing is improved, and passages of the vapor refrigerant and the refrigerant can be formed in a simple manner.

FIG. 1



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Description

BACKGROUND

1. Technical Field

[0001] The present disclosure relates to a motor operated compressor, and more particularly, to a motor operated compressor having a structure in which a passage through which vaporized vapor refrigerant supplied to a compression chamber flows is formed in a housing.

2. Description of the Related Art

[0002] A compressor is a device to compress a refrigerant used in a refrigeration cycle or a heat pump. The compressor may be provided in various apparatuses requiring an input and an output of heat.

[0003] Electric vehicles powered by electricity are also provided with compressors for air conditioning and the like. Particularly, motor operated compressors driven by electric power using motors have been actively developed according to the tendency of electrification of parts of electric vehicles.

[0004] For the compressor provided in the electric vehicle, a size of the compressor is limited due to a narrow installation space. Therefore, techniques have been introduced to improve a compression efficiency of the refrigerant without increasing the size of the compressor.

[0005] An example of the above techniques may be a vapor injection method. The vapor injection method is a technique of extracting a high-pressure vapor refrigerant from an outlet of a condenser constituting the refrigerant cycle and supplying the high-pressure vapor refrigerant to the compressor again.

[0006] As the vapor refrigerant is resupplied to the compressor, an amount of refrigerant compressed in the motor operated compressor is increased. Accordingly, the compression efficiency of the refrigerant may be improved, and an efficiency of the refrigerant cycle or the heat pump may be improved.

[0007] Korean Laid-Open Patent Literature No. 10-2003-0062208 discloses a scroll compressor using the vapor injection. Specifically, the prior art discloses a scroll compressor that injects a vapor refrigerant into two closed spaces by using a single large injection port.

[0008] However, this type of scroll compressor must have a separate passage for the vapor refrigerant to flow therein. That is, the scroll compressor according to the prior art has to be provided with a structure such as a separate vapor refrigerant port in order for the vapor refrigerant to flow in a space between a fixed scroll and an orbiting scroll.

[0009] As a result, the passage for the refrigerant and the vapor refrigerant to flow inside the scroll compressor is formed complicatedly. This may result in increasing the size of the scroll compressor. That is, the prior art fails to suggest a method for minimizing the compressor.

[0010] Korean Laid-Open Patent Literature No. 10-2016-0081431 discloses a scroll compressor applying the vapor injection method and an air conditioning equipment having the same. Specifically, the scroll compressor of a structure having a separate vapor refrigerant injection pipe outside the scroll compressor and communicating the vapor refrigerant injection pipe with the scroll compressor to supply the vapor refrigerant is disclosed in the prior art.

[0011] However, this type of scroll compressor also needs a separate passage for the vapor refrigerant to flow therethrough.

[0012] In addition, the scroll compressor according to the prior art has to be aligned with a vertical hole formed in a body portion of the fixed scroll, and with the vapor refrigerant injection pipe through which the vapor refrigerant flows outside the scroll compressor. Therefore, a design freedom of the housing, the fixed scroll, and the vapor refrigerant injection pipe is drastically reduced.

[0013] In addition, in the scroll compressor according to the prior art, the vapor refrigerant is introduced into a narrow space in which a fixed scroll, an orbiting scroll, a frame, and the like are concentrated. Therefore, passages inside the scroll compressor are formed complicatedly.

[0014] As a result, the scroll compressor in the prior arts has a structure in which the overall size of the scroll compressor is increased to secure a passage through which the refrigerant in a vapor state to flow.

[0015] Further, a through hole provided in the scroll compressor according to the prior arts is formed near the compression chamber where the high-pressure refrigerant flows. Therefore, additional task is needed to seal the through hole. Accordingly, fabricating cost and time of the scroll compressor may be increased.

[Prior Art Literature]

[Patent Literature]

[0016] Korean Laid-Open Patent Literature No. 10-2003-0062208 (July 23, 2003)

[0017] Korean Laid-Open Patent Literature No. 10-2016-0081431 (July 08, 2016)

SUMMARY

[0018] The present disclosure is directed to providing a motor operated compressor having a structure, capable of solving the above problems.

[0019] First, one aspect of the present disclosure is to provide a motor operated compressor having a structure capable of forming a simple passage through which a vapor refrigerant flows, while applying a vapor injection method.

[0020] In addition, another aspect of the present disclosure is to provide a motor operated compressor having a structure capable of miniaturization while applying a vapor injection method.

[0021] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure in which no additional member to form a passage through which an introduced vapor refrigerant flows is needed.

[0022] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure in which a through hole is not necessarily formed near a compression chamber through which a high-pressure refrigerant flows.

[0023] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure capable of preventing a weakening of structural rigidity.

[0024] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure capable of forming an external vapor refrigerant passage and an external suction refrigerant passage in a simple manner.

[0025] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a simple structure to prevent backward flow of an introduced vapor refrigerant.

[0026] In addition, still another aspect of the present disclosure is to provide a motor operated compressor capable of opening and closing a suction passage of a vapor refrigerant and a refrigerant with a simple structure.

[0027] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure capable of unifying paths through which a vapor refrigerant and a refrigerant are sucked.

[0028] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure which may apply a vapor injection method to both a low-pressure compressor and a high-pressure compressor.

[0029] In addition, still another aspect of the present disclosure is to provide a motor operated compressor having a structure capable of improving a compression efficiency of a refrigerant by applying a vapor injection method.

[0030] In order to achieve the above aspects and other advantages according to the preferred embodiment, there is provided a motor operated compressor having the following structure.

[0031] First, a path through which a vapor refrigerant flows inside a main housing is formed separately from a path through which a refrigerant introduced into an internal space of the main housing.

[0032] Specifically, a vapor refrigerant passage is formed inside a wall portion of the main housing. In addition, the vapor refrigerant passage is recessed in by a predetermined distance from one side in a lengthwise direction of the wall portion facing a fixed scroll.

[0033] That is, the vapor refrigerant passage is a space in which the one side is opened in the wall portion and extends toward an inverter part. The opened portion of the vapor refrigerant passage communicates with a scroll communication hole formed in the fixed scroll.

[0034] In addition, a scroll inner passage is formed inside the fixed scroll. The scroll inner passage is a space extending to one end of the scroll communication hole in a direction away from the wall portion.

[0035] As a result, the scroll communication hole communicates with the scroll inner passage.

[0036] One end of the vapor refrigerant passage facing the inverter part may extend in a lengthwise direction to a position where a vapor refrigerant intake port is provided. That is, the one end of the vapor refrigerant passage extends to one end of the vapor refrigerant intake port facing inside the main housing.

[0037] As a result, the vapor refrigerant intake port and the vapor refrigerant passage communicate with each other.

[0038] A scroll discharge port is formed in a fixed end plate portion of the fixed scroll. The scroll discharge port includes one end portion that is open toward the compression chamber. In addition, the scroll discharge port is opposite to the one end portion, and includes another end portion in communication with the scroll inner passage.

[0039] Accordingly, the scroll inner passage communicates with the compression chamber.

[0040] By the above configuration, the vapor refrigerant introduced into the vapor refrigerant intake port may be introduced into the compression chamber through the vapor refrigerant passage, the scroll communication hole, the scroll inner passage, and the scroll discharge port.

[0041] The wall portion may have a passage protrusion. The passage protrusion protrudes to an inner side of the main housing by a predetermined distance from one side the wall portion where the vapor refrigerant intake port is located. The passage protrusion extends in a lengthwise direction, like the wall portion.

[0042] The vapor refrigerant passage may be formed inside the passage protrusion. As in the case where the vapor refrigerant passage is formed inside the wall portion, the vapor refrigerant passage may be recessed by a predetermined distance from one end portion in a lengthwise direction of the passage protrusion facing the fixed scroll.

[0043] The vapor refrigerant intake port is located adjacent to an intake port through which the refrigerant is sucked. The vapor refrigerant introduced through the vapor refrigerant intake port may be introduced into the compression chamber through the above-described path.

[0044] The scroll discharge port communicating the scroll inner passage with the compression chamber may be formed in plurality. Each scroll discharge port may be located between one end portion and another end portion of a fixed wrap.

[0045] That is, each scroll discharge port is located between one end portion of the fixed wrap located near a center of the fixed scroll and another end portion of the fixed wrap located at a radially outermost of the fixed scroll.

[0046] Preferably, each scroll discharge port may be located adjacent to the one end portion of the fixed wrap.

[0047] The vapor refrigerant intake port or the scroll communication hole is provided with an opening and closing plate and a sealing ring to prevent backward flow of the vapor refrigerant.

[0048] The vapor refrigerant intake port includes a first intake space communicating with outside, and a second intake space communicating with the first intake space and having a smaller diameter than that of the first intake space.

[0049] The first intake space is provided with the opening and closing plate and the sealing ring. The sealing ring may be fitted to the first intake space facing the outside. The opening and closing plate is located between the sealing ring and the second intake space. The opening and closing plate has a diameter smaller than that of the first intake space.

[0050] The opening and closing plate may be moved in a direction toward the sealing ring or away from the sealing ring inside the first intake space. When the opening and closing plate moves in a direction away from the sealing ring, the vapor refrigerant may flow through a space between an outer circumference of the opening and closing plate and an inner circumference surrounding the first intake space.

[0051] The scroll communication hole includes a first space communicating with the vapor refrigerant passage, a second space communicating with the first space and having a smaller diameter than that of the first space, and a third space communicating with the second space and having a smaller diameter than that of the second space.

[0052] The opening and closing plate is provided in the second space. The opening and closing plate has a diameter smaller than that of the second space. The opening and closing plate may be moved in a direction toward the first space or in a direction toward the third space. When the opening and closing plate is moved in the direction toward the third space, the vapor refrigerant may flow through a space between the outer circumference of the opening and closing plate and an inner circumference surrounding the second space.

[0053] The opening and closing plate may be moved under a predetermined condition, so that the vapor refrigerant may flow. For example, the opening and closing plate may be configured to move when a pressure difference between one side space and another side space partitioned by the opening and closing plate exceeds a predetermined value.

[0054] The vapor refrigerant intake port and the intake port are closed by a refrigerant sealing part. The refrigerant sealing part includes a body portion, a refrigerant sealing member, a vapor refrigerant sealing member, and a coupling member. The refrigerant sealing member, the vapor refrigerant sealing member, and the coupling member are respectively coupled through a refrigerant sealing hole, a vapor refrigerant sealing hole, and a coupling hole formed in the body portion.

[0055] The refrigerant sealing part is coupled to a boss portion in which the intake port and the vapor refrigerant intake port are formed. When the refrigerant sealing part is coupled to the boss portion, the refrigerant sealing member and the vapor refrigerant sealing member are inserted and coupled into the intake port and the vapor refrigerant intake port, respectively. The coupling member is inserted and coupled into a coupling member coupling hole formed in the boss portion.

[0056] In one embodiment, the vapor refrigerant intake port may be integrated with the intake port. In the present embodiment, both the refrigerant and the vapor refrigerant may be introduced through the intake port. Also, the intake port may be provided with a partition member or a passage switching member configured to prevent the refrigerant and the vapor refrigerant from being mixed with each other.

[0057] Accordingly, the refrigerant may be introduced into the internal space of the main housing, and the vapor refrigerant may be guided to be introduced into the vapor refrigerant passage.

[0058] According to the present disclosure, the following effects can be achieved.

[0059] First, the vapor refrigerant passage is formed inside the wall portion of the main housing without a separate member. When a cross-sectional area of the vapor refrigerant passage needs to be increased, the vapor refrigerant passage may be formed inside the passage protrusion that protrudes from the wall portion.

[0060] The vapor refrigerant passed through the vapor refrigerant passage may flow into the compression chamber through the scroll communication hole and the scroll inner passage formed in the fixed scroll.

[0061] Therefore, the introduced vapor refrigerant can flow into the compression chamber without adding a separate member to form a passage for the vapor refrigerant in the narrow inner space of the main housing.

[0062] Accordingly, the vapor injection method may be applied without having a separate member for the vapor refrigerant introduced into the main housing to flow.

[0063] In addition, the refrigerant and the vapor refrigerant flow into the compression chamber through separate passages. Therefore, a separate member to separate the passage for the refrigerant and the passage for the vapor refrigerant is not needed in the narrow inner space of the main housing.

[0064] Therefore, a passage through which the vapor refrigerant flows can be formed in a simple manner.

[0065] In addition, since the above-described separate members are not needed inside the main housing, the vapor injection method can be applied without increasing the space of the main housing.

[0066] Therefore, the main housing can be downsized, and further, the entire motor operated compressor can be downsized.

[0067] In addition, the vapor refrigerant intake port through which the vapor refrigerant introduced is located adjacent to the inverter part. Accordingly, the vapor refrigerant intake port is spaced apart from the compression chamber in which the high-pressure refrigerant is compressed and flows.

[0068] Therefore, a structure to communicate inside of the motor operated compressor with outside of the motor operated compressor is not needed to be configured near the compression chamber where the refrigerant is compressed. Accordingly, the introduced vapor refrigerant and the refrigerant compressed at high-pressure do not influence each other.

[0069] Furthermore, a punching to communicate with outside is not needed in the main housing or a rear housing near the compression chamber in which the high-pressure refrigerant flows. Accordingly, a structural rigidity of the main housing or the rear housing can be secured by a predetermined level or above.

[0070] In addition, the vapor refrigerant intake port through which the vapor refrigerant is introduced is located adjacent to the refrigerant intake port through which the refrigerant is introduced.

[0071] Therefore, pipes to supply the refrigerant and the vapor refrigerant to the motor operated compressor from the outside need not to be disposed in a spread-out manner. That is, a pipe to supply the refrigerant and a pipe to supply the vapor refrigerant may be disposed adjacent to each other outside the motor operated compressor.

[0072] Therefore, the pipe into which the refrigerant is introduced and the pipe into which the vapor refrigerant is introduced can be disposed in a concentrated manner at predetermined positions of the motor operated compressor. Accordingly, an arrangement structure of the external pipes among the motor operated compressor, an evaporator and a heat exchanger can be formed in a simple manner.

[0073] In addition, the opening and closing plate is provided at the vapor refrigerant intake port through which the vapor refrigerant is introduced.

[0074] The opening and closing plate divides the vapor refrigerant intake port into a space communicating with outside and a space communicating with the vapor refrigerant passage. The opening and closing plate is moved according to a difference between a pressure of the space communicating with the outside and a pressure of the space communicating with the vapor refrigerant passage.

[0075] The space communicating with the outside is provided with the sealing ring. The sealing ring has an inner diameter smaller than that of the opening and closing plate. The sealing ring limits a moving distance of the opening and closing plate, so that the opening and closing plate is not detached to the space communicating with the outside.

[0076] Thus, when the opening and closing plate is brought into contact with the sealing ring, the vapor refrigerant intake port is closed. In order to open the vapor refrigerant intake port, the opening and closing plate should be moved in a direction toward the space communicating with the vapor refrigerant passage. This corresponds to a path through which the vapor refrigerant is introduced.

[0077] Similarly, the opening and closing plate may also be provided in the scroll communication hole that communicates the vapor refrigerant passage with the scroll inner passage.

[0078] The opening and closing plate divides the scroll communication hole into the space communicating with the vapor refrigerant passage and a space communicating with the scroll inner passage. The opening and closing plate is moved according to a difference between a pressure of the space communicating with the vapor refrigerant passage and a pressure of the space communicating with the scroll inner passage.

[0079] The space communicating with the vapor refrigerant passage is provided with the sealing ring. The sealing ring has an inner diameter smaller than that of the opening and closing plate. The sealing ring limits a moving distance of the opening and closing plate, so that the opening and closing plate is not detached to the space communicating with the vapor refrigerant passage.

[0080] Therefore, when the opening and closing plate is brought into contact with the sealing ring, the communication between the vapor refrigerant passage and the scroll inner passage is blocked. In order for the communication to be established, the opening and closing plate should be moved in a direction toward the scroll inner passage. This also corresponds to the path through which the vapor refrigerant is introduced.

[0081] As a result, when the vapor refrigerant is introduced, the opening and closing plate may be moved to form a path through which the vapor refrigerant is introduced. In contrast, when the vapor refrigerant flows back, the opening and closing plate is brought into contact with the sealing ring to close the path in which the vapor refrigerant is introduced.

[0082] Therefore, the introduction of the vapor refrigerant can be controlled only by providing the opening and closing plate and the sealing ring on the path through which the vapor refrigerant is introduced. Furthermore, the backward flow of the introduced vapor refrigerant can be effectively prevented.

[0083] In addition, the intake port through which the refrigerant is introduced and the vapor refrigerant intake port through which the vapor refrigerant is introduced are formed in the boss portion. The boss portion is provided with the refrigerant sealing part to seal the intake port and the vapor refrigerant intake port.

[0084] The refrigerant sealing part includes the refrigerant sealing member inserted and coupled into the intake port, and the vapor refrigerant sealing member inserted and coupled into the vapor refrigerant intake port. The refrigerant sealing member and the vapor refrigerant sealing member are respectively coupled through the refrigerant sealing hole and the vapor refrigerant sealing hole formed through the body portion of the refrigerant sealing part.

[0085] When the body portion is coupled to the boss portion, the refrigerant sealing member is inserted and coupled into the intake port and the vapor refrigerant sealing member is inserted and coupled into the vapor refrigerant intake port. In addition, the coupling member is inserted through and inserted and coupled into the body portion and the boss portion, respectively, to maintain a coupled state of the body portion and the boss portion.

[0086] Accordingly, the intake port and the vapor refrigerant intake port can be easily closed.

[0087] In addition, suction passages of the refrigerant and the vapor refrigerant may be opened only by removing the body portion from the boss portion after releasing the coupling member.

[0088] Therefore, the suction passages of the refrigerant and the vapor refrigerant can be easily opened and closed.

[0089] In one embodiment, the vapor refrigerant intake port may be integrated with the intake port. That is, both the refrigerant and the vapor refrigerant may be introduced through the intake port. In the embodiment, the intake port may be provided with the partition member or a bypass valve to prevent the refrigerant and the vapor refrigerant from being mixed with each other.

[0090] Therefore, since both the refrigerant and the vapor refrigerant can be supplied through a single intake port, the main housing can be configured in a simple structure. In addition, since the number of through holes formed in the main housing is reduced, the structural rigidity of the main housing can also be ensured by a predetermined level or above.

[0091] In addition, the vapor refrigerant passage may be applied to both the low-pressure compressor and the high-pressure compressor. Since the vapor refrigerant passage is formed in the wall portion of the main housing, no separate member is needed.

[0092] Therefore, the vapor refrigerant passage can be formed in both the low-pressure compressor and the high-pressure compressor which have different arrangement structures in the inner spaces of the main housing and the rear housing. Accordingly, the vapor injection method can be applied to both the low-pressure compressor and the high-pressure compressor, thereby improving a compatibility.

[0093] In addition, the motor operated compressor is provided with a vapor refrigerant passage part for the vapor refrigerant to be introduced in and flowed into the compression chamber. The vapor refrigerant passage part includes the vapor refrigerant intake port through which the vapor refrigerant is introduced from outside.

[0094] The vapor refrigerant intake port communicates with the vapor refrigerant passage formed inside the wall portion of the main housing. The vapor refrigerant passage communicates with the scroll inner passage and the scroll communication hole formed in the fixed scroll. The scroll inner passage communicates with the scroll discharge port communicating with the compression chamber.

[0095] Therefore, not only the refrigerant but also the high-pressure vapor refrigerant is introduced into the compression chamber and compressed therein. Accordingly, a power consumption needed to compress the refrigerant by a target value can be reduced as compared with a case of compressing only the low-pressure refrigerant. As a result, the refrigerant compression efficiency of the motor operated compressor can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0096]

FIG. 1 is a perspective view illustrating an appearance of a motor operated compressor in accordance with an embodiment.

FIG. 2 is an exploded perspective view illustrating an internal structure of the motor operated compressor of FIG. 1.

FIGS. 3A to 3C are sectional views illustrating the internal structure of the motor operated compressor of FIG. 1.

FIG. 4 is a sectional view illustrating a vapor refrigerant passage part provided in the motor-operated compressor of FIG. 1.

FIG. 5 is a perspective view (a) and a coupled sectional view (b) illustrating an appearance of a fixed scroll provided in the motor operated compressor of FIG. 1.

FIG. 6 is a conceptual view illustrating a coupling relationship between an orbiting scroll and a fixed scroll provided in the motor operated compressor of FIG. 1.

FIG. 7 is a partially enlarged sectional view illustrating an embodiment in which an opening and closing plate and a sealing ring are provided in a scroll communication hole of the motor operated compressor of FIG. 1.

FIG. 8 is a partially enlarged sectional view illustrating an embodiment in which an opening and closing plate and a sealing ring are provided in a vapor refrigerant intake port of the motor operated compressor of FIG. 1.

FIG. 9 is a perspective view (a) and an exploded perspective view (b) illustrating an appearance of a passage sealing portion provided in the motor operated compressor of FIG. 4.

FIG. 10 is a perspective view illustrating a state in which the passage sealing portion of FIG. 9 is being coupled to the motor operated compressor of FIG. 1.

FIG. 11 is a perspective view illustrating a state in which the passage sealing portion of FIG. 9 is coupled to the motor operated compressor of FIG. 1.

FIG. 12 is a sectional view illustrating an internal structure of the motor operated compressor according to an embodiment in which a vapor refrigerant intake port is integrated in an intake port.

FIG. 13 is a partially enlarged sectional view illustrating a vapor refrigerant passage part provided in the motor operated compressor of FIG. 12.

FIG. 14 is a perspective view (a) and an exploded perspective view (b) illustrating an appearance of a passage sealing portion provided in the motor operated compressor of FIG. 12.

FIG. 15 is a perspective view illustrating a state in which the passage sealing portion of FIG. 14 is being coupled to the motor operated compressor of FIG. 12.

FIG. 16 is a perspective view illustrating a state in which the passage sealing portion of FIG. 14 is coupled to the motor operated compressor of FIG. 12.

FIG. 17 is a sectional view illustrating an internal structure of a motor operated compressor in accordance with another embodiment.

FIG. 18 is a perspective view (a) and a planar view (b) illustrating an appearance of a fixed scroll provided in the motor operated compressor of FIG. 17.

FIG. 19A is a sectional view illustrating a state in which the opening and closing plate blocks a communication with a compression chamber in a vapor refrigerant passage part according to an embodiment of the motor operated compressor of FIG. 4.

FIG. 19B is a sectional view illustrating a state in which the opening and closing plate allows the communication with the compression chamber in the vapor refrigerant passage part according to the embodiment of the motor operated compressor of FIG. 4.

FIG. 20A is a sectional view illustrating the state in which the opening and closing plate blocks the communication with the compression chamber in the vapor refrigerant passage part according to the embodiment of the motor operated compressor of FIG. 4.

FIG. 20B is a sectional view illustrating the state in which the opening and closing plate allows the communication with the compression chamber in the vapor refrigerant passage part according to the embodiment of the motor operated compressor of FIG. 4.

FIG. 21 is a sectional view illustrating a path through which a vapor refrigerant flows in the vapor refrigerant passage part of the motor operated compressor of FIG. 12.

FIG. 22 is a sectional view illustrating a path through which a vapor refrigerant flows in the vapor refrigerant passage part of the motor operated compressor of FIG. 17.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0097] Hereinafter, description will be given in detail of a motor operated compressor in accordance with an embodiment disclosed herein, with reference to the accompanying drawings.

[0098] In the following description, description of several components will be omitted in order to clarify the technical features of this disclosure.

1. Definition of Terms

[0099] It will be understood that when an element is referred to as being "connected with" another element, the element can be connected with the other element or intervening elements may also be present.

[0100] In contrast, it will be understood that when an element is referred to as being "directly connected with" another element, there are no intervening elements present.

[0101] A singular representation may include a plural representation unless it represents a definitely different meaning from the context.

[0102] The term "refrigerant" as used herein means any medium that takes heat away from a low-temperature object and transports it to a high-temperature object. In one embodiment, the refrigerant may be carbon dioxide (CO_2), R134a, R1234yf, R744, and the like.

[0103] The term "vapor refrigerant" as used in the following description refers to a high-pressure refrigerant in gaseous state after passing through a condenser, an expansion apparatus and a heat exchanger. In one embodiment, the vapor refrigerant may be in an over-heated state.

[0104] In addition, in the following description, the term "vapor refrigerant" refers to a refrigerant introduced to which a vapor injection method is applied. The term "vapor refrigerant" will be used differently from an original refrigerant that is sucked to be compressed regardless of an application of the vapor injection method.

[0105] The term "oil" used in the following description refers to a fluid used to reduce heat or frictional force generated at a contact portion between members. In one embodiment, the oil may function as a lubricant, a refrigerant or a cleaner.

[0106] The terms "front side", "rear side", "upper side", "lower side", "left side", and "right side" as used herein will be understood with reference to a coordinate system in FIG. 1.

2. Description of a Motor Operated Compressor 10 in accordance with an Embodiment

[0107] Referring to FIGS. 1 to 3, a motor operated compressor 10 according to an embodiment includes a main housing 100, a rear housing 200, an inverter part 300, a motor part 400, a rotational shaft part 500, and a compression part 600.

[0108] In addition, referring to FIG. 4, the motor operated compressor 10 according to an embodiment of the present disclosure includes a c for an introduction and a flow of a vapor refrigerant.

[0109] Furthermore, referring to FIG. 9, the motor operated compressor 10 according to the embodiment of the present disclosure includes a refrigerant sealing part 800 to block an introduction of the vapor refrigerant and a refrigerant.

[0110] Hereinafter, each configuration of the motor operated compressor 10 according to the embodiment of the present disclosure will be described, but a vapor refrigerant passage part 700 and the refrigerant sealing part 800 will be described in a separate clause.

[0111] FIG. 3 is divided into 3A, 3B, and 3C to prevent difficulties of understanding that may be caused by a dense description of reference numerals. Therefore, FIG. 3A, 3B, and 3C illustrate the same contents.

(1) Description of the Main Housing 100

[0112] The main housing 100 defines an appearance of the motor operated compressor 10. A predetermined space is formed inside the main housing 100. Various configurations to compress the refrigerant may be accommodated in the space.

[0113] In an embodiment, the motor part 400 and the rotational shaft part 500 may be accommodated in the space. In addition, the compression part 600 may be partially accommodated in the space.

[0114] In the illustrated embodiment, the main housing 100 is defined in a cylindrical shape which has a circular cross section and extends in one direction (back-and-forth direction in the illustrated embodiment). This is for the main housing 100 to have high-pressure resistance to a pressure of the refrigerant in the inner space of the main housing 100. A shape of the main housing 100 may vary.

[0115] The one direction in which the main housing 100 extends may be defined as a "lengthwise direction" of the main housing 100.

[0116] The rear housing 200 is located at one side of the main housing 100, namely, at a front side in the illustrated embodiment.

[0117] The main housing 100 communicates with the rear housing 200. The refrigerant introduced into the main housing 100 may flow to the rear housing 200. The flowed refrigerant is compressed in a compression chamber P formed in the rear housing 200 may be discharged outside the motor operated compressor 10 through an exhaust port 210.

[0118] The inverter part 300 is located at another side of the main housing 100 opposite to the one side, namely, at a rear side in the illustrated embodiment.

[0119] The main housing 100 is electrically connected to the inverter part 300. Power and control signals applied to the inverter part 300 from external power source and controller (not shown) may be transmitted to the main housing 100. The motor part 400 may be driven by the power and control signals.

[0120] In one embodiment, the main housing 100 may communicate with an inverter chamber S2 formed inside the inverter part 300. The refrigerant introduced into the main housing 100 may be introduced into the inverter chamber S2. Accordingly, an inverter device 340 provided in the inverter chamber S2 may be directly cooled by the refrigerant.

[0121] The main housing 100 includes a wall portion 110, an intake port 120, a rear housing coupling portion 130, and an inverter coupling portion 140.

[0122] In addition, as described above, a space surrounded by the wall portion 110 is formed inside the main housing 100. A part of the space may be defined as a motor chamber S1 in which the motor part 400 is accommodated.

[0123] The wall portion 110 forms an outer side wall of the main housing 100. The wall portion 110 surrounds the inner space of the main housing 100.

[0124] In the illustrated embodiment, since the main housing 100 is cylindrical, the wall portion 110 may be defined as a side surface of the main housing 100.

[0125] A through hole 120 through which the refrigerant is introduced is formed through the wall portion 110. In addition, a vapor refrigerant intake port 710 through which the vapor refrigerant is introduced is formed through the wall portion 110.

[0126] In the illustrated embodiment, the intake port 120 and the vapor refrigerant intake port 710 are located at one side of the wall portion 110 facing the inverter part 300.

[0127] The wall portion 110 may have a predetermined thickness.

[0128] In detail, a thickness of the wall portion 110 may be determined by an outer circumferential surface 111 and an inner circumferential surface 112. In addition, in an embodiment in which a passage protrusion 110a is formed, a thickness of the wall portion 110 may be determined by the outer circumferential surface 111 and the passage protrusion 110a.

[0129] The wall portion 110 includes the outer circumferential surface 111, the inner circumferential surface 112, a boss portion 113, and the passage protrusion 110a.

[0130] The outer circumferential surface 111 defines an outer surface of the wall portion 110. The outer circumferential surface 111 is exposed to an outer side of the main housing 100. The outer circumferential surface 111 may be provided with various members to install the motor operated compressor 10.

[0131] In the illustrated embodiment, a plurality of weight-reducing grooves is recessed into the outer circumferential surface 111 by a predetermined distance. This configuration may result in reducing a whole weight of the main housing 100. In addition, a rigidity of the main housing 100 may be increased, compared with a case where the outer circumferential surface 111 is formed as a perfectly curved surface.

[0132] The inner circumferential surface 112 defines an inner surface of the wall portion 110. A predetermined space formed inside the main housing 100 may be defined by the inner circumferential surface 112. That is, the inner circumferential surface 112 surrounds the predetermined space.

[0133] A stator 410 of the motor part 400 may be fixedly coupled to the inner circumferential surface 112. In order to stably maintain the fixed coupling state, a plurality of protrusions (not shown) may be formed on the inner circumferential surface 112.

[0134] The boss portion 113 protrudes from the outer circumferential surface 111 by a predetermined distance. The boss portion 113 has the intake port 120, a coupling member coupling hole 121, and the vapor refrigerant intake port 710.

[0135] As the boss portion 113 is formed, the intake port 120 and the vapor refrigerant intake port 710 may be formed through by a sufficient depth. The coupling member coupling hole 121 may also be recessed by a sufficient depth.

[0136] The boss portion 113 is located adjacent to the inverter part 300. Accordingly, the intake port 120 and the vapor refrigerant intake port 710 may also be located adjacent to the inverter part 300.

[0137] In addition, the boss portion 113 may be coupled to the refrigerant sealing part 800 to seal the intake port 120 and the vapor refrigerant intake port 710. As the boss portion 113 protrudes, a user can easily figure out a position to which the refrigerant sealing part 800 is to be coupled.

[0138] The passage protrusion 110a protrudes from the inner circumferential surface 112 by a predetermined distance. That is, the passage protrusion 110a protrudes from an inner circumferential surface 112a by a predetermined distance toward a radially inner side of the main housing 100.

[0139] In other words, the inner circumferential surface 112 of the passage protrusion 110a protrudes radially inward of the main housing 100. Alternatively, the passage protrusion 110a may be viewed as an increase in the thickness of the wall portion 110.

[0140] The passage protrusion 110a extends from one end portion in a lengthwise direction of the main housing 100 to another end portion.

[0141] That is, one side of the passage protrusion 110a in a lengthwise direction, namely, a front side in the illustrated embodiment, may be brought into contact with a fixed scroll 610. In addition, another side of the passage protrusion 110a in a lengthwise direction, namely, a rear side in the illustrated embodiment, may be brought into contact with the inverter part 300.

[0142] A vapor refrigerant passage 720 of the vapor refrigerant passage part 700 is formed through the passage protrusion 110a (see FIGS. 4, 7, and 8). Accordingly, no additional member is needed to form a passage through which the vapor refrigerant is introduced and flows into the compression part 600.

[0143] The passage protrusion 110a is formed on the inner circumferential surface 112 of the wall portion 110 at one side, namely, on the inner circumferential surface 112 at an upper side in the illustrated embodiment, in which the vapor refrigerant intake port 710 is formed. Accordingly, the vapor refrigerant passage 720 formed in the passage protrusion 110a may be located adjacent to the vapor refrigerant intake port 710.

[0144] This is to allow the vapor refrigerant introduced through the vapor refrigerant intake port 710 to be introduced into the vapor refrigerant passage 720 formed in the passage protrusion 110a.

[0145] In an embodiment not shown, the vapor refrigerant intake port 710 may be formed at the inner circumferential surface 112 of the wall portion 110 at another inside, that is, at a lower side. In this case, the passage protrusion 110a may also protrude from the lower inner circumferential surface 112 at a lower side to form a passage through which the vapor refrigerant flows.

[0146] The intake port 120 is a path through which the refrigerant is introduced into a predetermined space inside the main housing 100. The intake port 120 allows inside and outside of the main housing 100 to communicate with each other. The refrigerant is a refrigerant introduced regardless of the application of the vapor injection method.

[0147] The intake port 120 may penetrate radially inwardly into the wall portion 110. Specifically, the intake port 120 is formed through the outer circumferential surface 111, the inner circumferential surface 112, and the boss portion 113.

[0148] The intake port 120 is located adjacent to the inverter part 300. This is to allow the inverter device 340 provided in the inverter chamber S2 of the inverter part 300 to be cooled by the refrigerant introduced through the intake port 120.

[0149] The intake port 120 is located adjacent to the vapor refrigerant intake port 710. Accordingly, a piping structure in which the refrigerant and the vapor refrigerant flow into the motor operated compressor 10 may be simplified.

[0150] In another embodiment, the intake port 120 may be provided integrally with the vapor refrigerant intake port 710 (see FIG. 12). That is, both the refrigerant and the vapor refrigerant may be introduced through the intake port 120.

[0151] In the above embodiment, the intake port 120 may be provided with a member to prevent the refrigerant and the vapor refrigerant from being mixed with each other. For example, a bypass valve may be provided to separately form passages for the refrigerant and the vapor refrigerant. As another example, a partition member (not shown) may be provided to partition and separate the passages for the refrigerant and the vapor refrigerant.

[0152] The coupling member coupling hole 121 is located adjacent to the intake port 120 (see FIG. 10). A coupling member 840 of the refrigerant sealing part 800 is inserted and coupled into the coupling member coupling hole 121.

[0153] The coupling member coupling hole 121 may be recessed by a predetermined distance from an outer surface of the boss portion 113 to a radially inner side of the main housing 100. In another embodiment, the coupling member coupling hole 121 may penetrate radially inward to the boss portion 113.

[0154] A thread may be formed on an inner circumferential surface of the coupling member coupling hole 121, that is, a side surface surrounding the coupling member coupling hole 121. The thread may be engaged with a thread formed on the outer circumferential surface of the coupling member 840. Accordingly, the coupling member 840 may be coupled to the coupling member coupling hole 121 by using a screw.

[0155] The rear housing coupling portion 130 is a portion where the main housing 100 is coupled to the rear housing 200.

[0156] The rear housing coupling portion 130 may be defined as one end portion in a lengthwise direction of the main housing 100 facing the rear housing 200. In the illustrated embodiment, the rear housing coupling portion 130 is a front end portion of the main housing 100.

[0157] One end portion of the rear housing coupling portion 130 facing the rear housing 200 is coupled to the main housing coupling portion 230 of the rear housing 200. In the illustrated embodiment, the front end portion of the rear housing coupling portion 130 is engaged with a rear end portion of the main housing coupling portion 230.

[0158] In one embodiment, a groove (not shown) or a protrusion (not shown) may be formed in the rear housing coupling portion 130. The groove (not shown) or the protrusion (not shown) may be fitted with a protrusion (not shown) or a groove (not shown) formed in the main housing coupling portion 230.

[0159] By the above configuration, the main housing 100 and the rear housing 200 may be coupled in a predetermined direction.

[0160] A radially inner side surface of the rear housing coupling portion 130 is coupled with the fixed scroll 610. Specifically, the radially inner side surface of the rear housing coupling portion 130 is coupled with a main housing contact portion 615 of the fixed scroll 610. Since the surface also extends from the wall portion 110, it may be defined as the inner circumferential surface 112.

[0161] The inverter coupling portion 140 is a portion where the main housing 100 is coupled to the inverter part 300.

[0162] The inverter coupling portion 140 may be defined as one end portion in the lengthwise direction of the main housing 100 facing the inverter part 300. In the illustrated embodiment, the inverter coupling portion 140 is a rear end portion of the main housing 100.

[0163] One end portion of the inverter coupling portion 140 facing the inverter part 300 is coupled to the inverter housing 310. In the illustrated embodiment, the rear end portion of the inverter coupling portion 140 is coupled to a front surface of the inverter housing 310.

[0164] In one embodiment, a groove (not shown) or a protrusion (not shown) may be formed in the inverter coupling portion 140. The groove (not shown) or the protrusion (not shown) may be fitted with a protrusion (not shown) or a groove (not shown) formed in the front surface of the inverter housing 310.

[0165] By the above configuration, the main housing 100 and the inverter part 300 may be coupled in a predetermined direction.

[0166] In addition, a coupling member (not shown) may be coupled to the inverter coupling portion 140. The coupling member (not shown) may be coupled through the inverter part 300. In addition, one end portion of the coupling member (not shown) facing the main housing 100 may be coupled to the inverter coupling portion 140.

[0167] By the above configuration, the main housing 100 and the inverter part 300 can be stably maintained in a coupled state.

(2) Description of the Rear Housing 200

[0168] The rear housing 200 defines an appearance of the motor operated compressor 10. The rear housing 200 is located on one side of the main housing 100, namely, on the front side in the illustrated embodiment.

[0169] The rear housing 200 communicates with the main housing 100. In detail, the rear housing 200 communicates with a discharge chamber S3, a back pressure chamber S4, the compression chamber P, and the exhaust port 210 formed in the rear housing 200.

[0170] Accordingly, the refrigerant introduced into the space inside the main housing 100 may be introduced into the rear housing 200 and compressed therein, and then discharged outside the motor operated compressor 10.

[0171] As will be described later, the vapor refrigerant introduced into the compression chamber P may also be compressed and then discharged outside the motor operated compressor 10 through the rear housing 200.

[0172] In the illustrated embodiment, the rear housing 200 is formed in a cylindrical shape which has a circular cross section and extends in one direction. The shape of the rear housing 200 may change, but such change may preferably be made to correspond to the shape of the main housing 100.

[0173] The one direction in which the rear housing 200 extends may be defined as a "lengthwise direction" of the rear housing 200.

[0174] In the illustrated embodiment, a plurality of weight-reducing grooves is formed in an outer circumferential surface of the rear housing 200. This configuration may result in reducing a whole weight of the rear housing 100. In addition, a rigidity of the rear housing 200 may be increased, compared with a case where the outer circumferential surface of the rear housing 200 is formed as a perfectly curved surface.

[0175] A predetermined space is formed inside the rear housing 200. The compression part 600 may be partially accommodated in the space.

[0176] In detail, a fixed wrap 612 of the fixed scroll 610, an orbiting scroll 620, and a housing coupling unit 630 may be accommodated in an inner space of the rear housing 200. In particular, the orbiting scroll 620 may be accommodated in the space so as to perform an orbiting motion therein.

[0177] The rear housing 200 includes the exhaust port 210, a pin insertion portion 220, and the main housing coupling portion 230. In addition, the discharge chamber S3 and the back pressure chamber S4 are formed inside the rear housing 200.

[0178] The exhaust port 210 is a path through which compressed refrigerant and vapor refrigerant are discharged outside the motor operated compressor 10. The exhaust port 210 may be formed through an outer circumference and an inner circumference of the rear housing 200.

[0179] In the illustrated embodiment, the exhaust port 210 is formed in an upper outer circumference of the rear housing 200. This is to allow the compressed refrigerant and vapor refrigerant to flow smoothly by a density difference.

[0180] The exhaust port 210 communicates with an exhaust passage 211, an oil passage 212, and a communication portion 213.

[0181] The exhaust passage 211 is a passage through which the refrigerant and the vapor refrigerant compressed in the compression chamber P and introduced into the discharge chamber S3 move toward the exhaust port 210.

[0182] The exhaust passage 211 communicates with the discharge chamber S3. The compressed refrigerant and vapor refrigerant introduced in the discharge chamber S3 may be introduced in the exhaust passage 211 through the communication portion 213.

[0183] In the illustrated embodiment, the exhaust passage 211 extends in an up-down direction inside the rear housing 200. One end portion of the exhaust passage 211 facing the exhaust port 210, namely, an upper end portion in the illustrated embodiment, communicates with the exhaust port 210.

[0184] One end portion of the exhaust passage 211 opposite to the exhaust port 210 and facing the oil passage 212, namely, a lower end portion in the illustrated embodiment, communicates with the oil passage 212.

[0185] The exhaust passage 211 may be provided with an oil separator (not shown). The oil separator (not shown) is configured to separate oil mixed in the compressed refrigerant and vapor refrigerant. That is, the refrigerant and the vapor refrigerant compressed in the compression chamber P are in a state where oil is mixed.

[0186] The mixed fluid introduced in the exhaust passage 211 through the communication portion 213 flows along the exhaust passage 211, and oil in the fluid may be separated by the oil separator (not shown). The separated oil falls into a lower side of the exhaust passage 211 due to a density difference, and may be introduced in the oil passage 212.

[0187] In one embodiment, the oil separator (not shown) may be provided as a device using centrifugation, such as cyclone.

[0188] The oil passage 212 is a path along which the oil separated from the mixed fluid flows. In the illustrated embodiment, the oil passage 212 extends in a back-and-forth direction.

[0189] One end portion of the oil passage 212 facing the exhaust passage 211, namely, the front end portion in the illustrated embodiment, communicates with the exhaust passage 211. The oil separated by the oil separator (not shown) in the exhaust passage 211 may fall downward and be introduced in the oil passage 212.

[0190] One end portion of the oil passage 212 facing the back pressure chamber S4, namely, the front end portion in the illustrated embodiment, communicates with the back pressure chamber S4. The oil introduced in the oil passage 212 may pass through the back pressure chamber S4 and flow into the inner space of the main housing 100, the rotational shaft part 500 or the compression part 600.

[0191] The communication portion 213 communicates the discharge chamber S3 with the exhaust passage 211. The compressed refrigerant and vapor refrigerant staying in the discharge chamber S3 may be introduced in the exhaust passage 211 through the communication portion 213.

[0192] The pin insertion portion 220 is a space into which a pin member 632 of the housing coupling unit 630 is inserted. The pin insertion portion 220 is recessed by a predetermined distance from one side surface of the rear housing 200 facing the orbiting scroll 620.

[0193] The pin insertion portion 220 may be provided in plurality. In the illustrated embodiment, since six pin members 632 are provided, six pin insertion portions 220 may be formed correspondingly.

[0194] The plurality of pin insertion portions 220 is spaced apart from each other by a predetermined distance in a circumferential direction of the one side surface of the rear housing 200. An arrangement of the pin insertion portion 220 may be changed according to an arrangement of a ring insertion portion 626 formed in the orbiting scroll 620.

[0195] The main housing coupling portion 230 is a portion where the rear housing 200 is coupled to the main housing 100.

[0196] The main housing coupling portion 230 may be defined as one end portion of the rear housing 200 facing the main housing 100. In the illustrated embodiment, the main housing coupling portion 230 is a rear end portion of the rear housing 200.

[0197] One end portion of the main housing coupling portion 230 facing the main housing 100 is coupled to the rear housing coupling portion 130 and a support plate 614 of the fixed scroll 610.

[0198] A groove (not shown) or a protrusion (not shown) may be formed to lock a coupling direction of the main housing coupling portion 230 and the rear housing coupling portion 130 as described above.

[0199] A coupling member (not shown) may be coupled to the main housing coupling portion 230 and the rear housing coupling portion 130. Accordingly, a coupling between the main housing 100 and the rear housing 200 can be stably maintained.

[0200] The discharge chamber S3 is a space where the refrigerant and the vapor refrigerant compressed in the compression chamber P stay before being discharged outside the motor operated compressor 10.

[0201] Specifically, there may be a case where the refrigerant and the vapor refrigerant which have just been discharged from the compression chamber P is compressed to a pressure higher than an appropriate value. Therefore, the compressed refrigerant and vapor refrigerant stay in the discharge chamber S3 and are adjusted to an appropriate pressure, and then discharged outside the motor operated compressor 10.

[0202] The discharge chamber S3 communicates with the compression chamber P through the discharge port 625. The discharge port 625 is selectively opened or closed by the discharge valve 624. Accordingly, communication between the discharge chamber S3 and the compression chamber P may be allowed or blocked.

[0203] A back pressure is formed in the back pressure chamber S4. The back pressure prevents the orbiting scroll 620 from being arbitrarily separated from the fixed scroll 610 by the high-pressure of the compression chamber P.

[0204] Specifically, as the compression of the refrigerant and the vapor refrigerant in the compression chamber P proceeds, the orbiting scroll 620 tends to be spaced apart from the fixed scroll 610.

[0205] At this time, the refrigerant and the vapor refrigerant staying in the back pressure chamber S4 apply a pressure in a direction toward the fixed scroll 610 to the orbiting scroll 620. Accordingly, the orbiting scroll 620 may not be spaced apart from the fixed scroll 610.

[0206] The back pressure chamber S4 communicates with the discharge chamber S3. Also, the back pressure chamber S4 communicates with the exhaust passage 211 and the oil passage 212. Therefore, a part of the compressed refrigerant and vapor refrigerant may be introduced into the back pressure chamber S4. In addition, oil separated from the compressed refrigerant and vapor refrigerant may also be introduced into the back pressure chamber S4.

(3) Description of the Inverter Part 300

[0207] The inverter part 300 applies power and control signals to a device accommodated in the predetermined space of the main housing 100. In an embodiment, the inverter part 300 may apply power and control signals to the motor part 400.

[0208] The inverter part 300 is electrically connected to the main housing 100. The inverter part 300 and the main housing 100 may be electrically connected to a connector unit 330.

[0209] The inverter part 300 may be applied with power and control signals from the external power source and controller (not shown). The inverter part 300 is electrically connected to the external power source and controller (not shown). For the connection, a conductor wire (not shown) may be provided.

[0210] A predetermined space is formed inside the inverter part 300. The inverter device 340 is provided in the predetermined space. Therefore, the predetermined space may be defined as the inverter chamber S2.

[0211] The inverter part 300 is located at one side in the lengthwise direction of the main housing 100 opposite to the rear housing 200. In the illustrated embodiment, since the rear housing 200 is located at a front side of the main housing 100, the inverter part 300 is located at a rear side of the main housing 100.

[0212] In an embodiment, the inverter chamber S2 may communicate with the inner space of the main housing 100. By the communication, the inverter device 340 provided in the inverter chamber S2 may be cooled by direct heat-exchange with the refrigerant introduced into the main housing 100.

[0213] The inverter part 300 includes the inverter housing 310, an inverter cover 320, the connector unit 330, and the inverter device 340.

[0214] The inverter housing 310 defines an appearance of the inverter part 300 together with the inverter cover 320. The inverter housing 310 is coupled to the main housing 100.

[0215] The inverter housing 310 is coupled to the inverter cover 320. The inverter housing 310 forms a predetermined space with the inverter cover 320 therebetween. As described above, the predetermined space may be defined as the inverter chamber S2 in which the inverter device 340 is accommodated.

[0216] A connector coupling portion 311 is provided on one side of the inverter housing 310 so that the connector unit 330 is electrically connected to the inverter housing 310. A shape of the connector coupling portion 311 may be determined corresponding to a shape of the connector unit 330.

[0217] A connector module 312 is provided on one side of the inverter housing 310 facing the main housing 100, namely, on a front upper portion of the inverter housing 310 in the illustrated embodiment. The connector module 312 is electrically connected to the external power source and controller (not shown).

[0218] The connector module 312 includes a communication connector 312a and a power connector 312b. The communication connector 312a is electrically connected to the external controller (not shown) to receive control signals. The power connector 312b is electrically connected to the external power source (not shown) to receive a power signal.

[0219] Alternatively, the connector module 312 may be provided as a single connector and applied with both power and control signals from the external power source and controller (not shown).

[0220] The inverter housing 310 may be formed with a rotational shaft part coupling portion (not shown). A first bearing 521 is coupled to the rotational shaft part coupling portion (not shown). A first end portion 512 of the rotational shaft part 500 is coupled to the first bearing 521. Accordingly, the rotational shaft part 500 may be rotatably coupled to the rotational shaft part coupling portion (not shown).

[0221] The inverter housing 310 and the inverter cover 320 may be coupled to each other by a separate coupling member (not shown). To this end, a through hole (not shown) may be formed in the inverter housing 310. The coupling member (not shown) may be coupled through the inverter housing 310 and the inverter cover 320 and inserted and coupled into the inverter coupling portion 140 of the main housing 100.

[0222] The inverter cover 320 defines an appearance of the inverter part 300 together with the inverter housing 310. The inverter cover 320 is coupled to the inverter housing 310. The inverter cover 320 forms a predetermined space with the inverter housing 310 therebetween. The predetermined space may be defined as the inverter chamber S2.

[0223] The inverter cover 320 and the inverter housing 310 may be coupled to each other by a coupling member (not shown).

[0224] The connector unit 330 allows the inverter part 300 and the main housing 100 to be electrically connected to each other. In an embodiment, the connector unit 330 may electrically connect the inverter device 340 with the motor part 400.

[0225] One side of the connector unit 330, namely, a rear side in the illustrated embodiment, is coupled to the inverter housing 310. Specifically, the one side of the connector unit 330 is inserted into the connector coupling portion 311.

[0226] Another side of the connector unit 330, namely, the front side in the illustrated embodiment, is coupled to the motor part 400. Specifically, the another side of the connector unit 330 is inserted into a connector accommodating portion (not shown) of the motor part 400.

[0227] The connector unit 330 includes a support member 331 and an electric member 332.

[0228] The support member 331 defines a body of the connector unit 330. The electric member 332 is inserted through the support member 331. The support member 331 may be formed of an insulating material.

[0229] A shape of the support portion 331 may be determined corresponding to the shape of the connector coupling portion 311.

[0230] The electric member 332 is electrically connected to the inverter device 340 and the motor part 400, respectively. Accordingly, power and control signals may be applied to the motor part 400 from the inverter device 340.

[0231] The electric member 332 is inserted through the support member 331. The electric member 332 may be formed of a conductive material.

[0232] In the illustrated embodiment, a total of three electric members 332 are provided. This is because an alternative current power applied to the motor part 400 is a three-phase power, that is, U-phase, V-phase, and W-phase.

[0233] The electric member 332 extends in one direction. One side of the electric member 332 in one direction, namely, the rear side in the illustrated embodiment, is electrically connected to the inverter device 340. Another side of the electric member 332 in a lengthwise direction, namely, the front side in the illustrated embodiment, is electrically connected to the connector accommodating portion (not shown) of the motor part 400.

[0234] The one direction in which the electric member 332 extends may be defined as a "lengthwise direction" of the electric member 332.

[0235] The inverter device 340 transforms the power and control signals applied from the external power source and controller (not shown). In an embodiment, the inverter device 340 may transform the applied direct current power into the alternative current power with U-phase, V-phase, and W-phase.

[0236] The power and control signals transformed by the inverter device 340 are transmitted to the motor part 400 through the connector unit 330. Accordingly, the motor part 400 may be operated to drive the compression part 600.

[0237] The inverter device 340 may include arbitrary devices to process and transform power and control signals. In one embodiment, the inverter device 340 may include a printed circuit board (PCB), an insulated gate bipolar transistor (IGBT), a semiconductor element, and the like.

(4) Description of the Motor Part 400

[0238] The motor part 400 is operated according to the power and control signals applied from the inverter part 300. The motor part 400 is rotated according to the applied power and the control signal, and generates a rotational force for the compression part 600 to compress the refrigerant and the vapor refrigerant. The rotational force generated by the motor part 400 may be transmitted to the compression part 600 by the rotational shaft part 500.

[0239] The motor part 400 is electrically connected to the inverter device 340 by the connector unit 330. The power and control signals applied to the motor part 400 may be three-phase alternative current power and control signals transformed by the inverter device 340.

[0240] The motor part 400 is accommodated in the motor chamber S1 which is a part of the inner space of the main housing 100. An outer circumferential surface of the motor part 400, that is, an outer circumferential surface of the stator 410 may be fixed to the inner circumferential surface 112 of the main housing 100.

[0241] By the above configuration, when the motor part

400 is operated, the stator 410 is not rotated, and only a rotor 420 may be rotated relative to the stator 410.

[0242] The motor part 400 is connected to the rotational shaft part 500. Specifically, the rotational shaft part 500 is inserted through the rotor 420. When the rotor 420 of the motor part 400 is rotated, the rotational shaft part 500 is integrally rotated with the rotor 420. As a result, the compression part 600 connected to the rotational shaft part 500 performs an orbiting motion to compress the refrigerant.

[0243] The motor part 400 includes the stator 410 and the rotor 420.

[0244] The stator 410 defines an outer side of the motor part 400. The stator 410 has a circular cross section and extends in one direction. The one direction in which the stator 410 extends may be defined as a "lengthwise direction" of the stator 410.

[0245] A hollow portion is formed through the stator 410. The rotor 420 is spaced apart from an inner circumferential surface of the stator 410 by a predetermined distance in the hollow portion.

[0246] That is, the rotor 420 and the stator 410 are not brought into contact with each other. The rotor 420 may be rotated relative to the stator 410 inside the hollow portion.

[0247] The outer circumferential surface of the stator 410 may be fixed to the inner circumferential surface 112 of the main housing 100. Accordingly, even when the motor part 400 is operated, the stator 410 may not rotate.

[0248] The stator 410 forms an electromagnetic field according to the power and control signals applied from the inverter device 340. The rotor 410 includes a plurality of coils (not shown).

[0249] In one embodiment, the number of the coils may be a multiple of three. That is, each coil may be configured such that any one of the U-phase, V-phase, and W-phase of the applied three-phase alternative current power flows.

[0250] The coils may be wound around respective ends of the stator 410 in a lengthwise direction. The coils are electrically connected to the inverter device 340. The power and control signals applied from the inverter device 340 may be applied to the coils.

[0251] When power and control signals are applied to the coils, the coils form an electromagnetic field. The electromagnetic field formed by the coils (not shown) applies an electromagnetic force to a magnet (not shown) provided in the rotor 420. Accordingly, the rotor 420 provided with the magnet is rotated clockwise or counterclockwise by the electromagnetic force.

[0252] The rotor 420 is rotated by the electromagnetic field formed by the coils of the stator 410. The rotor 420 is rotatably accommodated in the hollow portion formed through the stator 410.

[0253] The rotor 420 is spaced apart from the inner circumferential surface of the stator 410 by a predetermined distance. Accordingly, the rotor 420 may be relatively rotated regardless of the stator 410.

[0254] The rotor 420 has a circular cross section and extends in one direction. The one direction in which the rotor 420 extends may be defined as a "lengthwise direction" of the rotor 420.

[0255] A diameter of a cross-section of the rotor 420 is preferably smaller than a diameter of the hollow portion formed through the stator 410.

[0256] The rotor 420 includes a plurality of magnets (not shown). When power and control signals are applied from the inverter device 340 so that the coils of the stator 410 form an electromagnetic field, the magnets are applied with the electromagnetic force by the formed electromagnetic field. The rotor 420 is rotated clockwise or counterclockwise by the electromagnetic force.

[0257] A rotor penetration portion 421 is formed through the rotor 420.

[0258] The rotational shaft part 500 is coupled through the rotor penetration portion 421. When the rotor 420 is rotated, the rotational shaft part 500 is integrally rotated with the rotor 420. Accordingly, the rotational force of the rotor 420 is transmitted to the orbiting scroll 620 to compress the refrigerant and the vapor refrigerant.

(5) Description of the Rotational Shaft Part 500

[0259] The rotational shaft part 500 transmits to the compression part 600 a rotational force generated as the motor part 400 is rotated. The compression part 600 performs an orbiting motion by the received rotational force, thereby compressing the refrigerant.

[0260] The rotational shaft part 500 is connected to the motor part 400. Specifically, the rotational shaft part 500 is coupled through the rotor penetration portion 421 of the rotor 420. The rotational shaft part 500 may be integrally rotated with the rotor 420.

[0261] The rotational shaft part 500 extends in one direction. The one direction in which the rotational shaft part 500 extends may be defined as a "lengthwise direction" of the rotational shaft part 500.

[0262] One end portion of the rotational shaft part 500 facing the inverter part 300, namely, a rear end portion in the illustrated embodiment, is rotatably coupled to the rotational shaft part coupling portion (not shown) of the inverter part 300.

[0263] The coupling is accomplished by the first bearing 521. By the first bearing 521, the rotational shaft part 500 may rotate regardless of the inverter part 300.

[0264] Another end portion of the rotational shaft part 500 facing the rear housing 200, namely, the front end portion in the illustrated embodiment, is rotatably coupled through a rotational shaft coupling portion 613 of the fixed scroll 610.

[0265] The coupling is accomplished by a second bearing 522. By the second bearing 522, the rotational shaft part 500 may rotate regardless of the fixed scroll 610.

[0266] The rotational shaft part 500 includes a shaft 510 and a bearing 520.

[0267] The shaft 510 transmits to the compression part

600 a rotational force generated as the motor part 400 is operated. The shaft 510 extends in a lengthwise direction, namely, in a back-and-forth direction in the illustrated embodiment.

[0268] A middle portion in the lengthwise direction of the shaft 510 is coupled through the rotor penetration portion 421. By the coupling, the shaft 510 may be integrally rotated with the rotor 420.

[0269] The shaft 510 includes a shaft body 511, the first end portion 512, a second end portion 513, an eccentric part 514, and balance weights 515.

[0270] The shaft body 511 defines a body of the shaft 510. The shaft body 511 has a circular cross section and extends in a lengthwise direction. A diameter of a cross-section of the shaft body 511 is preferably formed equal to a diameter of the rotor penetration portion 421.

[0271] One end portion in a lengthwise direction of the shaft body 511 facing the inverter part 300 may be defined as the first end portion 512. The first end portion 512 is rotatably coupled to the inverter housing 310.

[0272] In detail, the first end portion 512 is inserted into the first bearing 521, and the first bearing 521 is inserted into the rotational shaft part coupling portion (not shown) of the inverter housing 310.

[0273] Accordingly, the shaft 510 may rotate regardless of the inverter housing 310.

[0274] Another end portion in the lengthwise direction of the shaft body 511 facing the rear housing 200 may be defined as the second end portion 513. The second end portion 513 is rotatably coupled through the rotational shaft coupling portion 613.

[0275] In detail, the second end portion 513 is inserted and coupled into the second bearing 522, and the second bearing 522 is inserted and coupled into the rotational shaft coupling portion 613.

[0276] Accordingly, the shaft 510 may rotate regardless of the fixed scroll 610.

[0277] One side of the second end portion 513, namely, the front side in the illustrated embodiment, is connected to the eccentric part 514.

[0278] The eccentric part 514 allows the orbiting scroll 620 to be turned relative to the fixed scroll 610 as the rotor 420 rotates. That is, the eccentric part 514 forms a central axis different from that of the rotor 420 and the shaft body 511. Accordingly, when the rotor 420 is rotated, the orbiting scroll 620 may be turned centering on an eccentric axis.

[0279] The eccentric part 514 is rotatably coupled to the shaft 510. In one embodiment, the eccentric part 514 may be coupled to the shaft 510 by a rotation pin member (not shown).

[0280] The eccentric part 514 is rotatably coupled to an eccentric part coupling portion 623 of the orbiting scroll 620. Specifically, the eccentric part 514 is inserted and coupled into an eccentric bearing 523. In addition, the eccentric bearing 523 is inserted and coupled into the eccentric part coupling portion 623.

[0281] Accordingly, even if the eccentric part 514 is rotated, the orbiting scroll 620 may perform an orbiting motion without rotation.

[0282] The balance weight 515 is configured to compensate for a movement of a center of mass due to the orbiting motion of the orbiting scroll 620. In one embodiment, the balance weight 515 may be configured as any member having a predetermined mass. For example, the balance weight 515 may be configured as a mass.

[0283] The balance weight 515 is coupled to the shaft 510. When the shaft 510 is rotated, the balance weight 515 may also be integrally rotated with the shaft 510.

[0284] The balance weights 515 may be provided in plurality. In the illustrated embodiment, the balance weights 515 are provided on the front side and the rear side of the motor part 400 in the lengthwise direction, respectively.

[0285] The plurality of balance weights 515 may be located at upper and lower sides of the shaft 510, respectively. In the illustrated embodiment, the balance weight 515 located at the upper side is illustrated larger than the balance weight 515 located at the lower side. This is due to the eccentric part 514 being located at a lower side of the shaft 510.

[0286] The bearing 520 prevents the member to which the shaft 510 is connected from rotating when the shaft 510 is rotated. That is, the bearing 520 allows the shaft 510 to be rotatably coupled with each member.

[0287] The bearing 520 may be configured as any form that can couple a plurality of members so that one member can be rotated regardless of other members. In one embodiment, the bearing 520 may be configured as a ball bearing.

[0288] The bearing 520 includes the first bearing 521, the second bearing 522, and the eccentric bearing 523.

[0289] The first bearing 521 allows the first end portion 512 of the shaft 510 to be rotatably coupled to the inverter housing 310.

[0290] The first bearing 521 is inserted and coupled into the rotational shaft part coupling portion (not shown) formed in the inverter housing 310. In addition, the first end portion 512 is inserted and coupled into the first bearing 521. Accordingly, the shaft 510 may rotate regardless of the inverter housing 310.

[0291] The second bearing 522 is inserted and coupled into the rotational shaft coupling portion 613 of the fixed scroll 610. In addition, the second end portion 513 is inserted and coupled into the second bearing 522. Accordingly, the shaft 510 may rotate regardless of the fixed scroll 610.

[0292] The eccentric bearing 523 is inserted and coupled into the eccentric part coupling portion 623 of the orbiting scroll 620. In addition, the eccentric part 514 is inserted and coupled into the eccentric bearing 523. Accordingly, when the eccentric part 514 is rotated, the orbiting scroll 620 may perform an orbiting motion relative to the fixed scroll 610 without rotation.

(6) Description of the Compression Part 600

[0293] The compression part 600 compresses the refrigerant and the vapor refrigerant introduced into the main housing 100. The compression part 600 is configured to compress the refrigerant by repeating a process of increasing or decreasing a volume of the compression chamber P into which the refrigerant and the vapor refrigerant are introduced.

[0294] The compression part 600 is connected to the rotational shaft part 500. In detail, the eccentric part 514 of the rotational shaft part 500 is rotatably coupled to the eccentric part coupling portion 623 of the orbiting scroll 620.

[0295] As described above, the eccentric part 514 is configured to have a central axis eccentric with respect to the rotor 420 and the shaft 510. Therefore, when the shaft 510 is rotated, the eccentric part 514 is eccentrically rotated with respect to the shaft 510. Accordingly, the orbiting scroll 620 may perform an orbiting motion relative to the fixed scroll 610.

[0296] At this time, the eccentric part 514 is coupled to the eccentric part coupling portion 623 by the eccentric bearing 523. Accordingly, even if the eccentric part 514 is rotated, the orbiting scroll 620 may not be rotated.

[0297] In the illustrated embodiment, the compression part 600 is partially accommodated in the main housing 100 and the rear housing 200, respectively.

[0298] Specifically, a fixed end plate portion 611 and the rotational shaft coupling portion 613 of the fixed scroll 610 are accommodated in the inner space of the main housing 100. In addition, the fixed wrap 612 of the fixed scroll 610 and the orbiting scroll 620 are accommodated in the inner space of the rear housing 200.

[0299] The compression part 600 extends in one direction. The one direction in which the compression part 600 is extended may be defined as a "lengthwise direction" of the compression part 600.

[0300] The motor part 400 is located at one side of the compression part 600 in a lengthwise direction, namely, at the rear side in the illustrated embodiment. The discharge chamber S3 and the back pressure chamber S4 are located at another side of the compression part 600 in a lengthwise direction, namely, at the front side in the illustrated embodiment.

[0301] The compression part 600 communicates with the inner space of the main housing 100. The refrigerant introduced into the main housing 100 may be introduced into the compression chamber P formed in the compression part 600.

[0302] The compression part 600 communicates with the vapor refrigerant passage part 700 to be described later. The vapor refrigerant introduced through the vapor refrigerant passage part 700 may be introduced into the compression chamber P formed in the compression part 600.

[0303] The compression part 600 communicates with the inner space of the rear housing 200. The refrigerant and the vapor refrigerant compressed in the compression chamber P may be discharged outside through the exhaust port 210 via the discharge chamber S3.

[0304] The compression part 600 includes the fixed scroll 610, the orbiting scroll 620, and the housing coupling unit 630.

[0305] The fixed scroll 610 is coupled to the orbiting scroll 620 to form a predetermined space therebetween. The predetermined space may be defined as the compression chamber P in which the refrigerant and the vapor refrigerant are compressed.

[0306] When the orbiting scroll 620 performs an orbiting motion relative to the fixed scroll 610, the process of increasing and decreasing the volume of the compression chamber P may be repeated to compress the refrigerant and the vapor refrigerant.

[0307] The fixed scroll 610 is fixedly coupled to the main housing 100 and the rear housing 200. In detail, the support plate 614 of the fixed scroll 610 is fixedly coupled to the main housing coupling portion 230 of the rear housing 200. In addition, the main housing contact portion 615 of the fixed scroll 610 is fixedly coupled to the rear housing coupling portion 130 of the main housing 100.

[0308] Accordingly, even when the orbiting scroll 620 is turned in accordance with the rotation of the motor part 400, the fixed scroll 610 may not be rotated and may remain in a stopped state.

[0309] The fixed scroll 610 is located between the motor part 400 and the orbiting scroll 620. Specifically, the motor part 400 is located at one side of the fixed scroll 610, namely, at the rear side in the illustrated embodiment. The orbiting scroll 620 is located at another side of the fixed scroll 610, namely, at the front side in the illustrated embodiment.

[0310] The fixed scroll 610 is partially accommodated in the main housing 100 and the rear housing 200, respectively.

[0311] Specifically, the fixed end plate portion 611, the rotational shaft coupling portion 613, the support plate 614, the main housing contact portion 615, and a refrigerant communication portion 616 of the fixed scroll 610 are accommodated in the inner space of the main housing 100.

[0312] In addition, the fixed wrap 612 of the fixed scroll 610 is accommodated in the inner space of the rear housing 200.

[0313] The fixed scroll 610 includes the fixed end plate portion 611, the fixed wrap 612, the rotational shaft coupling portion 613, the support plate 616, the main housing contact portion 615, and the refrigerant communication portion 616.

[0314] The fixed end plate portion 611 defines a body of the fixed scroll 610. In the illustrated embodiment, the fixed end plate portion 611 is provided in a disc shape, but the shape may change according to a shape of the inner space of the main housing 100.

[0315] The fixed wrap 612 protrudes from one side of the fixed end plate portion 611 facing the orbiting scroll 620, namely, from the front side in the illustrated embodiment, by a predetermined distance.

[0316] The fixed wrap 612 is engaged with the orbiting wrap 622 of the orbiting scroll 620 while defining a predetermined space therebetween. The predetermined space may be defined as the compression chamber P.

[0317] When the orbiting scroll 620 performs an orbiting motion with the fixed wrap 612 engaged with the orbiting wrap 622, the process of increasing and decreasing the volume of the compression chamber P is repeated. Accordingly, the refrigerant and the vapor refrigerant introduced into the compression chamber P may be compressed.

[0318] The fixed wrap 612 may be formed spirally. In detail, the fixing wrap 612 may include the first end portion located at a radially outer side and the second end portion located at a radially inner side on the fixed end plate portion 611. The second end portion may be located adjacent to a point of the fixed end plate portion 611 corresponding to the discharge port 625.

[0319] The fixed wrap 612 may extend in a form of an involute curve from the first end portion toward the second end portion. That is, a diameter of the curve formed by the fixed wrap 612 gradually decreases along the second end portion at the first end portion.

[0320] A first scroll discharge port 760a and a second scroll discharge port 760b to be described later are located between the first end portion and the second end portion, respectively. That is, the first scroll discharge port 760a and the second scroll discharge port 760b are located at a radially inner side of the first end portion and a radially outer side of the second end portion.

[0321] The rotational shaft coupling portion 613 is a portion to which the shaft 510 is rotatably coupled in a penetrating manner. The rotational shaft coupling portion 613 protrudes from one side of the fixed end plate portion 611 facing the motor part 400, namely, from the rear side in the illustrated embodiment, by a predetermined distance.

[0322] A hollow portion is formed inside the rotational shaft coupling portion 613. The hollow portion extends up to the fixed end plate portion 611. That is, the hollow portion is formed in a lengthwise direction of the fixed scroll 610 in a penetrating manner.

[0323] The second bearing 522 is inserted and coupled into the hollow portion inside the rotational shaft coupling portion 613. The shaft 510 is rotatably coupled through the second bearing 522. Accordingly, the fixed scroll 610 may remain in a stopped state regardless of a rotation of the shaft 510.

[0324] The support plate 614 is a portion where the fixed scroll 610 is coupled to the rear housing 200. The support plate 614 protrudes a predetermined distance from a radially outer side of the fixed end plate portion 611 (see FIG. 5).

[0325] The support plates 614 may be provided in plurality. The plurality of support plates 614 may be spaced apart from each other by a predetermined distance along an outer circumferential surface formed on the radially outer side of the fixed end plate portion 611. A space in which the plurality of support plates 614 is spaced apart from each other by a predetermined distance may be defined as the refrigerant communication portion 616.

[0326] A through hole may be formed through the support plate 614. A coupling member (not shown) to couple the fixed scroll 610 to the main housing coupling portion 230 of the rear housing 200 may be coupled through the through hole.

[0327] The main housing contact portion 615 is a portion where the fixed scroll 610 is coupled to the wall portion 110 of the main housing 100. The main housing contact portion 615 may be defined as an outer circumferential surface of the radially outer side of the support plate 614.

[0328] When the fixed scroll 610 is accommodated in the inner space of the main housing 100, the main housing contact portion 615 may be brought into contact with the inner circumferential surface 112 of the main housing 100.

[0329] The refrigerant communication portion 616 is a passage through which the refrigerant introduced into the inner space of the main housing 100 is introduced into the compression chamber P. The refrigerant communication portion 616 communicates the inner space of the main housing 100 with the compression chamber P.

[0330] The plurality of support plates 614 is spaced apart from each other on the refrigerant communication portion 616. The number and a shape of the refrigerant communication portion 616 may be determined depending on a shape and a spaced distance of the support plates 614.

[0331] The refrigerant passed through the refrigerant communication portion 616 may be introduced into the compression chamber P through a space formed between an end portion of the fixed wrap 612 and an end portion of the orbiting wrap 622 located at a radially outer side.

[0332] The orbiting scroll 620 performs an orbiting motion as the motor part 400 is operated. The orbiting scroll 620 performs an orbiting motion relative to the fixed scroll 610. Accordingly, the volume of the compression chamber P is changed, so that the refrigerant and the vapor refrigerant introduced into the compression chamber P may be compressed.

[0333] The orbiting scroll 620 is connected to the motor part 400. In detail, the rotational shaft part 500 connected to the motor part 400 is connected to the eccentric part 514, and the eccentric part 514 is connected to the orbiting scroll 620 by the eccentric bearing 523 as a medium.

[0334] One side of the orbiting scroll 620 facing the fixed scroll 610 may be brought into contact with one end portion of the fixed wrap 612 facing the orbiting scroll 620.

[0335] In addition, another side of the orbiting scroll

620 facing the discharge chamber S3 may be brought into contact with a blocking plate 633 while defining a predetermined space therebetween.

[0336] The orbiting scroll 620 is accommodated in the rear housing 200.

[0337] The orbiting scroll 620 includes the orbiting end plate portion 621, the orbiting wrap 622, the eccentric part coupling portion 623, the discharge valve 624, the discharge port 625, the ring insertion portion 626, and a gasket insertion portion 627.

[0338] The orbiting end plate portion 621 defines a body of the orbiting scroll 620. In the illustrated embodiment, the orbiting end plate portion 621 is provided in a disc shape, but the shape may change according to a shape of the inner space of the rear housing 200.

[0339] The orbiting wrap 622 protrudes from one side of the orbiting end plate portion 621 facing the fixed scroll 610, namely, from the rear side in the illustrated embodiment, by a predetermined distance.

[0340] The orbiting wrap 622 is engaged with the fixed wrap 612 while forming a predetermined space. The predetermined space may be defined as the compression chamber P.

[0341] When the orbiting scroll 620 performs an orbiting motion with the orbiting wrap 622 engaged with the fixed wrap 612, the process of increasing and decreasing the volume of the compression chamber P is repeated. Accordingly, the refrigerant and the vapor refrigerant introduced into the compression chamber P may be compressed.

[0342] The orbiting wrap 622 may be formed spirally, equally to the fixed wrap 612.

[0343] The orbiting wrap 622 may be formed spirally. In detail, the orbiting wrap 622 may include the first end portion located at a radially outer side and the second end portion located at a radially inner side on the orbiting end plate portion 621. The second end portion may be located adjacent to the discharge port 625.

[0344] The orbiting wrap 622 may extend in a form of an involute curve from the first end portion toward the second end portion. That is, a diameter of the curve formed by the orbiting wrap 622 gradually decreases along the second end portion at the first end portion.

[0345] The eccentric part coupling portion 623 is a portion to which the eccentric part 514 of the shaft 510 is rotatably coupled. The eccentric part coupling portion 623 may be defined as a space formed at one side of the orbiting end plate portion 621 facing the fixed scroll 610.

[0346] The eccentric bearing 523 is inserted and coupled into the eccentric part coupling portion 623. An eccentric part 514 is inserted and coupled into the eccentric bearing 523. Therefore, the orbiting scroll 620 may not rotate regardless of a rotation of the eccentric part 514.

[0347] The eccentric part coupling portion 623 may have a central axis different from that of the shaft 510. Accordingly, when the shaft 510 is rotated, the orbiting scroll 620 may be eccentrically turned with respect to the shaft 510.

[0348] The discharge valve 624 is configured to open or close the discharge port 625. The discharge valve 624 is provided on one side of the orbiting end plate portion 621 facing the discharge chamber S3.

[0349] The discharge valve 624 may open or close the discharge port 625 according to a difference in pressure between the compression chamber P and the discharge chamber S3 through which the discharge port 625 communicates.

[0350] That is, the discharge valve 624 may open the discharge port 625 when a difference in pressure between the refrigerant and the vapor refrigerant in the compression chamber P and in the discharge chamber S3 exceeds a predetermined value.

[0351] The discharge valve 624 may be configured as any form that can block or allow the communication in accordance with a difference in pressure in the two or more spaces in communication. In one embodiment, the discharge valve 624 may be configured as a reed valve.

[0352] The discharge port 625 communicates the compression chamber P with the discharge chamber S3. The refrigerant and the vapor refrigerant compressed in the compression chamber P may flow to the discharge chamber S3 through the discharge port 625.

[0353] The discharge port 625 may be opened or closed by the discharge valve 624. Therefore, a pressure in the compression chamber P and a pressure in the discharge chamber S3 may be different.

[0354] The ring insertion portion 626 is a space into which a ring member 631 and the pin member 632 of the housing coupling unit 630 are inserted. The ring insertion portion 626 is recessed by a predetermined distance from one side surface of the orbiting end plate portion 621 facing the discharge chamber S3.

[0355] A shape of the ring insertion portion 626 may be determined corresponding to a shape of the ring member 631.

[0356] In the illustrated embodiment, a plurality of ring insertion portions 626 are formed on the one side surface of the orbiting end plate portion 621. The plurality of ring insertion portions 626 is spaced apart from each other by a predetermined distance in a circumferential direction. The number of ring insertion portions 626 may be changed according to the number of the ring members 631 and the pin members 632.

[0357] The gasket insertion portion 627 is a space into which a gasket unit 634 of the housing coupling unit 630 is inserted. The gasket insertion portion 627 is recessed by a predetermined distance from one side surface of the orbiting end plate portion 621 facing the discharge chamber S3.

[0358] In the illustrated embodiment, the gasket insertion portion 627 includes a first gasket insertion portion 627a and a second gasket insertion portion 627b.

[0359] The first gasket insertion portion 627a is formed radially outer side of the ring insertion portion 626. A first gasket 634a is inserted into the first gasket insertion portion 627a.

[0360] The second gasket insertion portion 627b is formed radially inner side of the ring insertion portion 626. The second gasket 634b is inserted into the second gasket insertion portion 627b.

[0361] The number and a shape of the gasket insertion portion 627 may be determined depending on the number and a shape of the gasket unit 634.

[0362] The housing coupling unit 630 couples the orbiting scroll 620 to the rear housing 200 so as to perform an orbiting motion. The housing coupling unit 630 is located between the orbiting scroll 620 and the discharge chamber S3.

[0363] The housing coupling unit 630 includes the ring member 631, the pin member 632, the blocking plate 633, and the gasket unit 634.

[0364] The ring member 631 prevents an inner wall of the ring insertion portion 626 from being damaged by the pin member 632 that prevents a rotation of the orbiting scroll 620. In addition, the ring member 631 seals the ring insertion portion 626 to prevent the compressed refrigerant and vapor refrigerant from being randomly leaked.

[0365] The ring member 631 is a ring shape with an inner space.

[0366] The ring member 631 is inserted into the ring insertion portion 626. In addition, the pin member 632 is inserted into the ring member 631. The inserted pin member 632 may move in an inner space of the ring member 631 with an inner circumferential surface of the ring member 631 as a limit.

[0367] Accordingly, a range of the rotation of the orbiting scroll 620 is limited, so that the rotation of the orbiting scroll 620 can be prevented.

[0368] The pin member 632 is configured to prevent the rotation of the orbiting scroll 620, when the eccentric part 514 rotates.

[0369] The pin member 632 extends in a lengthwise direction. One side in a lengthwise direction of the pin member 632, namely, the rear side in the illustrated embodiment, is inserted into the ring insertion portion 626. As described above, since the ring member 631 is inserted into the ring insertion portion 626, the pin member 632 is inserted into a space formed inside the ring member 631.

[0370] Another side in the lengthwise direction of the pin member 632, namely, the front side in the illustrated embodiment, is inserted into the pin insertion portion 220 of the rear housing 200. The pin insertion portion 220 has a same diameter as that of the pin member 632. Therefore, the pin member 632 does not move in an up and down direction or a left and right direction inside the pin insertion portion 220.

[0371] Therefore, when the orbiting scroll 620 performs an orbiting motion as the eccentric part 514 is rotated, the rotation of the orbiting scroll 620 can be prevented by the pin member 632.

[0372] The blocking plate 633 prevents an unexpected separation of the ring member 631 and the gasket unit 634 inserted into the orbiting scroll 620. In addition, the blocking plate 633 seals one side surface of the orbiting end plate portion 621 except for the discharge port 625, thereby preventing random leakage of the compressed refrigerant and vapor refrigerant.

[0373] The blocking plate 633 is located between the orbiting scroll 620 and the discharge chamber S3.

[0374] On one side of the blocking plate 633, namely, on the rear side in the illustrated embodiment, the orbiting end plate portion 621 is located while defining a predetermined space with the blocking plate 633.

[0375] The discharge chamber S3 and the back pressure chamber S4 are located at another side of the blocking plate 633, namely, at the front side in the illustrated embodiment.

[0376] A predetermined space is formed inside the blocking plate 633. The predetermined space communicates with the discharge port 625.

[0377] A plurality of through holes is formed at a radially outer side of the predetermined space and spaced apart by a predetermined distance in a circumferential direction. The pin members 632 may be coupled through the through holes, respectively.

[0378] The gasket unit 634 seals between the orbiting scroll 620 and the blocking plate 633. The gasket unit 634 is inserted into the gasket insertion portion 627.

[0379] The gasket unit 634 includes the first gasket 634a and the second gasket 634b having a diameter smaller than that of the first gasket 634a.

[0380] The first gasket 634a seals a radially outer side of the orbiting end plate portion 621. The first gasket 634a is inserted into the first gasket insertion portion 627a.

[0381] The second gasket 634b seals a radially inner side of the orbiting end plate portion 621. The second gasket 634b is inserted into the second gasket insertion portion 627b.

[0382] Accordingly, the discharge port 625 is sealed by the first gasket 634a and the second gasket 634b, thereby preventing random leakage of the compressed refrigerant and vapor refrigerant.

3. Description of the Vapor Refrigerant Passage Part 700 provided in the Motor Operated Compressor 10 according to an Embodiment

[0383] The motor operated compressor 10 according to an embodiment of the present disclosure may improve a compression efficiency of the refrigerant by applying the vapor injection method. To this end, the vapor refrigerant may be introduced into the motor operated compressor 10.

[0384] In addition, the introduced vapor refrigerant may flow into the compression chamber P through the wall portion 110 of the main housing 100 without a separate member to form a passage.

[0385] Hereinafter, the vapor refrigerant passage part 700 provided in the motor operated compressor 10 according to an embodiment will be described in detail with reference to FIGS. 4 to 8.

[0386] In the illustrated embodiment, the vapor refrigerant passage part 700 may include the vapor refrigerant intake port 710, the vapor refrigerant passage 720, an opening and closing plate 730, a sealing ring 740, a scroll inner passage 750, and a scroll discharge port 760.

(1) Description of the Vapor Refrigerant Intake Port 710

[0387] The vapor refrigerant intake port 710 is a passage through which the vapor refrigerant is introduced from outside the main housing 100 into inside the main housing 100.

[0388] The vapor refrigerant intake port 710 may be configured as any form that can communicate the inside with the outside of the main housing 100. In one embodiment, the vapor refrigerant intake port 710 may be formed as a through hole.

[0389] The vapor refrigerant intake port 710 may be formed through the boss portion 113. Accordingly, a passage having a length sufficient to allow the vapor refrigerant to be introduced therethrough can be secured.

[0390] The vapor refrigerant intake port 710 may be located adjacent to the intake port 120. As a result, a passage member to supply the vapor refrigerant to the motor operated compressor 10 and a passage member to supply the refrigerant can be disposed adjacent to each other, thereby improving space utilization.

[0391] The vapor refrigerant intake port 710 communicates with the vapor refrigerant passage 720. To this end, the vapor refrigerant intake port 710 may extend up to one end portion in a lengthwise direction of the vapor refrigerant passage 720 facing the inverter part 300, namely, up to the rear end portion in the illustrated embodiment.

[0392] The vapor refrigerant introduced through the vapor refrigerant intake port 710 may be introduced into the vapor refrigerant passage 720.

[0393] The vapor refrigerant intake port 710 includes a first intake space 711 and a second intake space 712.

[0394] The first intake space 711 forms a part of the vapor refrigerant intake port 710. The first intake space 711 may be defined as a space formed in the vapor refrigerant intake port 710 facing the outside, namely, as an upper space in the illustrated embodiment.

[0395] The first intake space 711 has a larger diameter than that of the second intake space 712. The opening and closing plate 730 and the sealing ring 740 may be located in the first intake space 711.

[0396] The first intake space 711 communicates with the outside of the main housing 100. The vapor refrigerant may be introduced into the first intake space 711.

[0397] The first intake space 711 communicates with the second intake space 712. The vapor refrigerant introduced into the first intake space 711 may flow to the second intake space 712.

[0398] The first intake space 711 is provided with the sealing ring 740. An outer diameter of the sealing ring 740 may be equal to or larger than a diameter of the first intake space 711.

[0399] The first intake space 711 is provided with the opening and closing plate 730. The opening and closing plate 730 may be located at one side of the sealing ring 740 facing the second intake space 712, namely, at a lower side in the illustrated embodiment. That is, the opening and closing plate 730 is located between the sealing ring 740 and the second intake space 712.

[0400] The opening and closing plate 730 may have a diameter smaller than that of the first intake space 711.

[0401] The second intake space 712 forms another part of the vapor refrigerant intake port 710. The second intake space 712 may be defined as a space formed at a lower side of the first intake space 711 in a space formed in the vapor refrigerant intake port 710.

[0402] The second intake space 712 may have a diameter smaller than that of the first intake space 711.

[0403] The second intake space 712 communicates with the first intake space 711. The vapor refrigerant introduced into the first intake space 711 may flow to the second intake space 712.

[0404] The second intake space 712 communicates with the vapor refrigerant passage 720. The vapor refrigerant introduced into the second intake space 712 may flow to the vapor refrigerant passage 720.

(2) Description of the Vapor Refrigerant Passage 720

[0405] The vapor refrigerant passage 720 is a passage through which the vapor refrigerant introduced into the main housing 100 through the vapor refrigerant intake port 710 flows into the compression chamber P.

[0406] The vapor refrigerant passage 720 is formed in the wall portion 110 of the main housing 100. Alternatively, the vapor refrigerant passage 720 is formed as a space inside the passage protrusion 110a of the wall portion 110. The above embodiment may be applied when a cross-sectional area of the vapor refrigerant passage 720 needs to be increased.

[0407] The vapor refrigerant passage 720 extends in one direction, namely, in the back-and-forth direction in the illustrated embodiment. The one direction in which the vapor refrigerant passage 720 extends may be defined as a "lengthwise direction" of the vapor refrigerant passage 720.

[0408] The vapor refrigerant passage 720 is recessed by a predetermined distance from one end portion of the wall portion 110 facing the fixed scroll 610. As a result, the vapor refrigerant passage 720 communicates with the scroll inner passage 750.

[0409] One end portion in the lengthwise direction of the vapor refrigerant passage 720, namely, the rear end portion in the illustrated embodiment, communicates with the vapor refrigerant intake port 710.

[0410] In addition, another end portion in the lengthwise direction of the vapor refrigerant passage 720, namely, the front end portion in the illustrated embodiment, communicates with a scroll communication hole 751 formed in the fixed scroll 610.

[0411] In the illustrated embodiment, the vapor refrigerant passage 720 is formed through the upper wall portion 110 or the passage protrusion 110a formed on an upper side of the main housing 100. A position of the vapor refrigerant passage 720 may be changed according to a position of the vapor refrigerant intake port 710.

[0412] As the vapor refrigerant passage 720 is formed through the wall portion 110 or the passage protrusion 110a, a separate member to form a passage through which the vapor refrigerant flows into the compression chamber P is unnecessary. Accordingly, a structure of the passage through which the vapor refrigerant flows can be simplified. Furthermore, the inner space of the main housing 100 can be sufficiently secured.

(3) Description of the Opening and Closing Plate 730

[0413] The opening and closing plate 730 is configured to allow or block the vapor refrigerant to flow or from flowing into the compression chamber P.

[0414] That is, the opening and closing plate 730 is configured to allow or block communication between the scroll inner passage 750 or the scroll communication hole 751 and the vapor refrigerant passage 720.

[0415] In addition, the opening and closing plate 730 is configured to allow or block communication between the outside of the main housing 100 and the vapor refrigerant intake port 710.

[0416] In addition, the opening and closing plate 730 allows the introduced vapor refrigerant to flow only in a direction from the vapor refrigerant intake port 710 to the compression chamber P. That is, the opening and closing plate 730 prevents a backward flow of the vapor refrigerant.

[0417] The opening and closing plate 730 may be configured as any form that allows or blocks a flow of a fluid and limits a flow direction of the fluid. In the illustrated embodiment, the opening and closing plate 730 is provided in a disc shape. Alternatively, the opening and closing plate 730 may be provided in a form of a ball-spring check valve.

[0418] The opening and closing plate 730 may be operated according to a difference in pressure of each space partitioned by the opening and closing plate 730. The opening and closing plate 730 may be configured to open when the difference in pressure exceeds a predetermined value.

[0419] Specifically, the opening and closing plate 730 provided in the vapor refrigerant intake port 710 partitions the first intake space 711 and the second intake space 712. The opening and closing plate 730 may be opened when a difference between a pressure of the vapor refrigerant flowing in the first intake space 711 and a pressure of the vapor refrigerant flowing in the second intake space 712 exceeds a predetermined value.

[0420] Similarly, the opening and closing plate 730 provided in the scroll communication hole 751 partitions the first space 751a and the second space 751b. The opening and closing plate 730 may be opened when a difference between a pressure of the vapor refrigerant flowing in the first space 751a and a pressure of the vapor refrigerant flowing in the second space 751b exceeds a predetermined value.

[0421] Alternatively, the opening and closing plate 730 may be actuated by an electrical signal.

[0422] The opening and closing plate 730 may be provided at any position that may allow or block the vapor refrigerant to be or from being introduced into the compression chamber P.

[0423] In the embodiment illustrated in FIG. 7, the opening and closing plate 730 is provided in the scroll communication hole 751. Specifically, the opening and closing plate 730 is located in the second space 751b of the scroll communication hole 751.

[0424] The opening and closing plate 730 may be moved in a direction toward the sealing ring 740 or away from the sealing ring 740 inside the second space 751b.

[0425] An inner diameter of the sealing ring 740 is formed smaller than a diameter of the opening and closing plate 730. Therefore, when the opening and closing plate 730 is brought into contact with the sealing ring 740, the opening and closing plate 730 is no longer able to proceed toward the first space 751a.

[0426] In the above embodiment, the opening and closing plate 730 may have a diameter smaller than a diameter of the second space 751b. That is, a space through which the vapor refrigerant flows is formed between both end portions in an up and down direction of the opening and closing plate 730 and both side surfaces in an up and down direction of the second space 751b.

[0427] Therefore, when the opening and closing plate 730 is moved toward a third space 751c, that is, away from the sealing ring 740, a communication between the scroll inner passage 750 or the scroll communication hole 751 and the vapor refrigerant passage 720 is allowed. Accordingly, the vapor refrigerant may flow toward the compression chamber P through the space.

[0428] On the other hand, when the opening and closing plate 730 is not moved, the opening and closing plate 730 is brought into contact with the sealing ring 740. At this time, the sealing ring 740 has an inner diameter smaller than a diameter of the opening and closing plate 730.

[0429] Therefore, when the opening and closing plate 730 is brought into contact with the sealing ring 740, the scroll communication hole 751 is closed so that the vapor refrigerant does not flow toward the compression chamber P.

[0430] In the embodiment illustrated in FIG. 8, the opening and closing plate 730 is provided in the vapor refrigerant intake port 710.

[0431] Specifically, the opening and closing plate 730 is located in the first intake space 711 of the vapor refrigerant intake port 710. In addition, the sealing ring 740 is located at a portion where the first intake space 711 communicates with the outside, namely, at the upper side in the illustrated embodiment. The opening and closing plate 730 is located at a lower side of the sealing ring 740.

[0432] In the above embodiment, the opening and closing plate 730 may have a diameter smaller than the diameter of the first intake space 711.

[0433] That is, a space in which the vapor refrigerant may flow is formed between an outer circumference of the opening and closing plate 730 and an inner wall of the vapor refrigerant intake port 710 surrounding the first intake space 711.

[0434] Therefore, when the opening and closing plate 730 is moved toward the main housing 100, the vapor refrigerant may flow toward the vapor refrigerant passage 720 through the space.

[0435] On the other hand, when the opening and closing plate 730 is not moved, the opening and closing plate 730 is brought into contact with the sealing ring 740. At this time also, the sealing ring 740 has a diameter smaller the diameter of the opening and closing plate 730.

[0436] Therefore, when the opening and closing plate 730 is brought into contact with the sealing ring 740, the vapor refrigerant intake port 710 is closed so that the vapor refrigerant does not flow toward the vapor refrigerant passage 720.

[0437] As described above, the opening and closing plate 730 is configured to close the scroll communication hole 751 or the vapor refrigerant intake port 710 when no vapor refrigerant is applied. To this end, an elastic member (not shown) to press the opening and closing plate 730 toward the sealing ring 740 may be provided.

[0438] In one embodiment, the opening and closing plate 730 may be provided in plurality. That is, the opening and closing plate 730 may be provided in both the scroll communication hole 751 and the vapor refrigerant intake port 710.

[0439] In the above embodiment, conditions under which each opening and closing plate 730 provided in the scroll communication hole 751 and the vapor refrigerant intake port 710 is moved may be different. In one embodiment, a reference value of a difference in pressure to open the scroll communication hole 751 may be determined to be greater than a reference value of a difference in pressure to open the vapor refrigerant intake port 710.

[0440] Accordingly, the passage through which the vapor refrigerant flows may be opened or closed step by step.

<u>(4) Description of the Sealing Ring 740</u>

[0441] The sealing ring 740 blocks a path through which the vapor refrigerant flows from the outside to the compression chamber P when a predetermined condition is not satisfied. In addition, when the predetermined condition is satisfied, the sealing ring 740 opens the path through which the vapor refrigerant flows from the outside to the compression chamber P.

[0442] The opening and closing plate 730 may be coupled to the sealing ring 740. In this case, communication between the outside and the compression chamber P is blocked so that the vapor refrigerant cannot flow into the compression chamber P.

[0443] In addition, the contacted opening and closing plate 730 may be spaced apart from the sealing ring 740. In this case, the vapor refrigerant introduced from the outside may flow into the vapor refrigerant passage 720 and the compression chamber P.

[0444] The sealing ring 740 may be formed of a material elastically deformable. In one embodiment, the sealing ring 740 may be formed of a rubber material.

[0445] Accordingly, the sealing ring 740 may be deformed to be inserted into the vapor refrigerant intake port 710 or the scroll communication hole 751. The inserted sealing ring 740 is restored in shape and may be stably coupled to the vapor refrigerant intake port 710 or the scroll communication hole 751.

[0446] The sealing ring 740 is formed in a ring shape. The outer diameter of the sealing ring 740 may be larger than the diameter of the first intake space 711 or a diameter of the first space 751a. In addition, the inner diameter of the sealing ring 740 may be formed smaller the diameter of the opening and closing plate 730.

[0447] In the passage where the vapor refrigerant is directed toward the compression chamber P from the outside, the sealing ring 740 is located at more upstream side than the opening and closing plate 730.

[0448] Specifically, in the embodiment illustrated in FIG. 7, the sealing ring 740 is located in the first space 751a of the scroll communication hole 751. In the above embodiment, the opening and closing plate 730 is located in the second space 751b which is relatively downstream side.

[0449] In the above embodiment, the sealing ring 740 may have a diameter larger than the diameter of the first space 751a of the scroll communication hole 751. The sealing ring 740 may be elastically restored after being inserted into the first space 751a in a compressed state. Accordingly, the sealing ring 740 can stably maintain the state inserted into the first space 751a.

[0450] In addition, in the embodiment illustrated in FIG. 8, the sealing ring 740 is located in the first intake space 711 of the vapor refrigerant intake port 710. In the above embodiment, the opening and closing plate 730 is located at the lower side of the sealing ring 740, which is relatively downstream side in the first intake space 711.

[0451] In the above embodiment, the sealing ring 740 may have a diameter larger than the diameter of the first intake space 711. The sealing ring 740 may be elastically restored after being inserted into the first intake space 711 in a compressed state. Accordingly, the sealing ring 740 can stably maintain the state inserted into the first intake space 711.

[0452] Fixing protrusions (not shown) may be provided to fix the sealing ring 740 to the first space 751a or the first intake space 711. The fixing protrusions (not shown) may be configured to prevent the sealing ring 740 from moving in a lengthwise direction of the scroll communication hole 751 and the vapor refrigerant intake port 710.

[0453] In one embodiment, the sealing ring 740 described above may be provided in plurality. That is, the sealing ring 740 may be provided in both the scroll communication hole 751 and the vapor refrigerant intake port 710.

[0454] In the above embodiment, conditions under which each opening and closing plate 730 is opened to form a passage through which the vapor refrigerant flows may be different. Accordingly, the passage through which the vapor refrigerant flows may be opened or closed step by step.

(5) Description of the Scroll Inner Passage 750

[0455] The scroll inner passage 750 is a passage through which the vapor refrigerant introduced into the vapor refrigerant intake port 710 and passed through the vapor refrigerant passage 720 flows inside the fixed scroll 610.

[0456] The scroll inner passage 750 communicates with the vapor refrigerant passage 720. The vapor refrigerant flew through the vapor refrigerant passage 720 may flow into the scroll inner passage 750.

[0457] The scroll inner passage 750 communicates with the compression chamber P. The vapor refrigerant introduced into the scroll inner passage 750 may flow into the compression chamber P.

[0458] The scroll inner passage 750 is a space extending inside the fixed end plate portion 611 by a predetermined distance. Specifically, the scroll inner passage 750 extends in a diametrical direction inside the fixed end plate portion 611.

[0459] In one embodiment, one end portion of the scroll inner passage 750 may be formed at a point spaced by a predetermined distance radially inner side from an upper outer circumferential surface of the fixed end plate portion 611. In addition, another end portion of the scroll inner passage 750 may be formed at a point spaced by a predetermined distance radially inner side from a lower outer circumferential surface of the fixed end plate portion 611.

[0460] In the above embodiment, the distance at which the another end portion of the scroll inner passage 750 is spaced apart may be determined to be longer than a distance at which the upper end portion is spaced apart.

[0461] That is, the distance between the rotational shaft coupling portion 613 and the upper end portion is longer than the distance between the rotational shaft coupling portion 613 and the lower end portion.

[0462] This is because the scroll communication hole 751 is formed at the upper end portion and communicates with the vapor refrigerant passage 720 formed through the wall portion 110 or the passage protrusion 110a.

[0463] The scroll inner passage 750 communicates with the scroll communication hole 751. Specifically, a radially outer end portion of the scroll inner passage 750, namely, the upper end portion in the illustrated embodiment, communicates with one end portion of the scroll communication hole 751 facing the orbiting scroll 620, namely, with the front end portion in the illustrated embodiment.

[0464] The scroll inner passage 750 may extend in a diametrical direction from the upper end portion, namely, the lower side in the illustrated embodiment. Accordingly, the scroll inner passage 750 extends in a direction away from the scroll communication hole 751.

[0465] The scroll inner passage 750 communicates with the scroll discharge port 760. Specifically, the scroll inner passage 750 extends up to one end portion of each of scroll discharge ports 760a, 760b facing the vapor refrigerant passage 720, namely, to the rear end portion in the illustrated embodiment.

[0466] Accordingly, the scroll inner passage 750 may communicate with the rear end portion of the each of the scroll discharge ports 760a, 760b.

[0467] The scroll communication hole 751 is formed at one end portion of the scroll inner passage 750, namely, at the upper end portion in the illustrated embodiment.

[0468] The scroll communication hole 751 is a passage through which the scroll inner passage 750 communicates with the vapor refrigerant passage 720. The scroll communication hole 751 is recessed by a predetermined distance from one side surface of the fixed end plate portion 611 facing the vapor refrigerant passage 720.

[0469] One side of the scroll communication hole 751, namely, the rear side in the illustrated embodiment communicates with the vapor refrigerant passage 720. Another side of the scroll communication hole 751, namely, the front side in the illustrated embodiment, communicates with the scroll inner passage 750.

[0470] In the illustrated embodiment, the scroll communication hole 751 is spaced radially inner side from the outer circumferential surface of the fixed end plate portion 611 by a predetermined distance. The scroll communication hole 751 may be formed at any position that can communicate with the vapor refrigerant passage 720.

[0471] The scroll communication hole 751 includes the first space 751a, the second space 751b, and the third space 751c.

[0472] The first space 751a is formed at one side of the scroll communication hole 751, namely, the rear side in the illustrated embodiment. The first space 751a communicates with the vapor refrigerant passage 720. In addition, the first space 751a communicates with the second space 751b.

[0473] The first space 751a is provided with the sealing ring 740. As described above, the diameter of the first space 751a may be smaller than the diameter of the sealing ring 740. Accordingly, the state in which the sealing ring 740 is inserted into the first space 751a may be stably maintained.

[0474] The diameter of the first space 751a is larger than diameters of the second space 751b and the third space 751c.

[0475] The second space 751b is formed in one side of the first space 751a facing the orbiting scroll 620, namely, in the front side in the illustrated embodiment. The second space 751b communicates with the first space 751a. In addition, the second space 751b communicates with the third space 751c.

[0476] The opening and closing plate 730 is provided in the second space 751b. As described above, the diameter of the second space 751b may be larger than the diameter of the opening and closing plate 730. Therefore, the vapor refrigerant may flow into a space between an inner wall forming the second space 751b and the opening and closing plate 730.

[0477] The diameter of the second space 751b is smaller the diameter of the first space 751a. In addition, the diameter of the second space 751b is larger than the diameter of the third space 751c.

[0478] The third space 751c is formed at one side of the second space 751b facing the orbiting scroll 620, namely, at the front side in the illustrated embodiment. The third space 751c communicates with the second space 751b. In addition, the third space 751c communicates with the scroll inner passage 750.

(6) Description of the Scroll Discharge Port 760

[0479] The scroll discharge port 760 is a passage through which the vapor refrigerant introduced into the scroll inner passage 750 is introduced into the compression chamber P. The scroll discharge port 760 communicates the scroll inner passage 750 with the compression chamber P.

[0480] The scroll discharge port 760 is formed through the fixed end plate portion 611. Specifically, the scroll discharge port 760 is formed through a portion where the compression chamber P is formed between the fixed wrap 612 and the orbiting wrap 622 on the fixed end plate portion 611.

[0481] The scroll discharge port 760 may be formed at any position that can be in communication with the compression chamber P. Further, the scroll discharge port 760 is preferably formed at a position not blocked by the orbiting wrap 622 even when the orbiting scroll 620 performs an orbiting motion.

[0482] In addition, the scroll discharge port 760 is spaced apart by a predetermined distance in a radially outer side from the discharge port 625.

[0483] The scroll discharge port 760 may be provided in plurality. In the illustrated embodiment, a total of two scroll discharge ports 760, that is, the first scroll discharge port 760a and the second scroll discharge port 760b, is formed. The number of scroll discharge ports 760 may be changed.

4. Description of the Refrigerant Sealing Part 800 provided in the Motor Operated Compressor 10 according to an Embodiment

[0484] The motor operated compressor 10 according to an embodiment of the present disclosure includes the refrigerant sealing part 800 to open or seal the intake port 120 or the vapor refrigerant intake port 710. The refrigerant sealing part 800 may be detachably coupled to the main housing 100.

[0485] As the refrigerant sealing part 800 is provided, the motor operated compressor 10 according to the embodiment of the present disclosure may easily block an inflow of the refrigerant and the vapor refrigerant, as needed.

[0486] Hereinafter, the refrigerant sealing part 800 according to the embodiment will be described in detail with reference to FIGS. 9 to 11. In the illustrated embodiment, the motor operated compressor 10 is provided with the intake port 120 and the vapor refrigerant intake port 710, separately.

[0487] In the illustrated embodiment, the refrigerant sealing part 800 includes a body portion 810, a refrigerant sealing member 820, a vapor refrigerant sealing member 830, and the coupling member 840.

[0488] The body portion 810 defines a body of the refrigerant sealing part 800. The refrigerant sealing member 820, the vapor refrigerant sealing member 830, and the coupling member 840 are coupled through the body portion 810.

[0489] The body portion 810 is detachably coupled to the boss portion 113 of the main housing 100. After the body portion 810 is brought into contact with the boss portion 113, the body portion 810 and the boss portion 113 may be coupled by the coupling member 840. In addition, the coupling member 840 is released and the body portion 810 may be separated from the boss portion 113.

[0490] In the illustrated embodiment, the body portion 810 has a three-dimensional shape extending in a height direction. A shape of the body portion 810 may be changed corresponding to a shape of the boss portion 113.

[0491] The body portion 810 includes a refrigerant sealing hole 811, a vapor refrigerant sealing hole 812, a coupling hole 813, and an intake port sealing hole 814.

[0492] The refrigerant sealing hole 811 is a space through which the refrigerant sealing member 820 is coupled. The refrigerant sealing hole 811 is formed through the body portion 810 in the height direction. A shape of the refrigerant sealing hole 811 may be determined corresponding to a shape of the refrigerant sealing member 820.

[0493] The vapor refrigerant sealing hole 812 is a space through which the vapor refrigerant sealing member 830 is coupled. The vapor refrigerant sealing hole 812 is formed through in a height direction of the body portion 810. A shape of the vapor refrigerant sealing hole

812 may be determined corresponding to a shape of the vapor refrigerant sealing member 830.

[0494] The refrigerant sealing hole 811 and the vapor refrigerant sealing hole 812 are adjacent to each other. Relative positions of the refrigerant sealing hole 811 and the vapor refrigerant sealing hole 812 are preferably determined according to relative positions of the intake port 120 and the vapor refrigerant intake port 710.

[0495] The coupling hole 813 is a space through which the coupling member 840 is coupled. The coupling hole 813 is formed through the body portion 810 in the height direction of the body portion 810. A shape of the coupling hole 813 may be determined corresponding to a shape of the coupling member 840.

[0496] In an embodiment in which the coupling member 840 is provided as a screw member, a thread may be formed on an inner surface of the body portion 810 surrounding the coupling hole 813. The coupling member 840 may be inserted into the coupling hole 813 and then screwed to the thread. Accordingly, a coupling between the body portion 810 and the boss portion 113 can be stably maintained.

[0497] The refrigerant sealing member 820 is inserted and coupled into the intake port 120 to close the intake port 120. When the refrigerant sealing member 820 is inserted into the intake port 120, the refrigerant is not introduced into the space inside the main housing 100.

[0498] In the illustrated embodiment, the refrigerant sealing member 820 is formed in a cylindrical shape which has a circular cross section and extends in one direction. The one direction in which the refrigerant sealing member 820 is extended may be defined as a "lengthwise direction" of the refrigerant sealing member 820.

[0499] A cross-sectional shape of the refrigerant sealing member 820 is preferably determined according to a cross-sectional shape of the intake port 120.

[0500] In one embodiment, a diameter of a cross section of the refrigerant sealing member 820 may be equal to a diameter of a cross section of the intake port 120.

[0501] The refrigerant sealing member 820 is coupled through the refrigerant sealing hole 811 of the body portion 810. A cross section of the refrigerant sealing hole 811 may be determined according to the cross section of the refrigerant sealing member 820.

[0502] In one embodiment, a diameter of the cross section of the refrigerant sealing hole 811 may be equal to a diameter of the cross section of the refrigerant sealing member 820.

[0503] The vapor refrigerant sealing member 830 is inserted and coupled into the vapor refrigerant intake port 710 to close the vapor refrigerant intake port 710. When the vapor refrigerant sealing member 830 is inserted into the vapor refrigerant intake port 710, the vapor refrigerant is not introduced into .

[0504] In the illustrated embodiment, the vapor refrigerant sealing member 830 is formed in a cylindrical shape which has a circular cross section and extends in one direction. The one direction in which the vapor refrigerant sealing member 830 is extended may be defined as a "lengthwise direction" of the vapor refrigerant sealing member 830.

[0505] A shape of the cross section of the vapor refrigerant sealing member 830 is preferably determined according to a shape of the cross section of the vapor refrigerant intake port 710.

[0506] In one embodiment, a diameter of the cross section of the vapor refrigerant intake port 710 may be equal to a diameter of the cross section of the vapor refrigerant sealing member 830.

[0507] As described above, in one embodiment, the vapor refrigerant intake port 710 may be divided into the first intake space 711 and the second intake space 712. In the above embodiment, a diameter of the cross section of the vapor refrigerant sealing member 830 may be determined to be equal to an inner diameter of the sealing ring 740 provided in the vapor refrigerant intake port 710.

[0508] The refrigerant sealing member 820 and the vapor refrigerant sealing member 830 may be selectively provided. That is, any one or more of the refrigerant sealing member 820 and the vapor refrigerant sealing member 830 may be provided to seal any one of the intake port 120 and the vapor refrigerant intake port 710, respectively.

[0509] The coupling member 840 couples the body portion 810 to the main housing 100. As the coupling member 840 couples the body portion 810 to the boss portion 113, the refrigerant sealing part 800 may stably seal the intake port 120 or the vapor refrigerant intake port 710.

[0510] The coupling member 840 may be provided in any form capable of coupling or releasing two or more members. In one embodiment, the coupling member 840 may be configured as a screw member.

[0511] The coupling member 840 is coupled through the coupling hole 813 of the body portion 810. In an embodiment in which the coupling member 840 is provided as a screw member, a thread may be formed on an inner surface surrounding the coupling hole 813.

[0512] The electric member 840 is inserted and coupled into the coupling member coupling hole 121. In an embodiment in which the coupling member 840 is provided as a screw member, a thread may be formed on an inner surface surrounding the coupling member coupling hole 121.

[0513] Accordingly, the coupling member 840 may be sequentially screwed to the body portion 810 and the boss portion 113.

5. Description of the Vapor Refrigerant Passage Part 700 and the Refrigerant Sealing Part 800 provided in the Motor Operated Compressor 10 according to another Embodiment

(1) Description of the Vapor Refrigerant Passage Part 700 provided in the Motor Operated Compressor 10 according to another Embodiment

[0514] Referring to FIGS. 12 and 13, a vapor refrigerant passage part 700 according to another embodiment of the present disclosure is illustrated.

[0515] In the present embodiment, the vapor refrigerant intake port 710 is integrated with the intake port 120. That is, the vapor refrigerant intake port 710 is not provided separately, and the refrigerant and the vapor refrigerant may be introduced into the main housing 100 through the intake port 120.

[0516] Compared with the above-described embodiment, the present embodiment has a difference in that the vapor refrigerant intake port 710 is not provided separately.

[0517] In addition, the present embodiment is different in that the opening and closing plate 730 and the sealing ring 740 is provided in a scroll communication hole 751.

[0518] Except for the differences, the vapor refrigerant passage part 700 according to the present embodiment is the same as the vapor refrigerant passage part 700 according to the above-described embodiment.

[0519] In the following description of the present embodiment, the intake port 120 and the vapor refrigerant intake port 710 will be collectively described as the "intake port 120".

[0520] The intake port 120 is a path through which the refrigerant of the vapor refrigerant is introduced into the main housing 100. The intake port 120 may be formed through the boss portion 113 and the wall portion 110.

[0521] As described above, the refrigerant is introduced into the inner space of the main housing 100. In addition, the vapor refrigerant is introduced into the vapor refrigerant passage 720 formed through the passage protrusion 110a. Therefore, the refrigerant and the vapor refrigerant introduced through the intake port 120 must flow in paths different from each other.

[0522] To this end, the intake port 120 may be provided with a bypass valve (not shown).

[0523] The bypass valve (not shown) may guide the refrigerant introduced through the intake port 120 to the inside of the main housing 100. In addition, when the vapor refrigerant is introduced through the intake port 120, the bypass valve may be configured to guide the vapor refrigerant to the vapor refrigerant passage 720.

[0524] In one embodiment, the bypass valve (not shown) may be provided in a form of a gate valve or a butterfly valve.

[0525] Alternatively, a partition member (not shown) may be provided in the intake port 120. The partition member (not shown) may partition a space inside the intake port 120 in a perpendicular direction along a lengthwise direction of the intake port 120.

[0526] The refrigerant may be introduced into any one of the spaces partitioned by the partition member (not shown). In addition, the vapor refrigerant may be introduced into another one of the spaces partitioned by the partition member (not shown).

[0527] By the above configuration, the refrigerant introduced through the intake port 120 may be introduced into the compression chamber P through the space inside the main housing 100. In addition, the vapor refrigerant introduced through the intake port 120 may flow into the compression chamber P through the vapor refrigerant passage 720.

[0528] Referring to FIG. 13, an embodiment in which the opening and closing plate 730 and the sealing ring 740 are provided in the scroll communication hole 751 is illustrated.

[0529] As described above, the intake port 120 may be provided with a member to switch passages of the refrigerant and the vapor refrigerant, such as the bypass valve (not shown) or the partition member (not shown).

[0530] Thus, in order to minimize complexity of the structure, the opening and closing plate 730 and the sealing ring 740 are preferably provided in the scroll communication hole 751.

[0531] Since the opening and closing plate 730 and the sealing ring 740 have been described above, a redundant description thereof will be omitted.

[0532] In the present embodiment, the vapor refrigerant intake port 710 through which the vapor refrigerant is introduced is integrated into the intake port 120. Accordingly, even when the vapor injection method is applied to the motor operated compressor 10, change of the structure can be minimized.

(2) Description of the Refrigerant Sealing Part 800 of the Motor Operated Compressor 10 according to another Embodiment

[0533] FIGS. 14 to 16 illustrate the refrigerant sealing part 800 according to an embodiment in which a single intake hole 120 and a single vapor refrigerant intake port 710 are provided.

[0534] Compared to the above-described embodiment, the present embodiment has a difference in that a single intake port sealing hole 814, instead of the refrigerant sealing hole 811 and the vapor refrigerant sealing hole 812, is formed through the body portion 810.

[0535] In addition, the present embodiment has a difference in that a single intake port sealing member 850, instead of the refrigerant sealing member 820 and the vapor refrigerant sealing member 830, is provided.

[0536] Except for the above differences, the body portion 810 and the coupling member 840 according to the present embodiment are the same as the refrigerant sealing part 800 according to the above-described embodiment.

[0537] Therefore, the refrigerant sealing part 800 according to the present embodiment will be described below based on the intake port sealing hole 814 and the intake port sealing member 850 in order to exclude redundant descriptions.

[0538] The body portion 810 includes the intake port sealing hole 814.

[0539] The intake port sealing hole 814 is a space through which the intake port sealing member 850 is coupled. The intake port sealing hole 814 is formed through the body portion 810 in a height direction. A shape of the intake port sealing member 814 may be determined corresponding to a shape of the intake port sealing member 850.

[0540] The intake port sealing member 850 is inserted and coupled into the intake port 120 to close the intake port 120. When the intake port sealing member 850 is inserted into the intake port 120, the refrigerant and the vapor refrigerant are not introduced into the space inside the main housing 100 and the vapor refrigerant passage 720.

[0541] In the illustrated embodiment, the intake port sealing member 850 is formed in a cylindrical shape which has a circular cross section and extends in one direction. The one direction in which the intake port sealing member 850 is extended may be defined as a "lengthwise direction" of the intake port sealing member 850.

[0542] A cross-sectional shape of the intake port sealing member 850 is preferably determined according to a cross-sectional shape of the intake port 120.

[0543] In one embodiment, a diameter of the cross section of the intake port sealing member 850 may be equal to a diameter of the cross section of the intake port 120.

[0544] The intake port sealing member 850 is coupled through the intake port sealing hole 814 of the body portion 810. A cross section of the intake port sealing hole 814 may be determined according to the cross section of the intake port sealing member 850.

[0545] In one embodiment, a diameter of the cross section of the intake port sealing hole 814 may be equal to the diameter of the cross section of the intake port sealing member 850.

[0546] In this embodiment, introductions of the refrigerant and the vapor refrigerant may be blocked by the single intake port sealing member 850.

6. Description of Motor Operated Compressor 10 in accordance with another Embodiment

[0547] Referring to FIGS. 17 and 18, a motor operated compressor 10 according to another embodiment of the present disclosure includes a fixed frame portion 900.

[0548] Compared with the above-described embodiments, the motor operated compressor 10 of the present embodiment has the following differences.

[0549] First, the rotational shaft part 500 is not coupled through the fixed scroll 610, but coupled through a frame 930 which is additionally provided.

[0550] In addition, the frame 930 through which the rotational shaft part 500 is coupled is located adjacent to the motor part 400. An orbiting scroll 920 is located adjacent to the frame 930, and a fixed scroll 910 is located adjacent to the rear housing 200.

[0551] That is, positions in a back-and-forth direction of the fixed scroll 910 and the orbiting scroll 920 are changed.

[0552] Except for the differences, a structure and a function of each component of the motor operated compressor 10 according to the present embodiment are similar to a structure and a function of each component of the motor operated compressor 10 according to the above-described embodiments.

[0553] The differences are due to the differences between the compression part 600 according to the above-described embodiments and the fixed frame portion 900 according to the present embodiment.

[0554] Thus, the following description will focus on the fixed frame portion 900, but the same or corresponding contents as those of the compression part 600 according to the embodiments will be omitted.

[0555] The fixed frame portion 900 compresses the refrigerant and the vapor refrigerant introduced into the motor operated compressor 10.

[0556] The fixed frame portion 900 includes the fixed scroll 910, the orbiting scroll 920, and a coupling portion 930.

[0557] The fixed scroll 910 is not rotated regardless of an operation of the motor part 400. Accordingly, the orbiting scroll 920 may perform an orbiting motion relative to the fixed scroll 910.

[0558] The fixed scroll 910 is located adjacent to the rear housing 200. In the illustrated embodiment, the fixed scroll 910 is located at a frontmost side of the fixed frame portion 900.

[0559] The fixed scroll 910 includes a fixed end plate portion 911, a fixed wrap 912, a frame coupling portion 913, and a discharge port 914.

[0560] The fixed end plate portion 911 defines a body of the fixed scroll 910. In the illustrated embodiment, the fixed end plate portion 911 is provided in a disc shape.

[0561] The scroll inner passage 750 is formed inside the fixed end plate portion 911. The structure and function of the scroll inner passage 750 are as described above.

[0562] The scroll discharge port 760 is formed through the fixed end plate portion 911. The structure and function of the scroll discharge port 760 are as described above.

[0563] The fixed wrap 912 protrudes from one side of the fixed end plate portion 911 facing the orbiting scroll 920 by a predetermined distance.

[0564] The fixed wrap 912 is engaged with an orbiting wrap 922 while forming a predetermined space. When the orbiting scroll 920 is rotated, the process of increasing or decreasing the volume of the predetermined space is repeated to compress the introduced refrigerant and the vapor refrigerant. Therefore, the predetermined space may be defined as the compression chamber P.

[0565] The frame coupling portion 913 is a portion where the fixed scroll 910 is coupled to the main housing 100 and the frame 930. The frame coupling portion 913 protrudes from a radially outer side of a center of the fixed end plate portion 911 toward the frame 930 by a predetermined distance. One end portion of the frame coupling portion 913 facing the frame 930 is coupled to the wall portion 110 and the frame 930.

[0566] On one side of the frame coupling portion 913 facing the frame 930, the scroll communication hole 751 is recessed by a predetermined distance. The structure and function of the scroll communication hole 751 are as described above.

[0567] The discharge port 914 is a passage through which the refrigerant and the vapor refrigerant compressed in the compression chamber P flow toward a discharge chamber (not shown). The discharge port 914 communicates the compression chamber P and the discharge chamber (not shown).

[0568] The discharge port 914 is formed through the fixed end plate portion 911. The discharge port 914 may be opened or closed by a discharge valve (not shown).

[0569] The orbiting scroll 920 performs an orbiting motion relative to the fixed scroll 910, in response to the rotation of the motor part 400. By the rotation of the orbiting scroll 920, the volume of the compression chamber P is changed and the refrigerant and the vapor refrigerant can be compressed.

[0570] The orbiting scroll 920 is disposed between the fixed scroll 910 and the frame 930.

[0571] The orbiting scroll 920 includes an orbiting end plate portion 921 and the orbiting wrap 922.

[0572] The orbiting end plate portion 921 defines a body of the orbiting scroll 920. In the illustrated embodiment, the orbiting end plate portion 921 is provided in a disc shape.

[0573] The orbiting wrap 922 protrudes from one side of the orbiting end plate portion 921 facing the fixed scroll 910 by a predetermined distance.

[0574] The orbiting wrap 922 is engaged with the fixed wrap 912 while forming a predetermined space. The predetermined space may be defined as the compression chamber P.

[0575] The frame 930 supports the orbiting scroll 920 to perform an orbiting motion. Also, the rotational shaft part 500 is rotatably coupled through the frame 930.

[0576] The frame 930 is located adjacent to the motor part 400. In the illustrated embodiment, the frame 930 is located at a rearmost side of the fixed frame portion 900.

[0577] The frame 930 is coupled with the fixed scroll 910. Specifically, a radially outer side portion of the frame 930 is coupled with the frame coupling portion 913. The frame 930 and the fixed scroll 910 are not rotated regardless of an orbiting motion of the orbiting scroll 920.

[0578] In this embodiment, the fixed scroll 910 is located closer to the rear housing 200 than to the orbiting scroll 920. Also, in the present embodiment, the vapor refrigerant passage 720 through which the vapor refrigerant flows is formed in the wall portion 110 of the main housing 100 or in the passage protrusion 110a.

[0579] In addition, the scroll inner passage 750 is formed in the fixed scroll 910 to communicate with the vapor refrigerant passage 720. Accordingly, the introduced vapor refrigerant may be introduced into the compression chamber P through the scroll inner passage 750 and compressed therein, and then may flow into the discharge chamber (not shown) through the scroll discharge port 760.

[0580] In addition, although not shown, an embodiment in which the vapor refrigerant intake port 710 is integrated into the intake port 120 may be considered. In the above embodiment, the intake port 120 may be provided with the bypass valve (not shown) or the partition member (not shown) as described above.

7. Description of a process in which the Vapor Refrigerant Flows inside the Motor Operated Compressor 10 according to an Embodiment

[0581] The motor operated compressor 10 according to an embodiment of the present disclosure may form a passage of the vapor refrigerant without adding a separate member to the inner space of the main housing 100. The introduced vapor refrigerant may be introduced into the compression chamber P and compressed therein.

[0582] Hereinafter, a process in which the vapor refrigerant flows inside the motor operated compressor 10 according to an embodiment will be described in detail with reference to FIGS. 19 to 22.

(1) Description of the process in which the Vapor Refrigerant Flows inside the Motor Operated Compressor 10 according to an Embodiment

[0583] Referring to FIG. 19, an embodiment in which the vapor refrigerant intake port 710 is provided separately from the intake port 120 is illustrated. In the illustrated embodiment, the opening and closing plate 730 and the sealing ring 740 are provided in the scroll communication hole 751.

[0584] When the motor operated compressor 10 is operated, power and control signals are applied to the motor part 400. When the motor part 400 is rotated according to the applied power and control signals, the orbiting scroll 620 performs an orbiting motion relative to the fixed scroll 610 and a compression process of the refrigerant and the vapor refrigerant proceeds.

[0585] The refrigerant is introduced into the main housing 100 through the intake port 120. The introduced refrigerant is introduced into the compression chamber P through the refrigerant communication portion 616. The refrigerant introduced into the compression chamber P is compressed by the orbiting motion of the orbiting scroll 620 and then flows to the discharge chamber S3.

[0586] The vapor refrigerant is introduced into the vapor refrigerant passage 720 through the vapor refrigerant intake port 710.

[0587] Referring to FIG. 19A, the opening and closing plate 730 is brought into contact with the sealing ring 740 to block communication between the vapor refrigerant passage 720 and the scroll refrigerant passage 750. Therefore, the vapor refrigerant introduced through the vapor refrigerant intake port 710 cannot enter the scroll inner passage 750 and remains in the vapor refrigerant passage 720.

[0588] When a flow rate of the vapor refrigerant flowing into the vapor refrigerant passage 720 is increased, a pressure inside the vapor refrigerant passage 720 is increased. As a result, a difference between the pressure inside the vapor refrigerant passage 720 and a pressure inside the scroll inner passage 750 exceeds a predetermined value.

[0589] In this state, the opening and closing plate 730 is moved away from the sealing ring 740, so that the vapor refrigerant passage 720 and the scroll inner passage 750 communicate with each other.

[0590] Referring to FIG. 19B, the opening and closing plate 730 is spaced apart from the sealing ring 740, so that the vapor refrigerant passage 720 and the scroll inner passage 750 communicate with each other.

[0591] The vapor refrigerant passed through the vapor refrigerant passage 720 passes through a space formed between the outer circumference of the opening and closing plate 730 and an inner surface surrounding the second space 751b of the scroll communication hole 751. The scroll communication hole 751 communicates with the scroll inner passage 750. Accordingly, the vapor refrigerant passed through the scroll communication hole 751 flows to the scroll inner passage 750.

[0592] The scroll inner passage 750 communicates with the scroll discharge port 760. Accordingly, the vapor refrigerant flowed in the scroll inner passage 750 passes through the scroll discharge port 760 and is introduced into the compression chamber P.

[0593] The refrigerant introduced into the compression chamber P is compressed by the orbiting motion of the orbiting scroll 620 and then flows to the discharge chamber S3.

[0594] Referring to FIG. 20, an embodiment in which the vapor refrigerant intake port 710 is provided separately from the intake port 120 is illustrated. In the illustrated embodiment, the opening and closing plate 730 and the sealing ring 740 are provided in the vapor refrigerant intake port 710.

[0595] A process in which the refrigerant is introduced into the space inside the main housing 100 through the intake port 120 and then compressed is as described above.

[0596] FIG. 20A illustrates a state in which the opening and closing plate 730 is brought into contact with the sealing ring 740, so that the vapor refrigerant intake port 710 is closed. That is, communication between the outside of the main housing 100 and the vapor refrigerant intake port 710 is blocked. Therefore, the vapor refrigerant cannot be introduced through the vapor refrigerant intake port 710.

[0597] When a pressure applied by the external vapor refrigerant to the vapor refrigerant intake port 710 is increased, a difference between a pressure outside the vapor refrigerant intake port 710 and a pressure inside the vapor refrigerant intake port 710 exceeds a predetermined value.

[0598] In this state, the opening and closing plate 730 is moved away from the sealing ring 740 to communicate an outside of the vapor refrigerant intake port 710 with an inside of the vapor refrigerant intake port 710.

[0599] Referring to FIG. 20B, the opening and closing plate 730 is spaced apart from the sealing ring 740, so that the inside and the outside of the vapor refrigerant intake port 710 communicate with each other. Accordingly, the vapor refrigerant can pass through the vapor refrigerant intake port 710.

[0600] The vapor refrigerant passed through the vapor refrigerant intake port 710 flows toward the vapor refrigerant passage 720. In the illustrated embodiment, a separate opening and closing plate 730 and a separate sealing ring 740 are not provided between the vapor refrigerant passage 720 and the scroll inner passage 750.

[0601] Therefore, the vapor refrigerant introduced in the vapor refrigerant passage 720 may be introduced into the compression chamber P through the scroll inner passage 750 and the scroll discharge port 760.

[0602] As described above, the opening and closing plate 730 and the sealing ring 740 may be provided in plurality, and may be provided in the vapor refrigerant intake port 710 and the scroll communication hole 751, respectively.

[0603] In the above embodiment, it may be configured such that any one of the opening and closing plates 730 provided in the vapor refrigerant intake port 710 and the opening and closing plate 730 provided in the scroll communication hole 751 is moved first.

[0604] That is, a predetermined value at which the opening and closing plate 730 provided in the vapor refrigerant intake port 710 is moved may be set to be greater than a predetermined value at which the opening and closing plate 730 provided in the scroll communication hole 751 is moved.

[0605] With the configuration, each opening and closing plate 730 may be operated in multiple stages according to differences in pressure among the vapor refrigerant intake port 710, the vapor refrigerant passage 720, and the scroll inner passage 750.

[0606] As a result, the amount and condition in which the vapor refrigerant is introduced can be controlled more accurately.

(2) Description of a process in which the Vapor Refrigerant Flows inside the Motor Operated Compressor 10 according to another Embodiment

[0607] Referring to FIG. 21, an embodiment in which the vapor refrigerant intake port 710 is integrated with the intake port 120 is illustrated. In the illustrated embodiment, the opening and closing plate 730 and the sealing ring 740 are provided in the scroll communication hole 751.

[0608] In addition, in the illustrated embodiment, the opening and closing plate 730 is moved, so that the vapor refrigerant passage 720 and the scroll inner passage 750 communicate with each other. Since the movement process of the opening and closing plate 730 has been described above, the following description will focus on a flow of the refrigerant and the vapor refrigerant.

[0609] The refrigerant is introduced into the main housing 100 through the intake port 120. The introduced refrigerant is introduced into the compression chamber P through the refrigerant communication portion 616. The refrigerant introduced into the compression chamber P is compressed by the orbiting motion of the orbiting scroll 620 and then flows to the discharge chamber S3.

[0610] The vapor refrigerant is introduced into the vapor refrigerant passage 720 through the vapor refrigerant intake port 710. The vapor refrigerant introduced into the vapor refrigerant passage 720 is introduced into the compression chamber P through the scroll inner passage 750 and the scroll discharge port 760. The refrigerant introduced into the compression chamber P is compressed by the orbiting motion of the orbiting scroll 620 and then flows to the discharge chamber S3.

[0611] As described above, a bypass valve (not shown) or a partition member (not shown) may be provided to separate a path through which the refrigerant and the vapor refrigerant are introduced from the outside.

(3) Description of the process in which the Vapor Refrigerant Flows inside the Motor Operated Compressor 10 according to another Embodiment

[0612] Referring to FIG. 22, an embodiment in which the fixed frame portion 900 is provided instead of the compression part 600 is illustrated. In the illustrated embodiment, the vapor refrigerant intake port 710 is provided separately from the intake port 120. In addition, the opening and closing plate 730 and the sealing ring 740 are provided in the scroll communication hole 751.

[0613] In addition, in the illustrated embodiment, the opening and closing plate 730 is moved, so that the vapor refrigerant passage 720 and the scroll inner passage 750 communicate with each other. Since the movement process of the opening and closing plate 730 has been described above, the following description will focus on the flow of the refrigerant and the vapor refrigerant.

[0614] The refrigerant is introduced into the main housing 100 through the intake port 120. The introduced refrigerant is introduced into the compression chamber P through the refrigerant communication portion 616. The refrigerant introduced into the compression chamber P is compressed by the orbiting motion of the orbiting scroll 920 and then flows to the discharge chamber S3.

[0615] The vapor refrigerant is introduced into the vapor refrigerant passage 720 through the vapor refrigerant intake port 710. The vapor refrigerant introduced into the vapor refrigerant passage 720 is introduced into the compression chamber P through the scroll inner passage 750 and the scroll discharge port 760. The refrigerant introduced into the compression chamber P is compressed by the orbiting motion of the orbiting scroll 920 and then flows to the discharge chamber S3.

[0616] In the illustrated embodiment, the opening and closing plate 730 and the sealing ring 740 are provided in the scroll communication hole 751. Alternatively, the opening and closing plate 730 and the sealing ring 740 may be provided in the vapor refrigerant intake port 710.

[0617] In addition, as described above, the opening and closing plate 730 and the sealing ring 740 may be provided in each of the scroll communication hole 751 and the vapor refrigerant intake port 710.

8. Description of Effects of the Motor Operated Compressor 10 including the Vapor Refrigerant Passage Part 700 according to an Embodiment

[0618] The motor operated compressor 10 according to the embodiment of the present disclosure includes the vapor refrigerant passage part 700. A vapor refrigerant in a high-pressure gaseous state condensed while passing through the condenser is introduced into the vapor refrigerant passage part 700. The introduced vapor refrigerant flows into the compression chamber P through the vapor refrigerant passage part 700.

[0619] Therefore, both the refrigerant and the vapor refrigerant introduced through the intake port 120 may be compressed in the compression chamber P. Accordingly, a total amount of the refrigerant to be compressed can be increased to improve the compression efficiency.

[0620] In addition, the vapor refrigerant being introduced is at a high pressure. Therefore, a refrigerant mixed with the vapor refrigerant is at a higher pressure than a refrigerant not mixed with the vapor refrigerant.

[0621] This reduces a power required to compress the refrigerant up to a desired pressure, compared with a case of compressing only the refrigerant. As a result, a power consumption of the motor operated compressor 10 is reduced, so that the compression efficiency can be improved.

[0622] The vapor refrigerant passage 720 through which the introduced vapor refrigerant flows is formed in the wall portion 110 of the main housing 100. Or, the vapor refrigerant passage 720 may be formed in the passage protrusion 110a protruding from the inner circumferential surface 112 of the wall portion 110.

[0623] Accordingly, a separate member to form a path through which the introduced vapor refrigerant flows into the compression chamber P does not need to be provided in the inner space of the main housing 100. Therefore, the vapor refrigerant passage 720 may be formed in a simple manner.

[0624] In addition, the vapor refrigerant passage 720 through which the introduced vapor refrigerant flows is separated from the inner space of the main housing 100 through which the refrigerant flows. Accordingly, the vapor refrigerant is not introduced into the inner space of the main housing 100 through which the refrigerant flows. Therefore, a member to separate a passage of the refrigerant and a passage of the vapor refrigerant does not need to be provided in the inner space of the main housing 100.

[0625] Therefore, it is not necessary to increase the volume of the main housing 100 in order to apply the vapor injection method. As a result, an overall size of the motor operated compressor 10 can be reduced.

[0626] The vapor refrigerant intake port 710 through which the vapor refrigerant is introduced is located adjacent to the intake port 120 through which the refrigerant is introduced. The vapor refrigerant introduced through the vapor refrigerant intake port 710 may be introduced into the compression chamber P through the vapor refrigerant passage 720 and the scroll inner passage 750.

[0627] Therefore, paths in which the refrigerant and the vapor refrigerant are introduced into the main housing 100 may be formed adjacent to each other. Accordingly, an arrangement structure of external piping to supply the refrigerant and the vapor refrigerant to the motor operated compressor 10 can be simplified.

[0628] Furthermore, no separate port or the like passing through the main housing 100 is required near the compression chamber P. That is, it is not necessary to dispose the vapor refrigerant intake port 710 adjacent to the exhaust port 210 through which the refrigerant compressed at high-pressure is discharged.

[0629] Therefore, the external piping to apply the vapor injection method is not affected by the high-pressure refrigerant being discharged. Accordingly, compression reliability of the motor operated compressor 10 can be improved.

[0630] In addition, a through hole through which an external vapor refrigerant is introduced does not need to be formed near the compression chamber P where the high-pressure compressed refrigerant flows. Therefore, a structural rigidity of the main housing 100 in which the compression chamber P is located can be maintained.

[0631] The vapor refrigerant intake port 710 through which the vapor refrigerant is introduced may be provided with the opening and closing plate 730 and the sealing ring 740. In addition, the scroll communication hole 751 through which the vapor refrigerant is introduced may also be provided with the opening and closing plate 730 and the sealing ring 740.

[0632] Each of the opening and closing plate 730 and the sealing ring 740 may limit a direction of the flow of the vapor refrigerant to a direction from the vapor refrigerant intake port 710 toward the compression chamber P. Each opening and closing plate 730 may be operated by a difference in pressure of each space partitioned by the opening and closing plate 730 or an electrical signal.

[0633] Therefore, a backward flow of the vapor refrigerant can be prevented by the opening and closing plate 730 and the sealing ring 740. Accordingly, the direction of the flow of the vapor refrigerant can be easily controlled without a complicated structure.

[0634] The intake port 120 and the vapor refrigerant intake port 710 may be sealed by the refrigerant sealing part 800. The refrigerant sealing part 800 includes the refrigerant sealing member 820 sealing the intake port 120 and the vapor refrigerant sealing member 830 sealing the vapor refrigerant intake port 710.

[0635] The intake port 120 and the vapor refrigerant intake port 710 may be closed, only by inserting and coupling the refrigerant sealing member 820 and the vapor refrigerant sealing member 830 into the intake port 120 and the vapor refrigerant intake port 710.

[0636] On the contrary, the intake port 120 and the vapor refrigerant intake port 710 can be opened, only by removing the refrigerant sealing member 820 and the vapor refrigerant sealing member 830 from the intake port 120 and the vapor refrigerant intake port 710.

[0637] Therefore, the intake port 120 and the vapor refrigerant intake port 710 can be easily opened and closed.

[0638] In one embodiment, the vapor refrigerant intake port 710 may be integrated into the intake port 120. Both the refrigerant and the vapor refrigerant may be introduced into the inner space of the main housing 100 and the vapor refrigerant passage 720 through the intake port 120.

[0639] Therefore, passages through which the refrigerant and the vapor refrigerant are introduced in can be unified. Accordingly, the external piping structure to receive the refrigerant and the vapor refrigerant can be simplified.

[0640] The vapor refrigerant passage part 700 and the refrigerant sealing part 800 described above may be provided in a compressor that compresses the refrigerant to different pressures, respectively.

[0641] That is, the vapor refrigerant passage part 700 and the refrigerant sealing part 800 may be provided in the high-pressure compressor in which the shaft 510 is coupled through the fixed scroll 610. In addition, the vapor refrigerant passage part 700 and the refrigerant sealing part 800 may be provided in the low-pressure compressor in which the shaft 510 is coupled through the frame 930.

[0642] Therefore, the vapor injection method can be applied to both the low-pressure compressor and the high-pressure compressor.

[0643] Although the foregoing description has been given with reference to the preferred embodiment, it will be understood that those skilled in the art will be able to variously modify and change the present disclosure without departing from the scope of the disclosure described in the claims below.

Claims

1. A motor operated compressor comprising:

a main housing (100) extending in one direction, defining a space therein, and provided with a wall portion (110) surrounding the space;
a fixed scroll (610) having one side thereof coupled to one end portion of the main housing (100) in the one direction, and provided with a scroll inner passage (750) as a space extending by a predetermined distance therein; and
an orbiting scroll (620) located at another side of the fixed scroll (610) opposite to the one side of the fixed scroll, being coupled to the fixed scroll (610) while defining a predetermined space therebetween, and configured to compress a refrigerant introduced into the predetermined space by performing an orbiting motion relative to the fixed scroll (610),
wherein the wall portion (110) is provided therein with:

a vapor refrigerant passage (720) running along the wall portion in the one direction a predetermined distance from one end portion of the wall portion (110) facing the fixed scroll (610), so that one side thereof in the one direction communicates with the scroll inner passage (750); and
a vapor refrigerant intake port (710) provided at one side of the wall portion (110) corresponding to an end portion of another side of the vapor refrigerant passage (720) opposite to the one side in the one direction, so as to communicate with outside of the main housing (100), the vapor refrigerant intake port (710) communicating with the end portion of the another side of the vapor refrigerant passage (720).

2. The compressor of claim 1, wherein the fixed scroll (610) comprises a fixed end plate portion (611) in a circular plate shape, being coupled to the wall portion (110) on an outer circumferential surface of a radially outer side thereof,
wherein the fixed end plate portion (611) is provided with a scroll communication hole (751) located at a radially inner side of the outer circumferential surface, and recessed by a predetermined distance into one surface thereof facing the vapor refrigerant passage (720) to communicate with each of the vapor refrigerant passage (720) and the scroll inner passage (750), and
wherein the scroll inner passage (750) extends in a direction away from one end portion of the scroll communication hole (751) facing the orbiting scroll (620).

3. The compressor of claim 2, wherein the fixed end plate portion (611) is provided with a first scroll discharge port (760a) located at a radially inner side of the scroll communication hole (751), extending a predetermined distance to another surface of the fixed end plate portion (611) facing the orbiting scroll (620) to communicate with the predetermined space, wherein the scroll inner passage (750) extends up to one end portion of the first scroll discharge port (760a) facing the vapor refrigerant passage (720) to communicate with the first scroll discharge port (760a).

4. The compressor of claim 3, wherein the fixed end plate portion (611) is provided with a second scroll discharge port (760b) spaced apart from the first scroll discharge port (760a) in a direction away from the scroll communication hole (751) by a predetermined distance, extending a predetermined distance to the another surface of the fixed end plate portion (611) to communicate with the predetermined space, wherein the scroll inner passage (750) extends up to one end portion of the second scroll discharge port (760b) facing the vapor refrigerant passage (720) to communicate with the second scroll discharge port (760b).

5. The compressor of claim 4, wherein the fixed end plate portion (611) is provided with a fixed wrap (612) protruding from the another surface by a predetermined distance to be engaged with an orbiting wrap (622) of the orbiting scroll (620) while forming the predetermined space,
wherein the fixed wrap (612) extends in a form of an involute curve from one end portion of a radially outer side thereof toward another end portion of a radially inner side, and
wherein the first scroll discharge port (760a) and the second scroll discharge port (760b) are located at the radially inner side of the one end portion of the fixed wrap (612) and the radially outer side of the another end portion of the fixed wrap (612).

6. The compressor of any one of claims 2 to 5, wherein the scroll communication hole (751) comprises:

a first space (751a) communicating with the vapor refrigerant passage (720); and
a second space (751b) communicating with the first space (751a) and the scroll inner passage (750), and having a smaller diameter than that of the first space (751a),
wherein the first space (751a) is provided with a sealing ring (740) having an inner diameter smaller than that of the second space (751b),
wherein the second space (751b) is provided with an opening and closing plate (730) having a diameter smaller than the diameter of the sec-

ond space (751b) and greater than the inner diameter of the sealing ring (740), and
wherein the opening and closing plate (730) is adapted to move in a direction toward or away from the sealing ring (740) to block or allow communication between the scroll communication hole (751) and the vapor refrigerant passage (720).

7. The compressor of claim 6, wherein the opening and closing plate (730) is adapted to move away from the sealing ring (740) when a difference between a pressure inside the vapor refrigerant passage (720) and a pressure inside the scroll inner passage (750) exceeds a predetermined value, to allow the communication between the scroll communication hole (751) and the vapor refrigerant passage (720).

8. The compressor of any one of claims 2 to 7, wherein the vapor refrigerant intake port (710) comprises:

a first intake space (711) communicating with the outside of the main housing (100); and
a second intake space (712) communicating with the first intake space (711) and the vapor refrigerant passage (720), and having a smaller diameter than that of the first intake space (711),
wherein the first intake space (711) comprises:

a sealing ring (740) located at one side of the first intake space (711) facing the outside; and
an opening and closing plate (730) having a diameter larger than those of the sealing ring (740) and the second intake space (712), and smaller than that of the first intake space (711), and

wherein the opening and closing plate (730) is adapted to move in a direction toward or away from the sealing ring (740) to block or allow communication between the vapor refrigerant intake port (710) and the vapor refrigerant passage (720).

9. The compressor of any one of claims 1 to 8, wherein the wall portion (110) is provided with an intake port (120) communicating the space inside the main housing (100) with an outside of the main housing (100), and
wherein the intake port (120) is located adjacent to the vapor refrigerant intake port (710).

10. The compressor of claim 9, further comprising a refrigerant sealing part (800) detachably coupled to the main housing (100), and configured to open or seal the intake port (120) and the vapor refrigerant intake port (710),
wherein the refrigerant sealing part (800) comprises:

a body portion (810) for being coupled to the main housing (100);
a refrigerant sealing member (820) coupled through the body portion (810), extending in one direction, for being inserted and coupled into the intake port (120); and
a vapor refrigerant sealing member (830) coupled through the body portion (810), extending in the one direction, for being inserted and coupled into the vapor refrigerant intake port (710).

FIG. 1

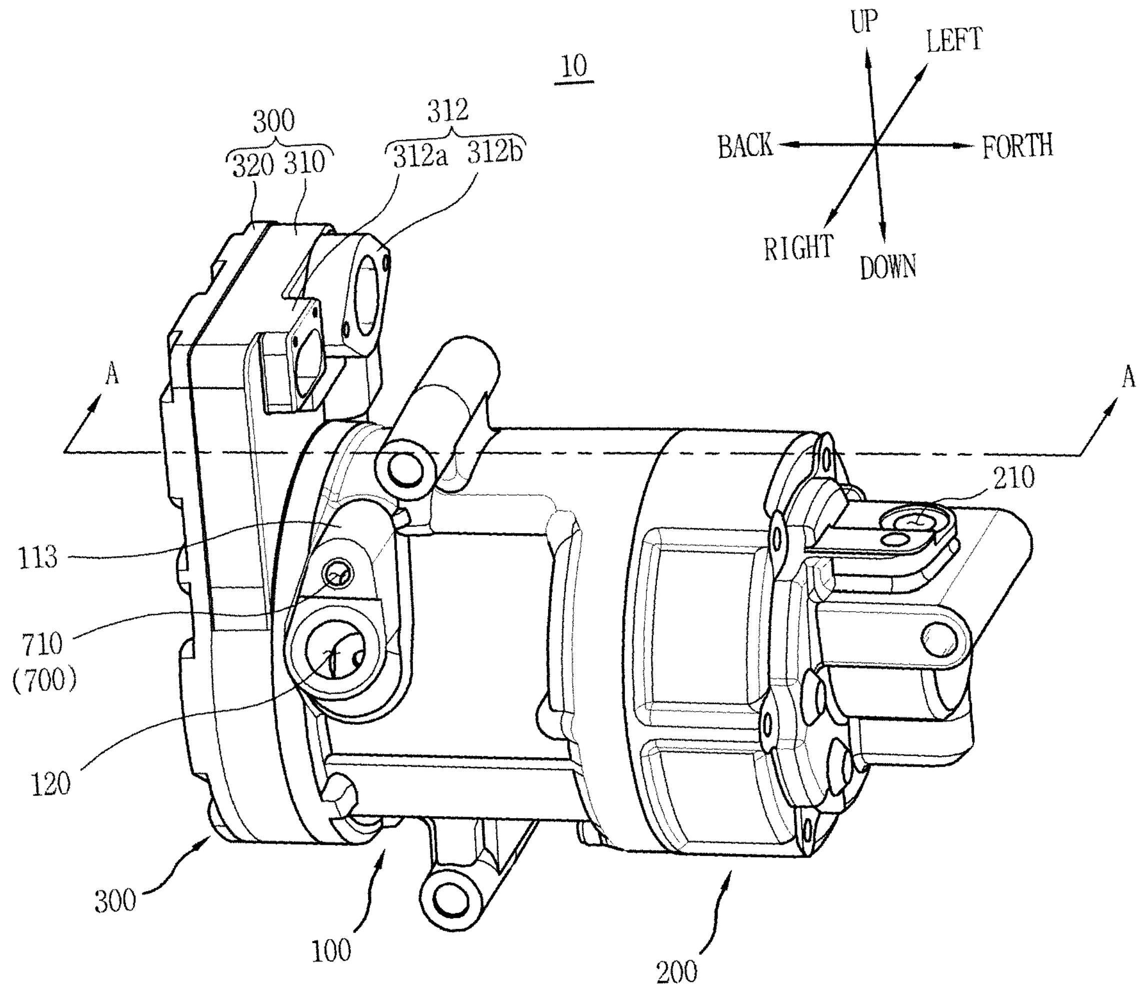

10
300
320 310
312
312a 312b
UP
LEFT
BACK
FORTH
RIGHT
DOWN
A
A
210
113
710
(700)
120
300
100
200

FIG. 2

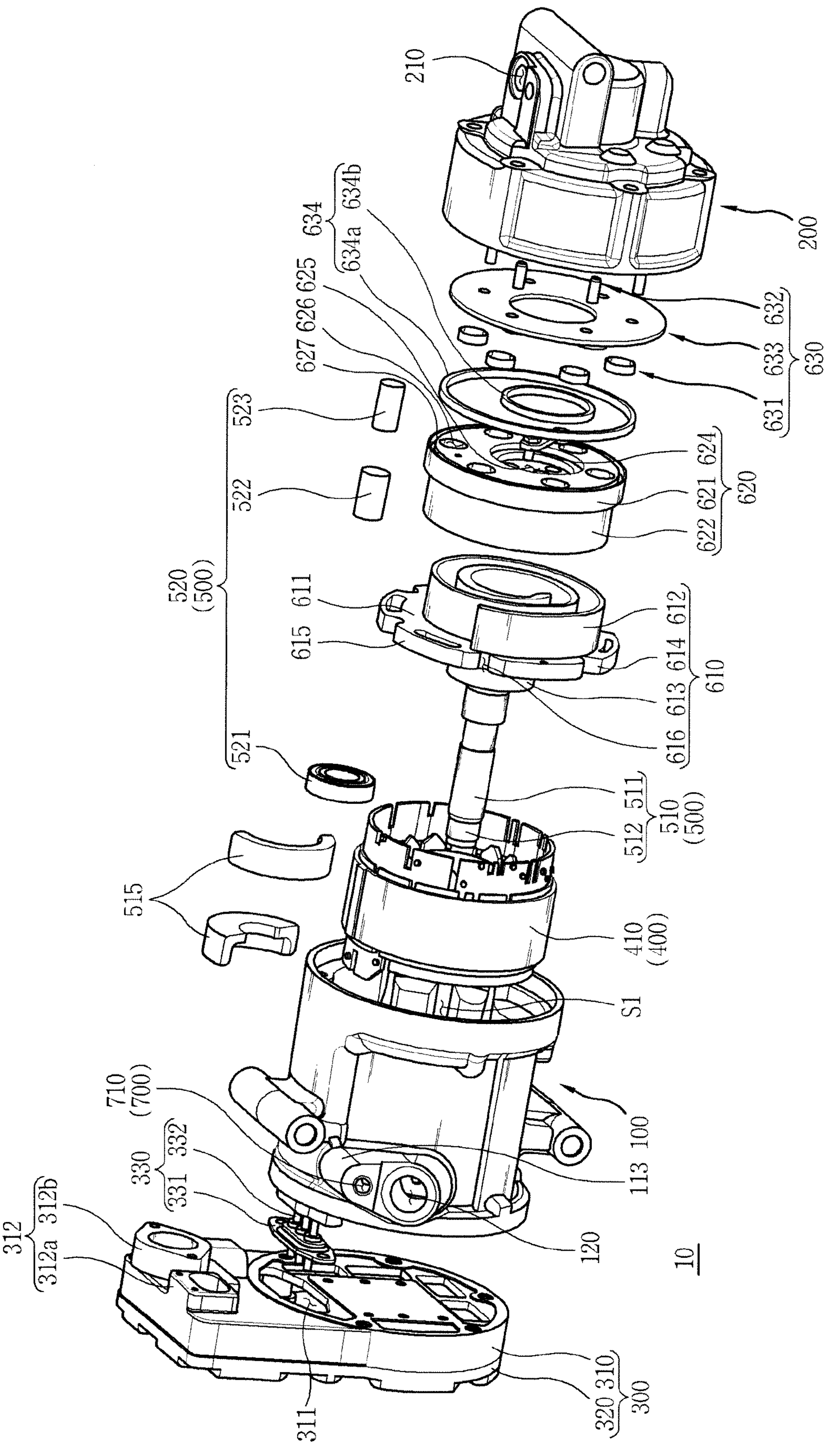

210
200
634
634a 634b
627 626 625
632
633
630
631
523
522
624
622 621
620
520
(500)
611
615
612
614 613
616
610
521
511
512
510
(500)
515
410
(400)
S1
710
(700)
330
331 332
113 100
100
312
312a 312b
120
10
311
320 310
300

FIG. 3A

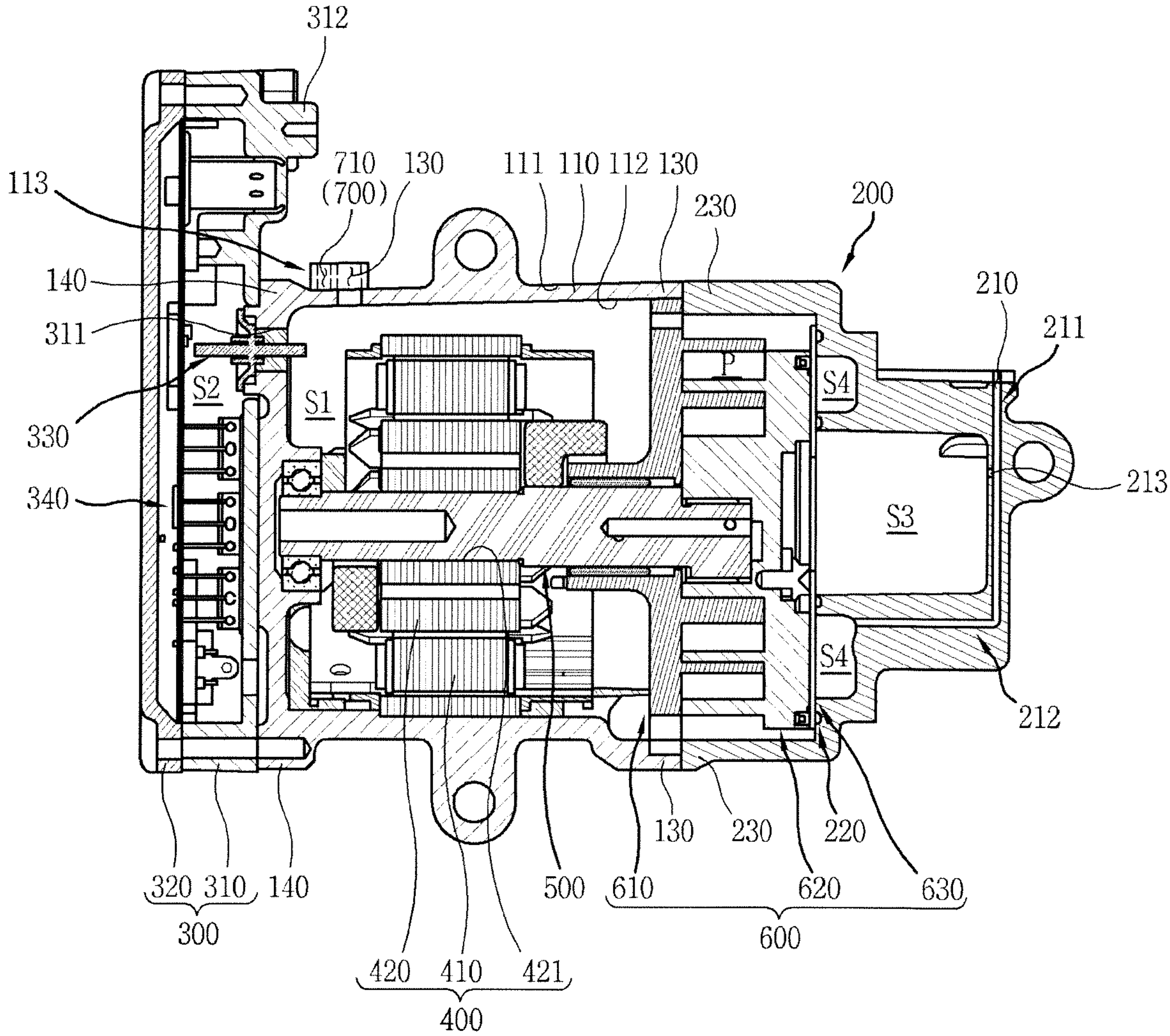

312
113
710
(700)
130
111
110
112
130
230
200
140
311
330
S2
S1
P
S4
210
211
213
340
S3
S4
212
320
310
140
300
420
410
421
400
500
610
130
230
620
220
630
600

FIG. 3B

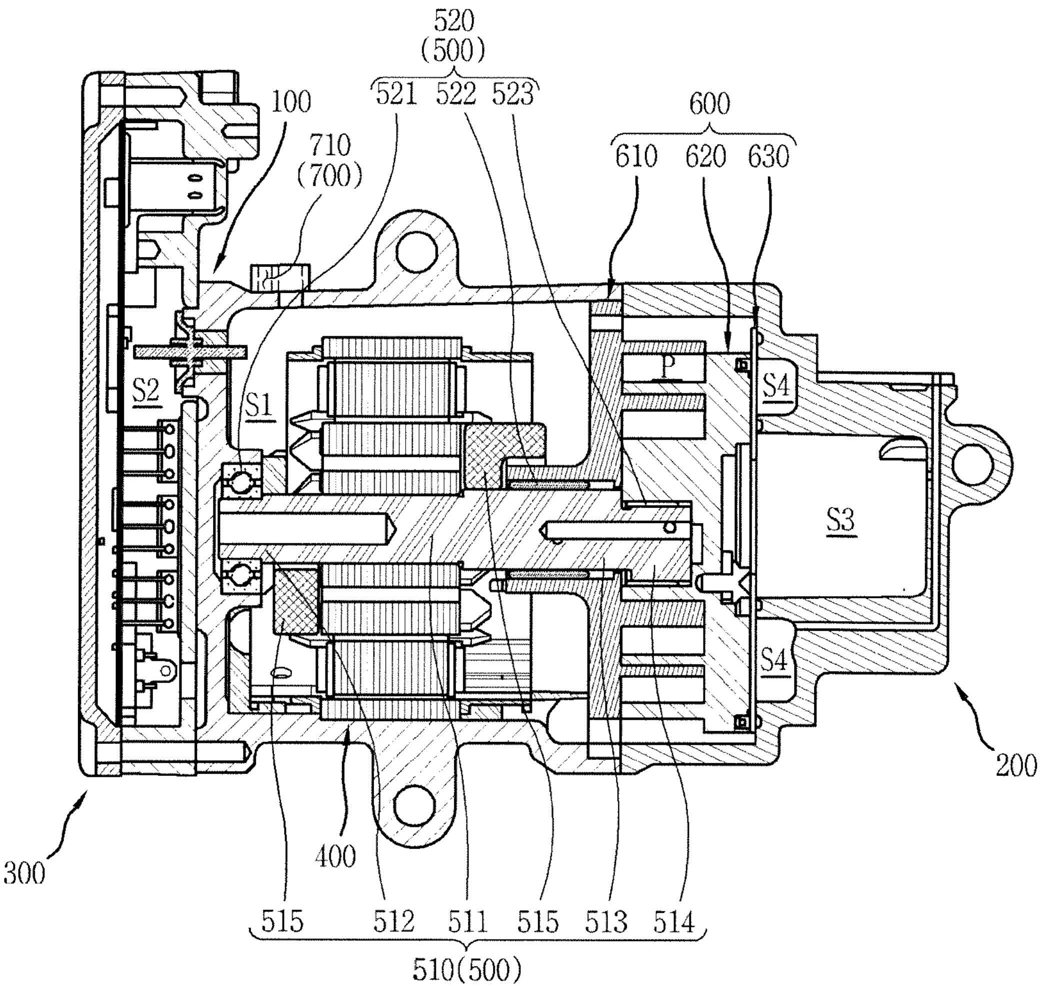

520
(500)
521 522 523
600
610 620 630
100
710
(700)
S2
S1
P
S4
S3
S4
200
300
400
515 512 511 515 513 514
510(500)

FIG. 3C

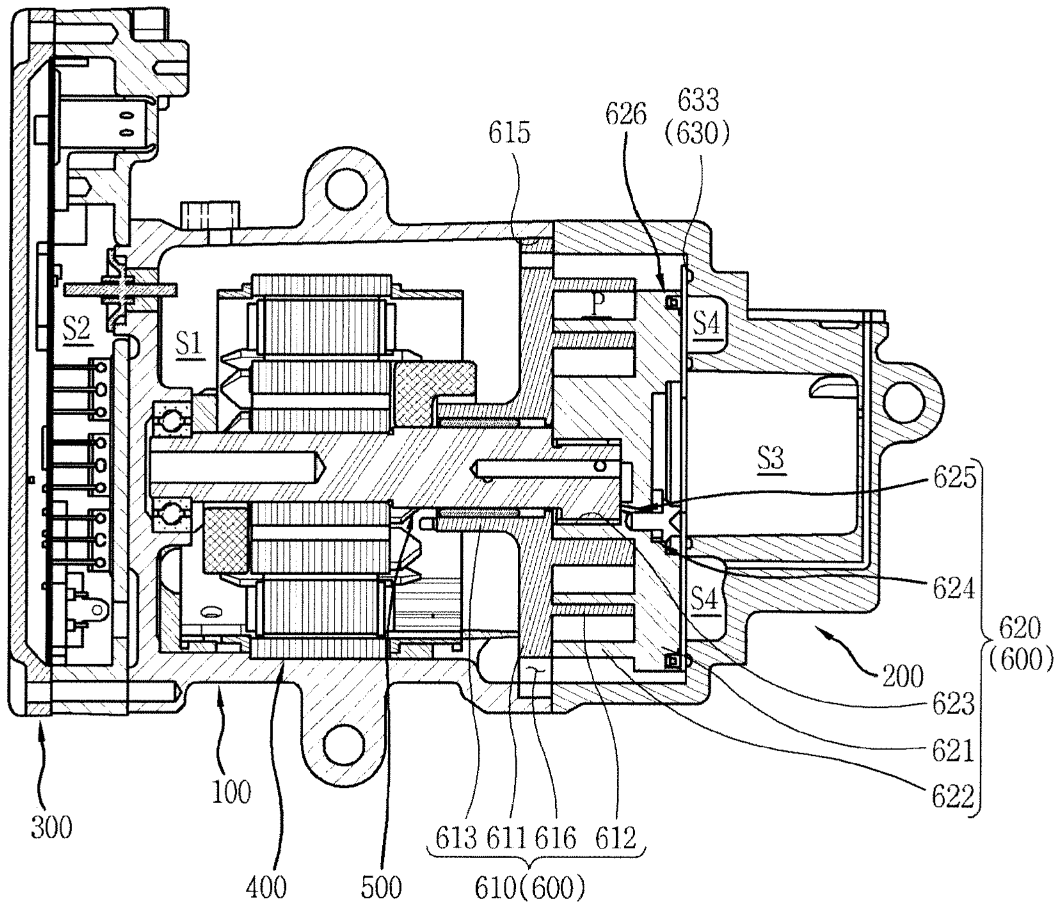

615
626
633
(630)
P
S4
S2
S1
S3
625
S4
624
620
(600)
200
623
621
622
300
100
400
500
613 611 616 612
610(600)

FIG. 4

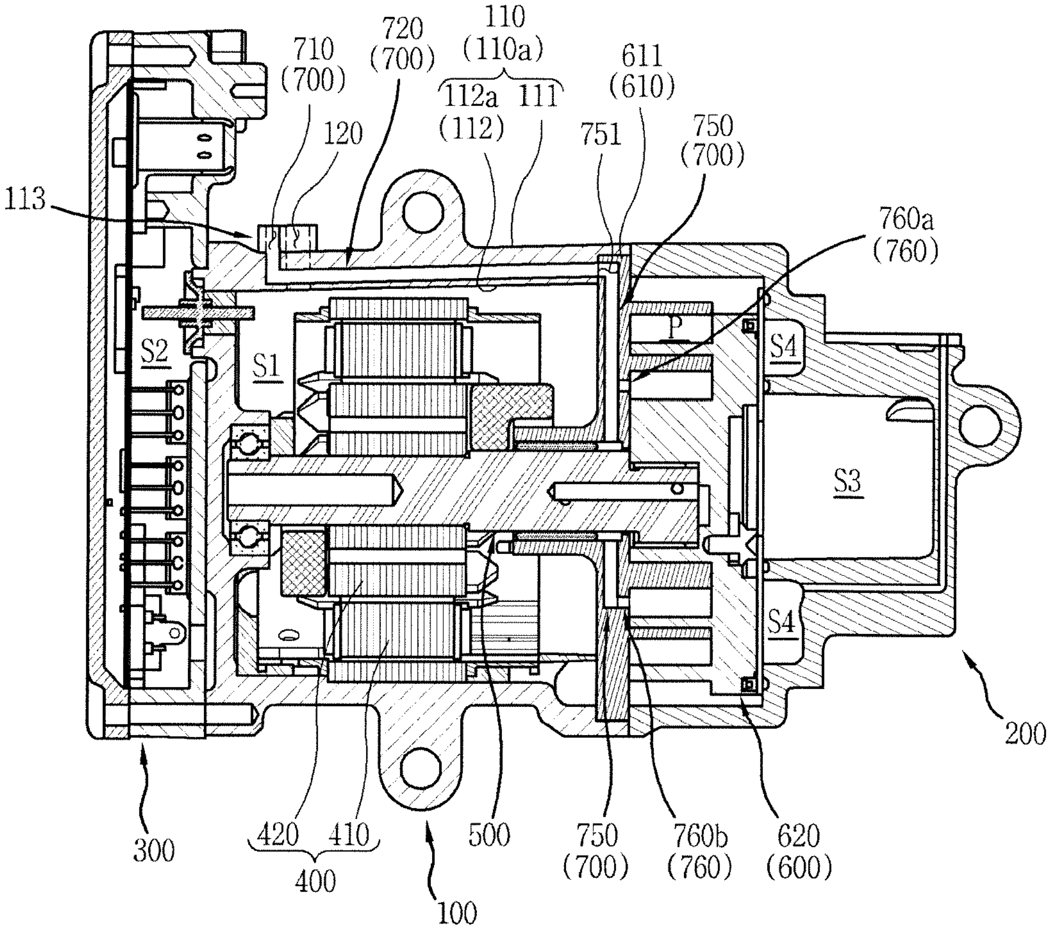
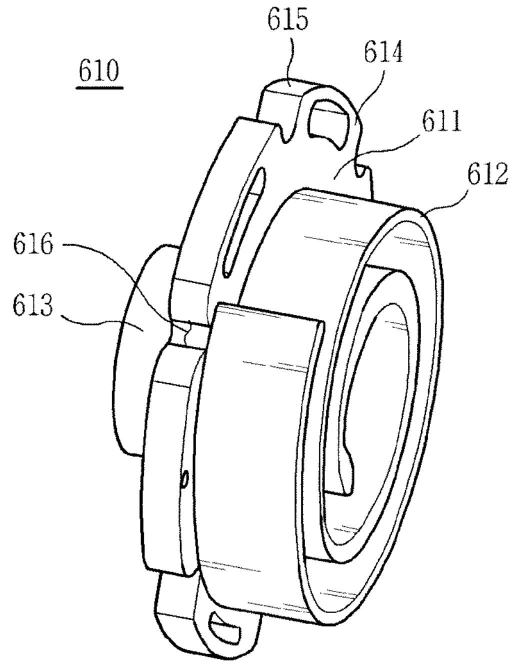
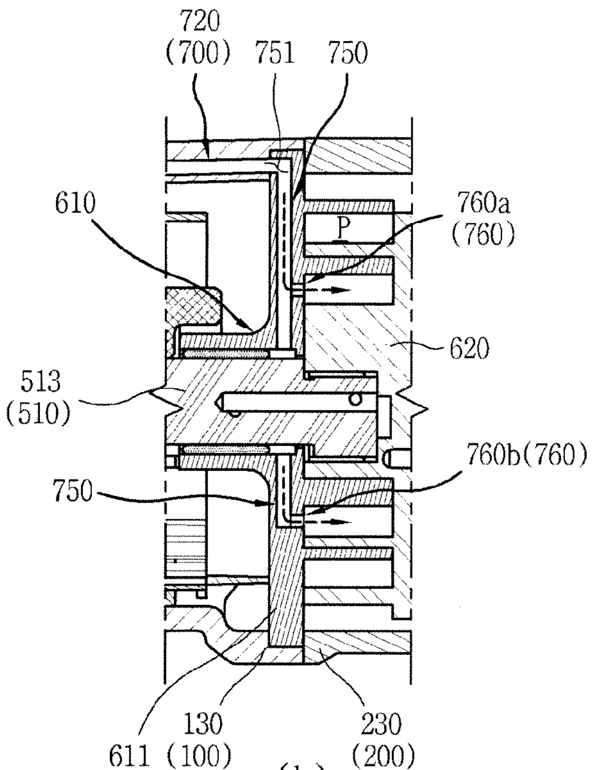

710
(700)
720
(700)
110
(110a)
112a
(112)
111
120
113
611
(610)
751
750
(700)
760a
(760)
P
S4
S2
S1
S3
S4
200
300
420
410
400
100
500
750
(700)
760b
(760)
620
(600)

FIG. 5

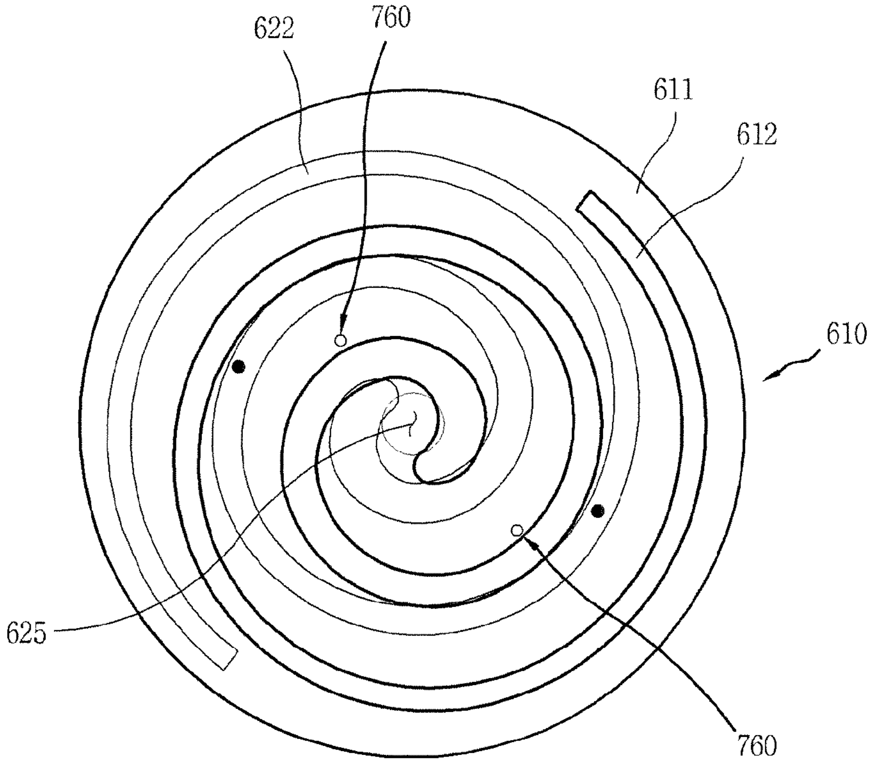

610
615
614
611
612
616
613

(a)

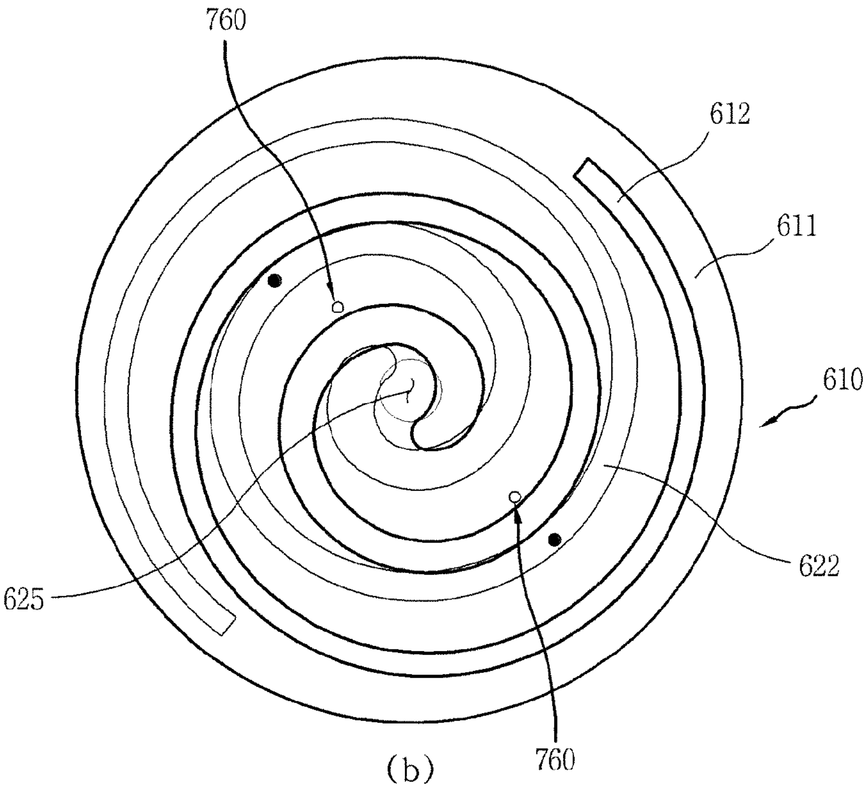

720
(700)
751
750
610
760a
(760)
P
620
513
(510)
760b(760)
750
611
130
(100)
230
(200)

(b)

FIG. 6

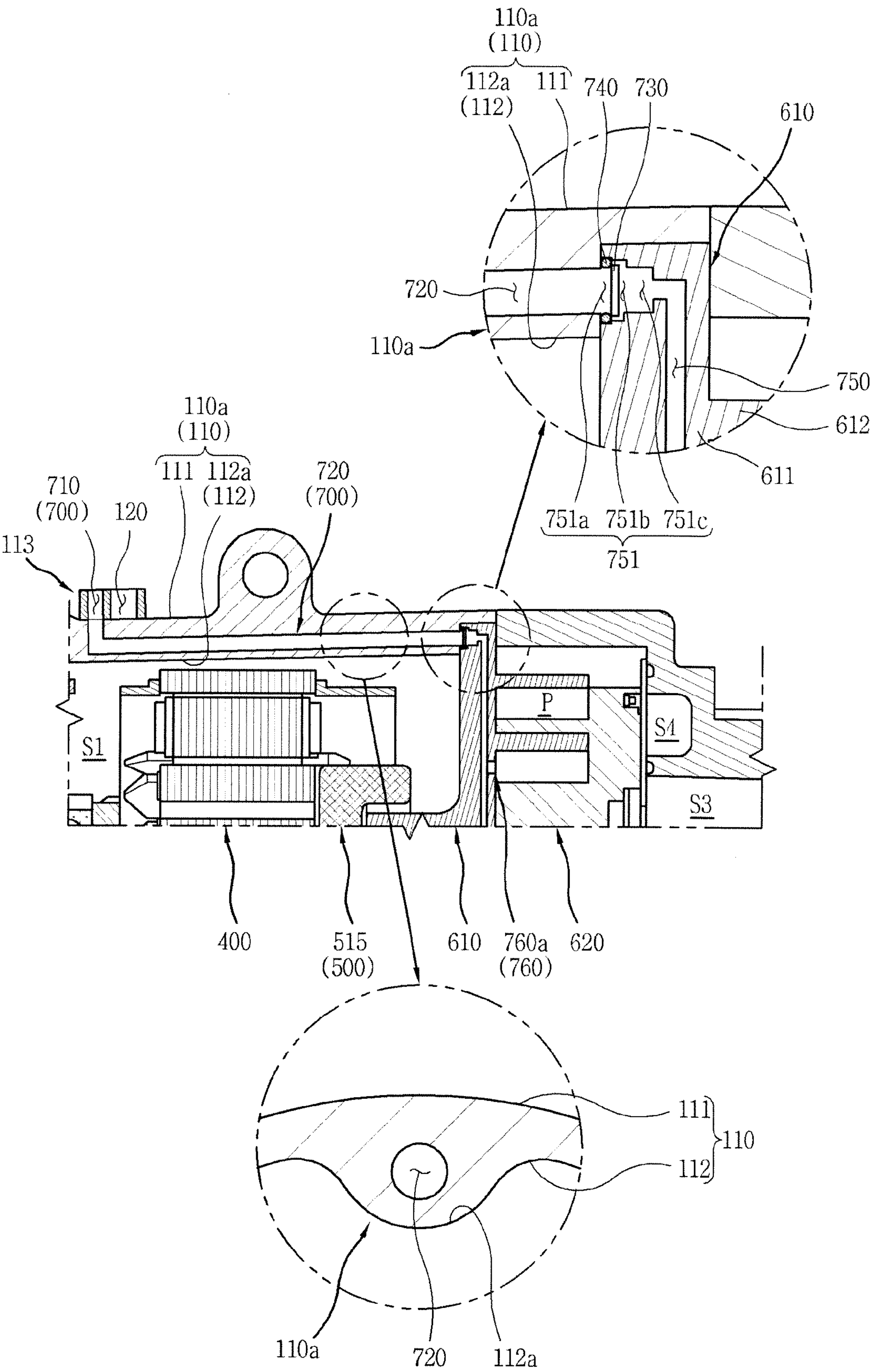


(a)



(b)

FIG. 7


110a
(110)
112a
(112)
111
740
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720
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750
612
611
751a
751b
751c
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(110)
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112a
(112)
720
(700)
710
(700)
120
113
P
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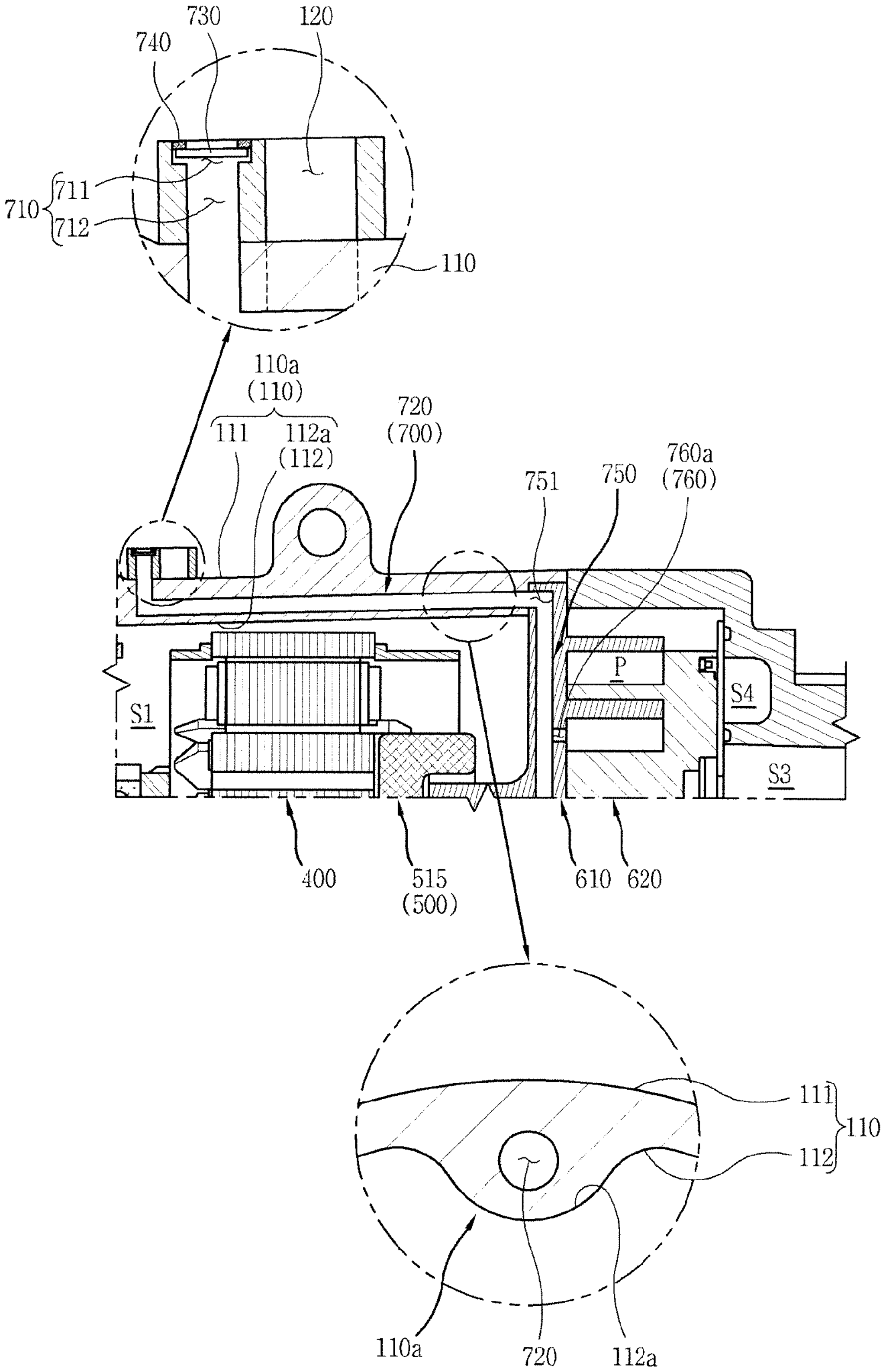
720
112a

FIG. 8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(760)
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S1
S3
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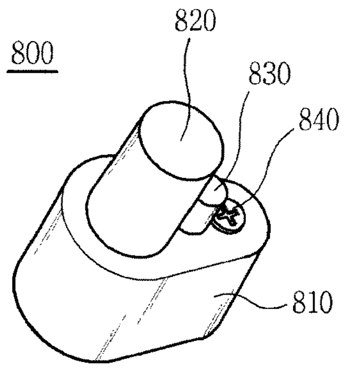
112a

FIG. 9



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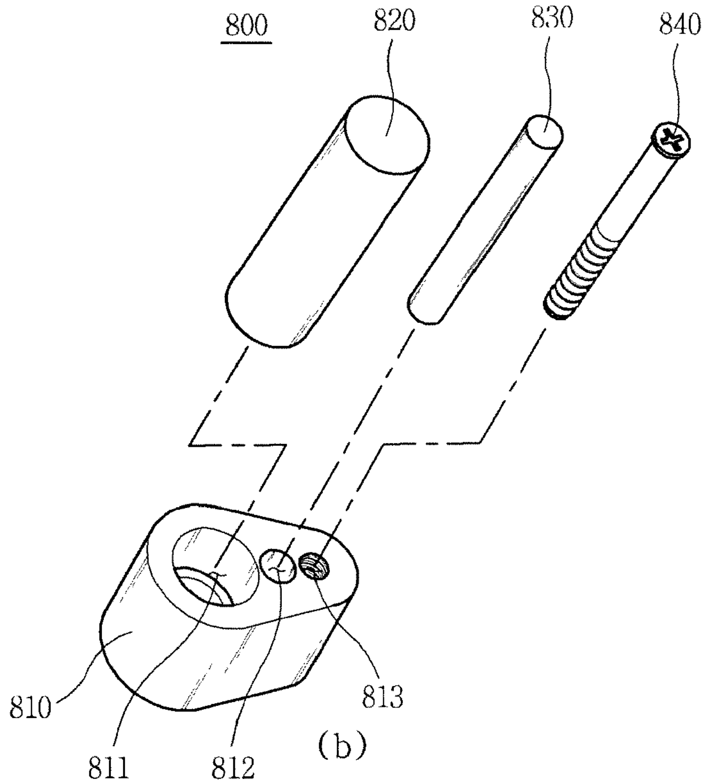


(b)

FIG. 10

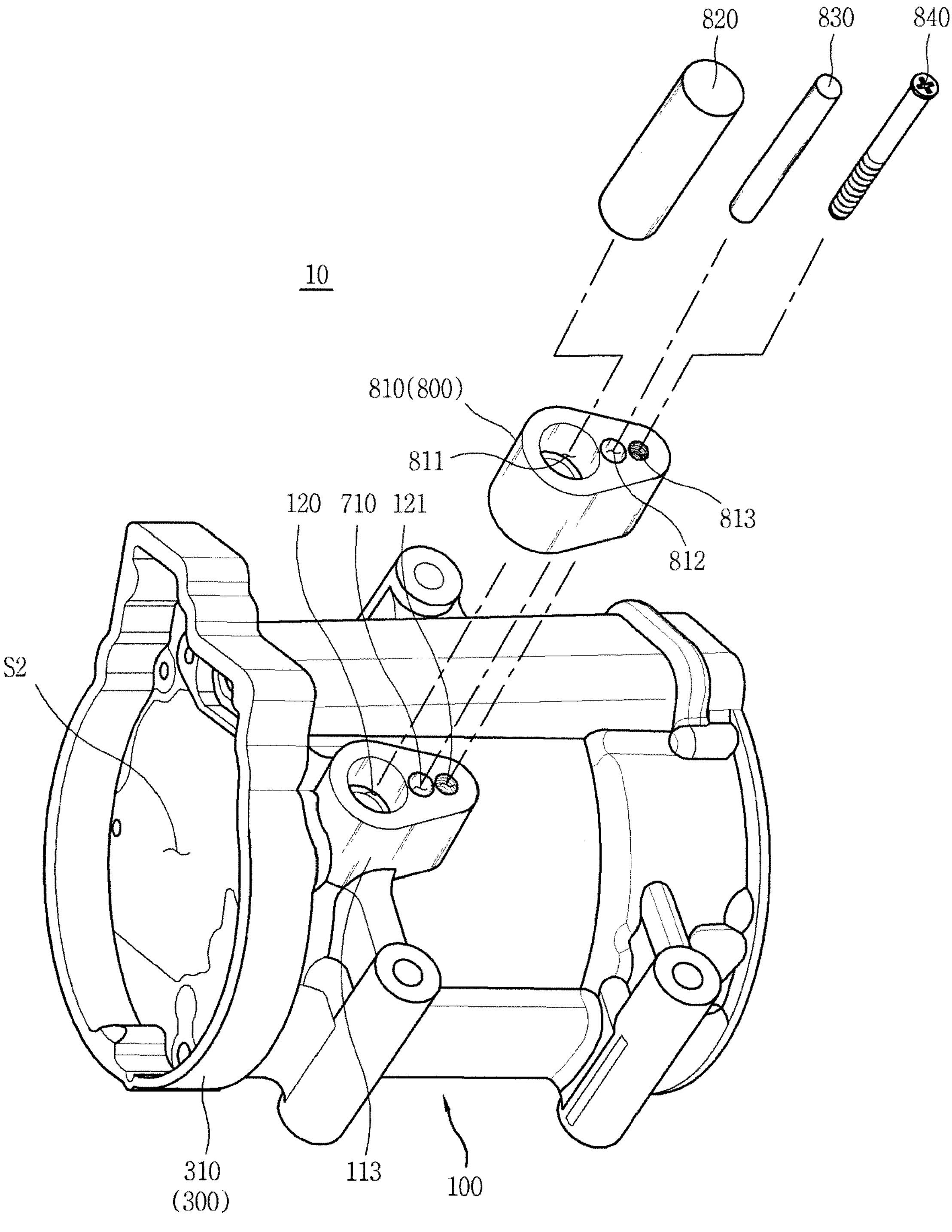


FIG. 11

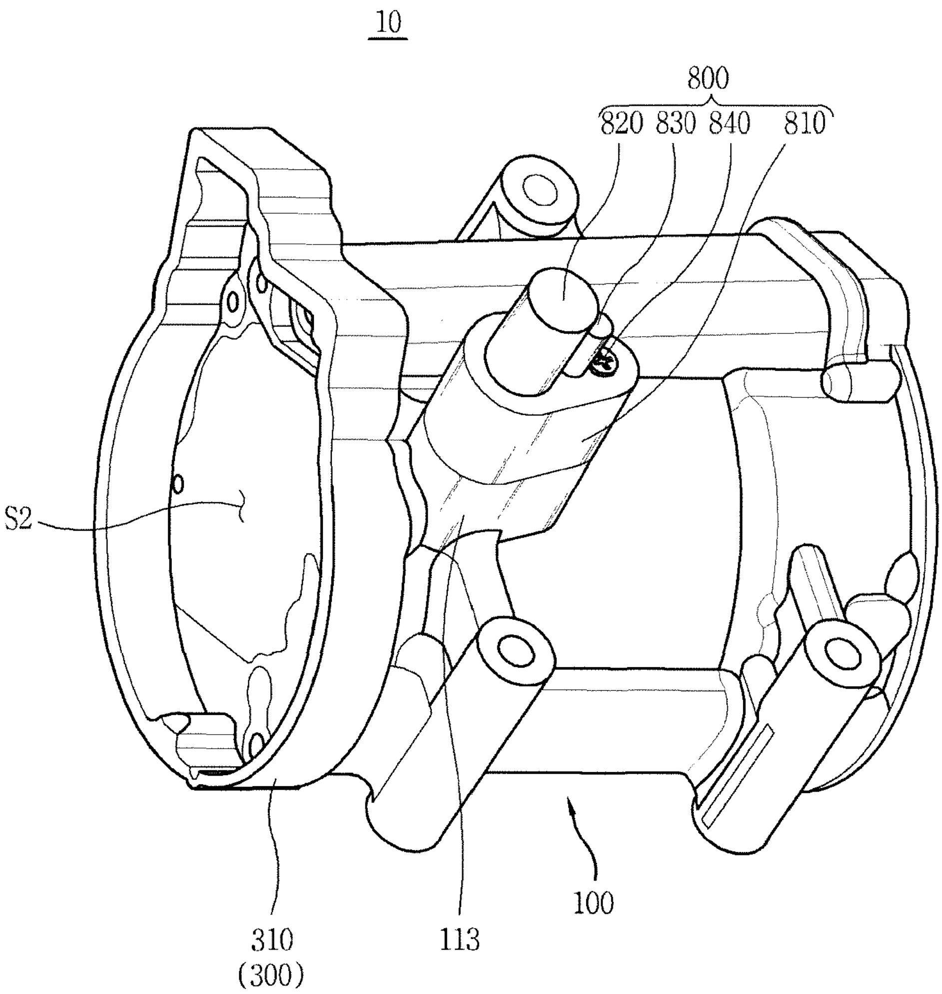
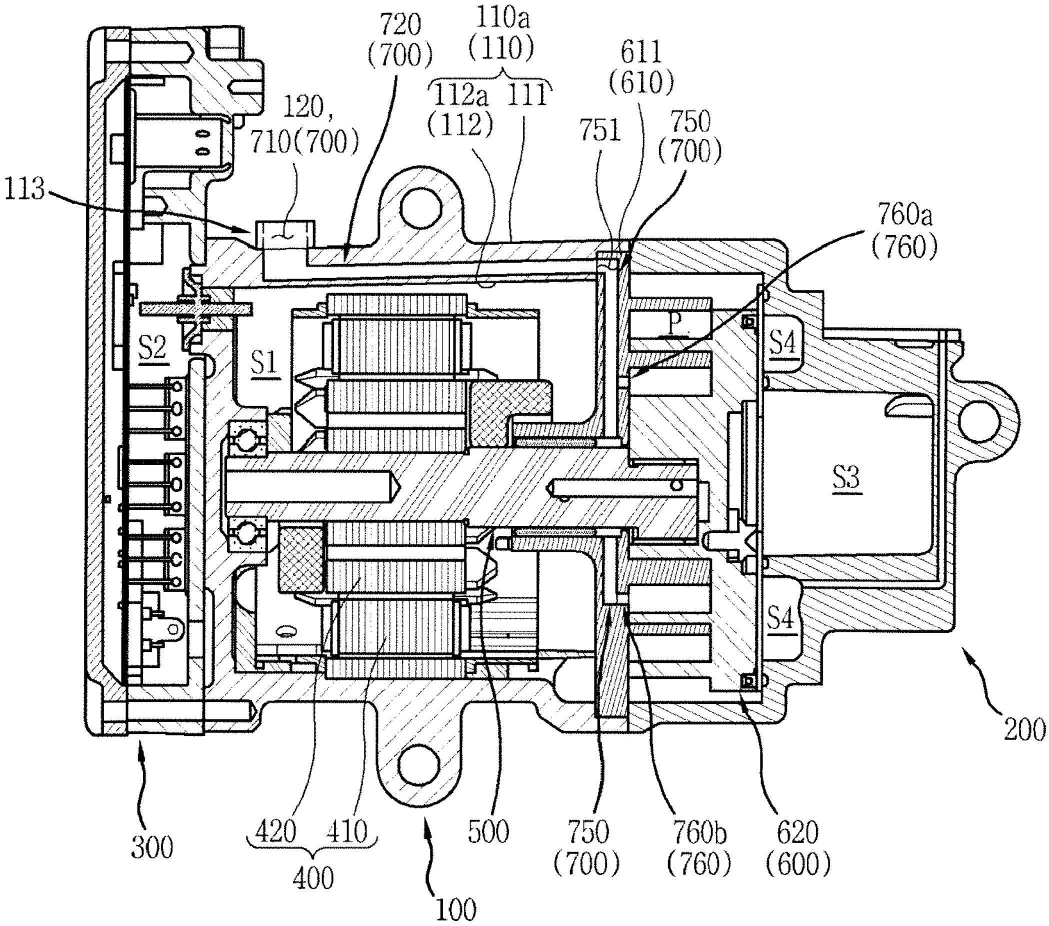


FIG. 12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760a
(760)
P
S2
S1
S4
S3
S4
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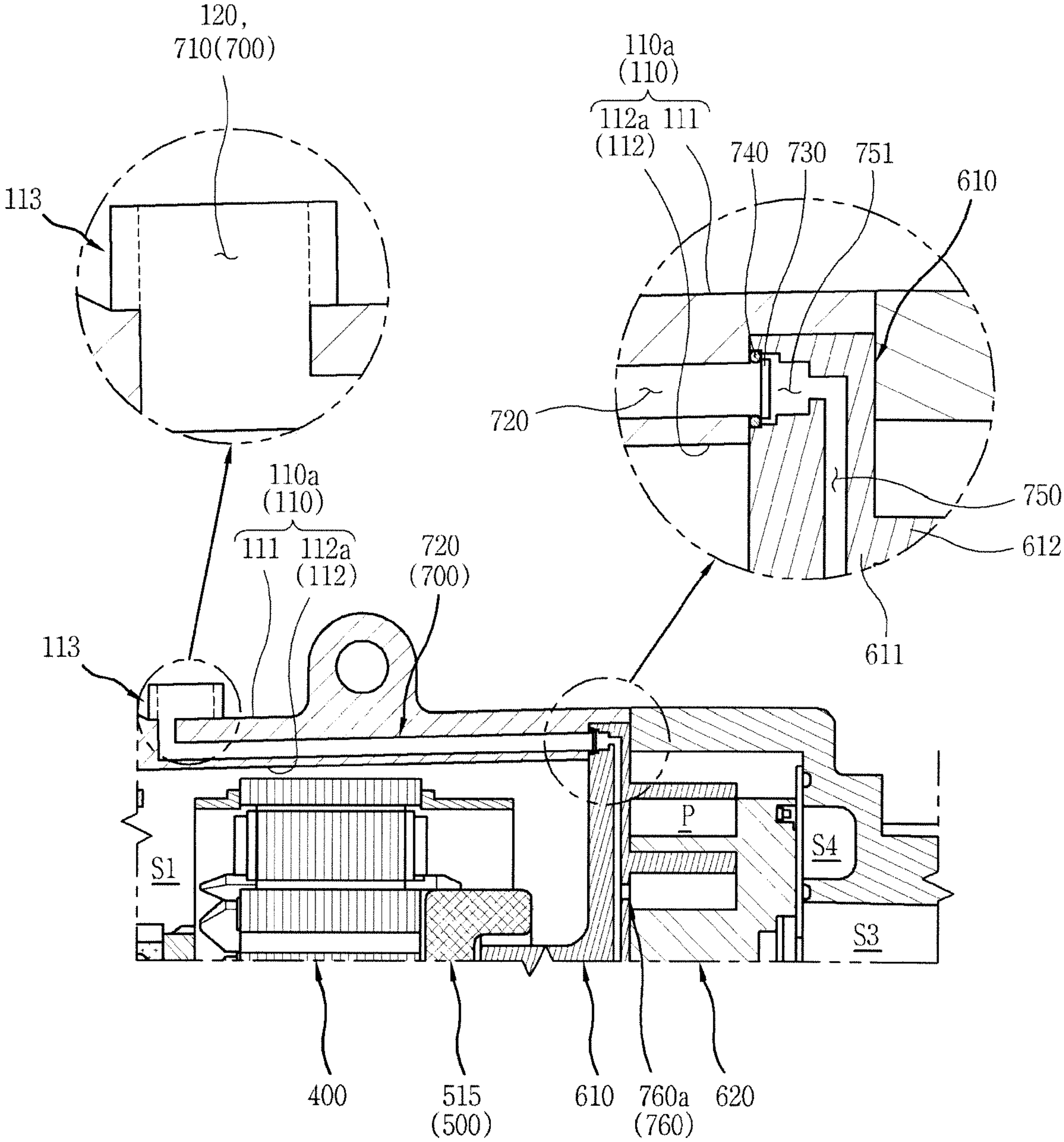
(700)
760b
(760)
620
(600)

FIG. 13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111 112a
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P
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S1
S3
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515
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760a
(760)
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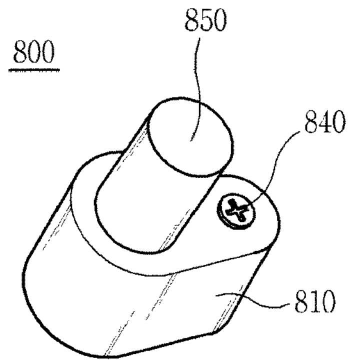
FIG. 14



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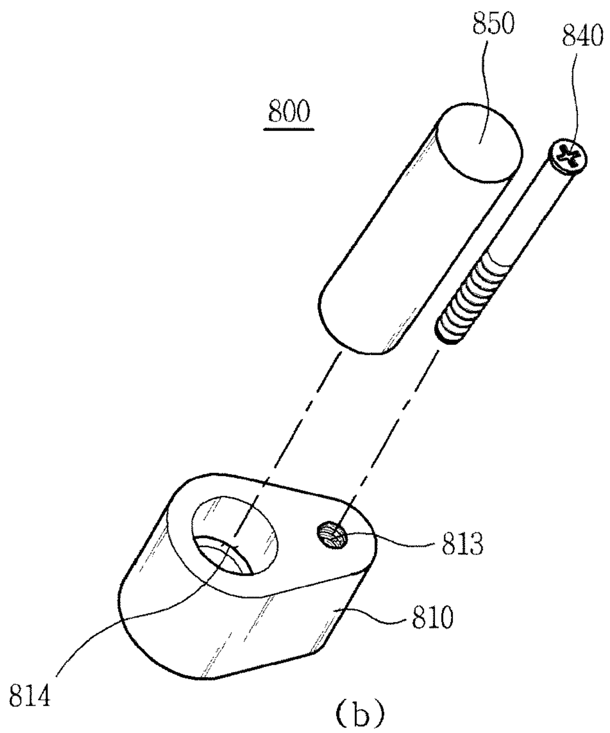


(b)

FIG. 15

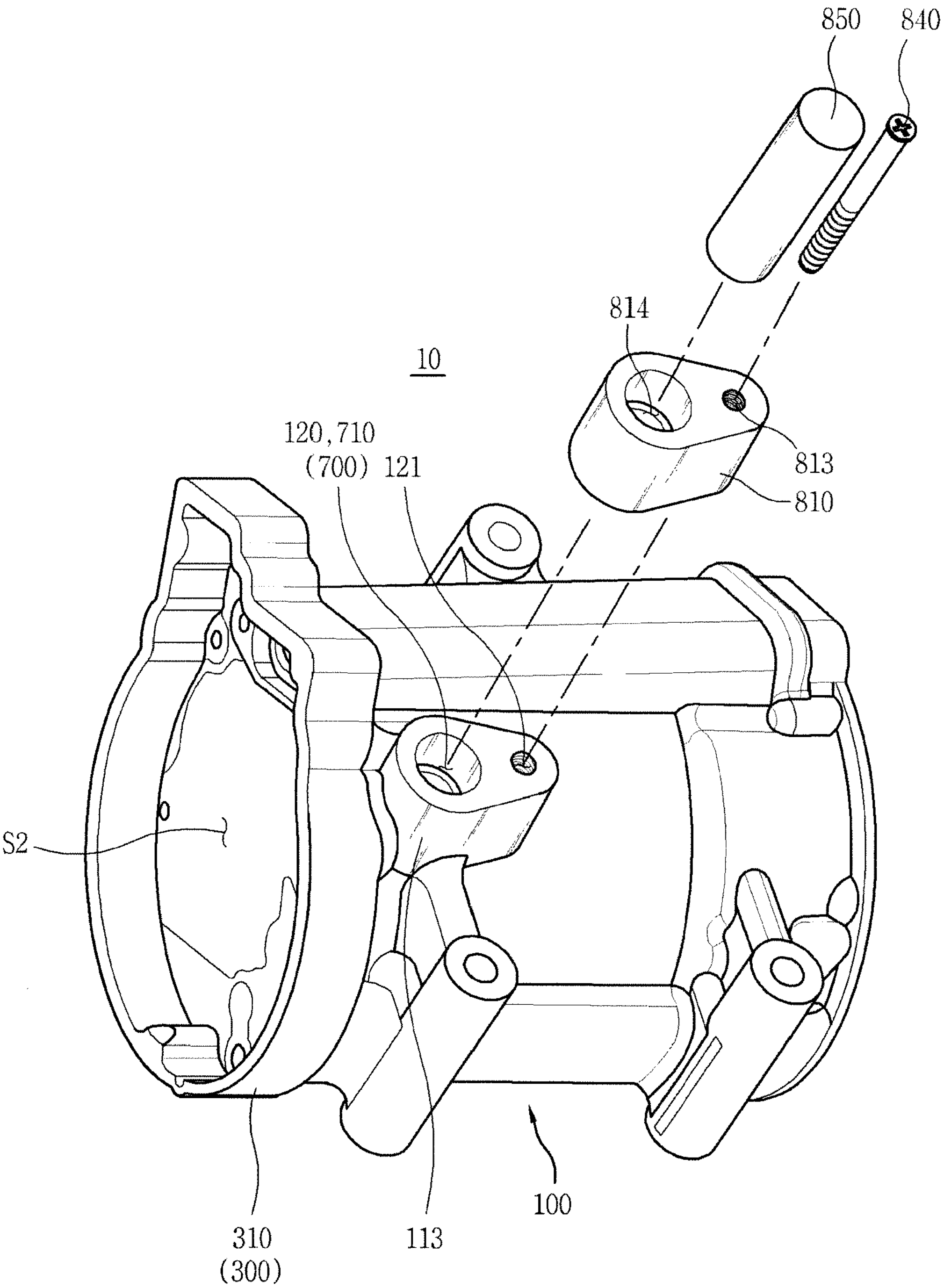


FIG. 16

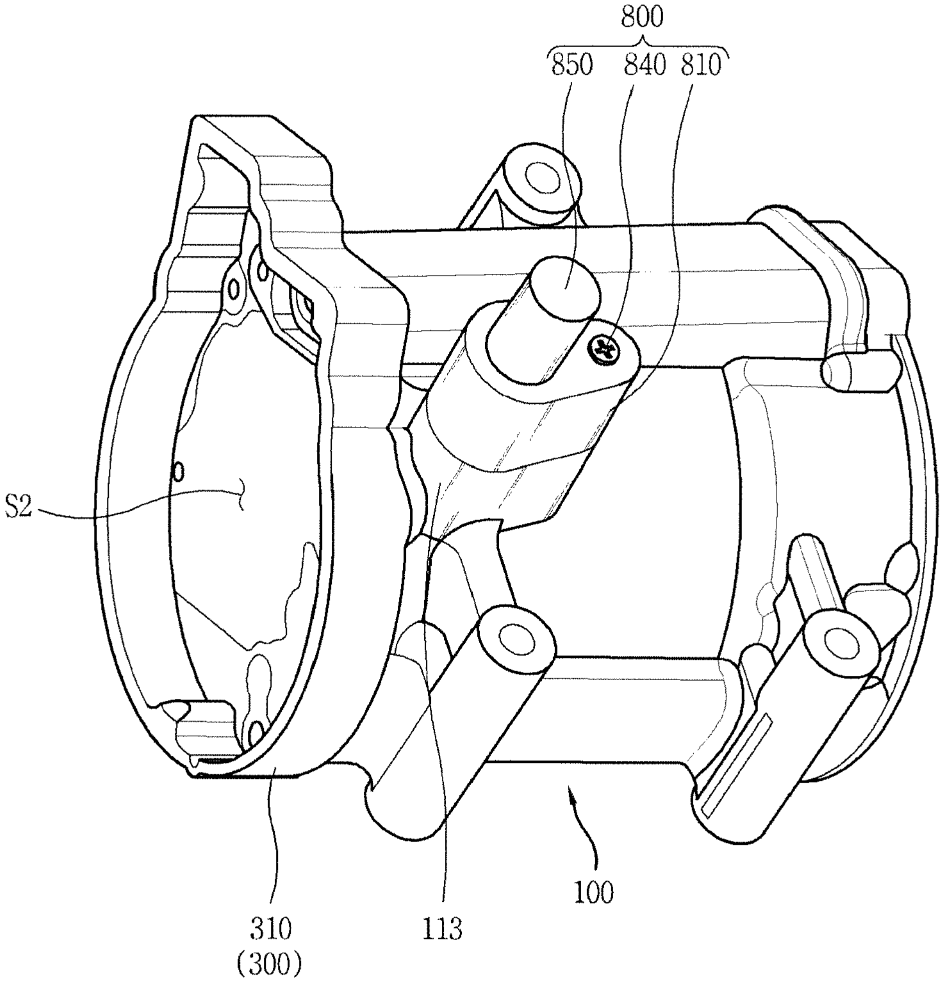
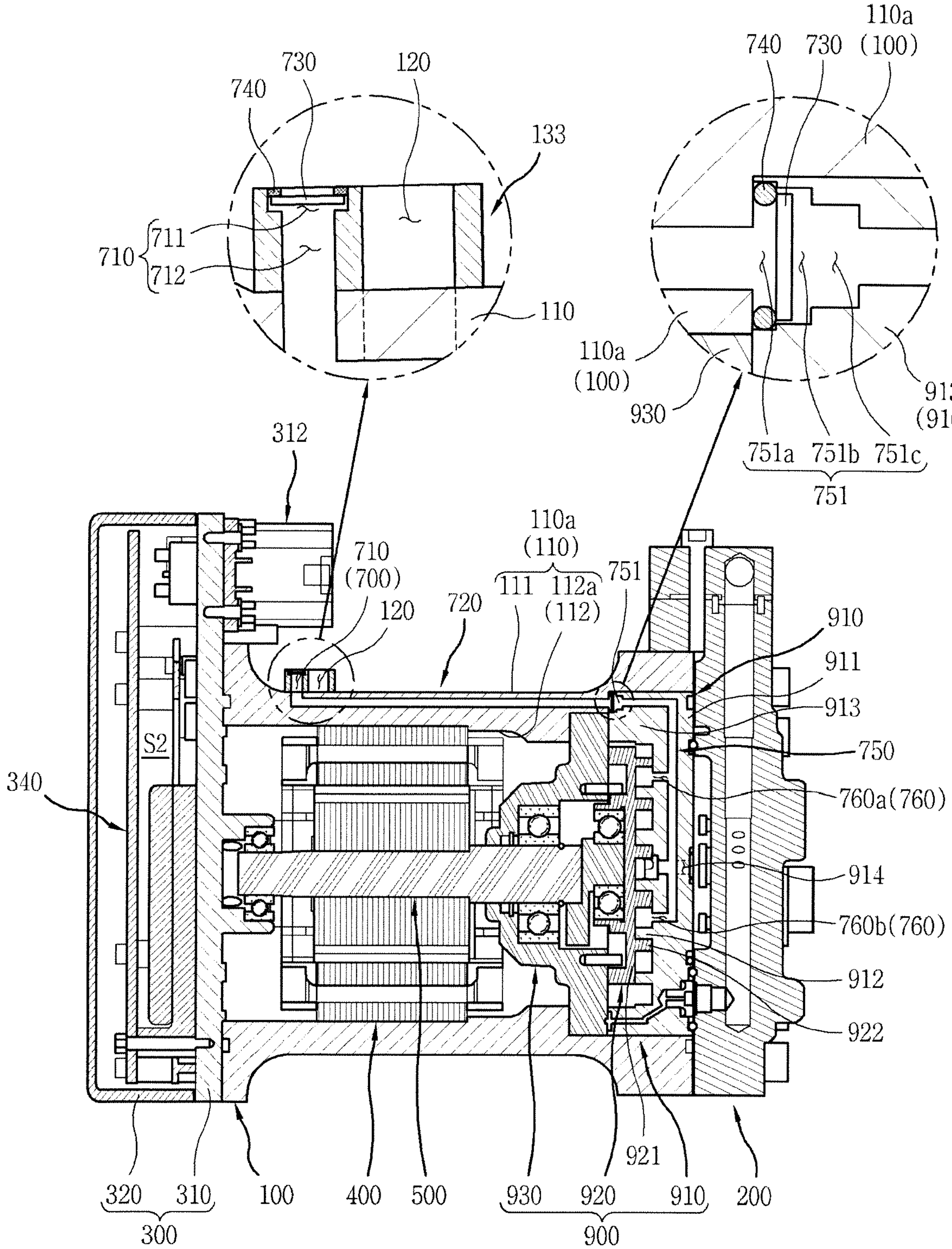


FIG. 17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751b
751c
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710
(700)
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720
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911
913
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760a(760)
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S2
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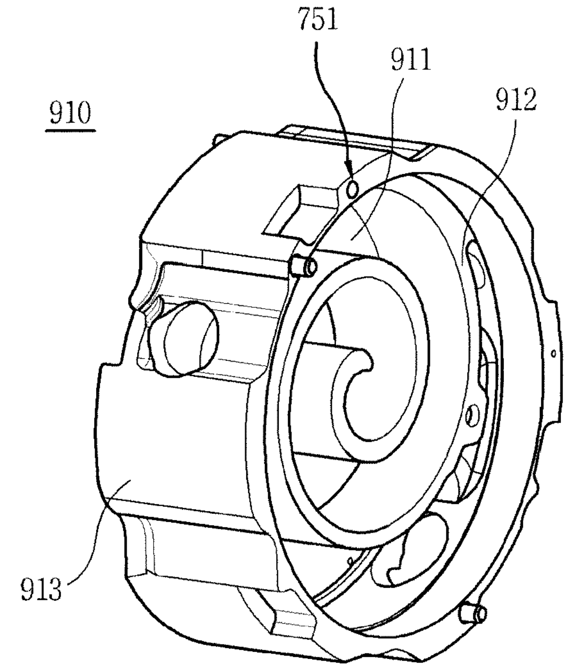
FIG. 18



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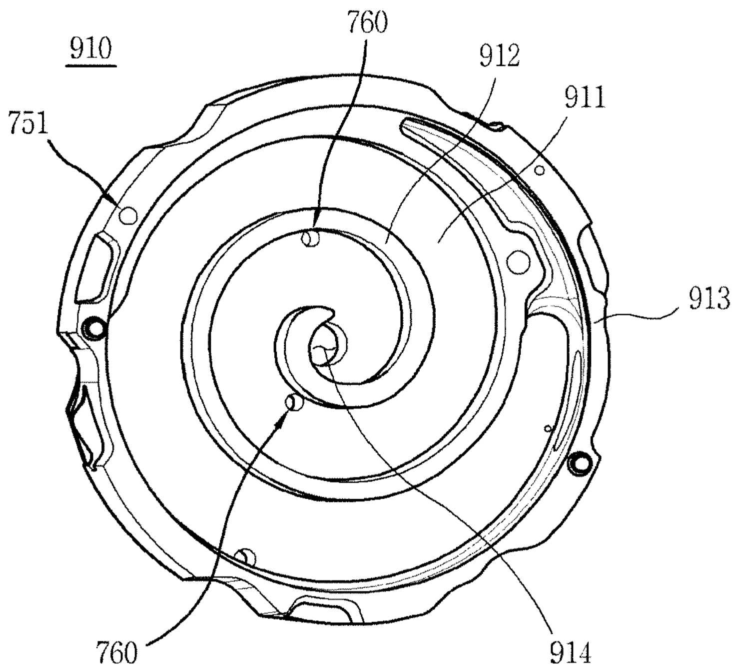
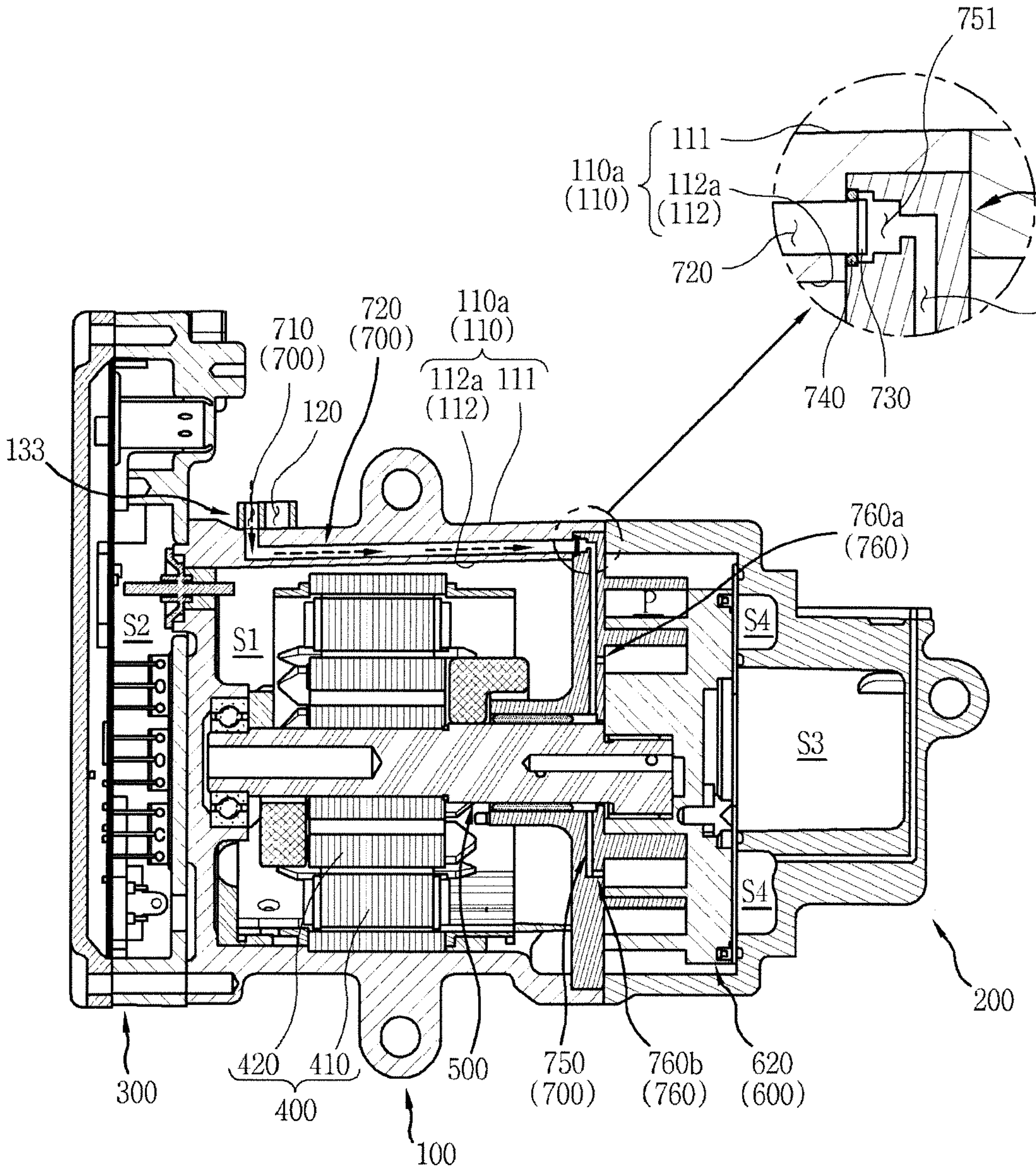


(b)

FIG. 19A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(600)

FIG. 19B

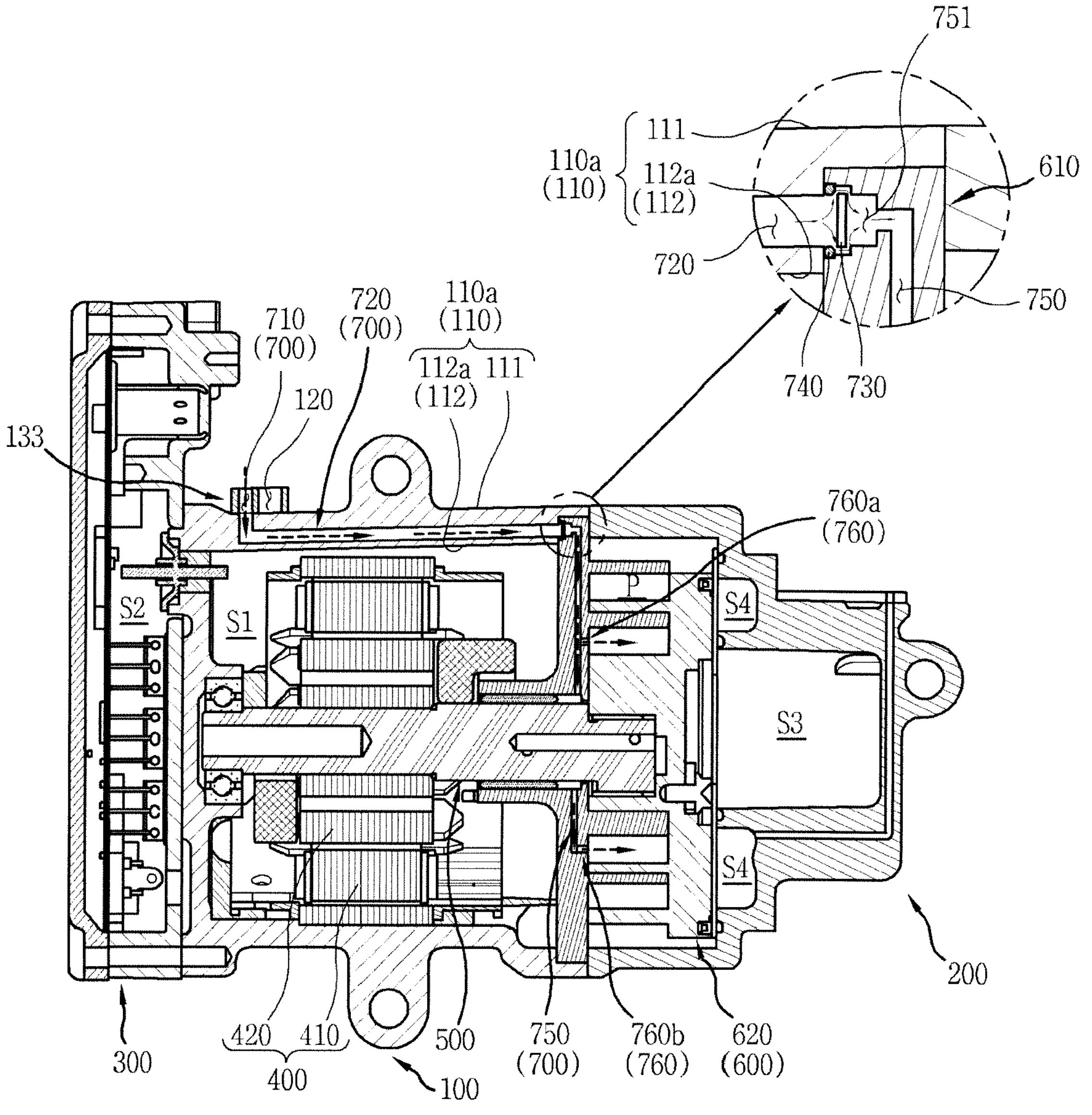
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FIG. 20A

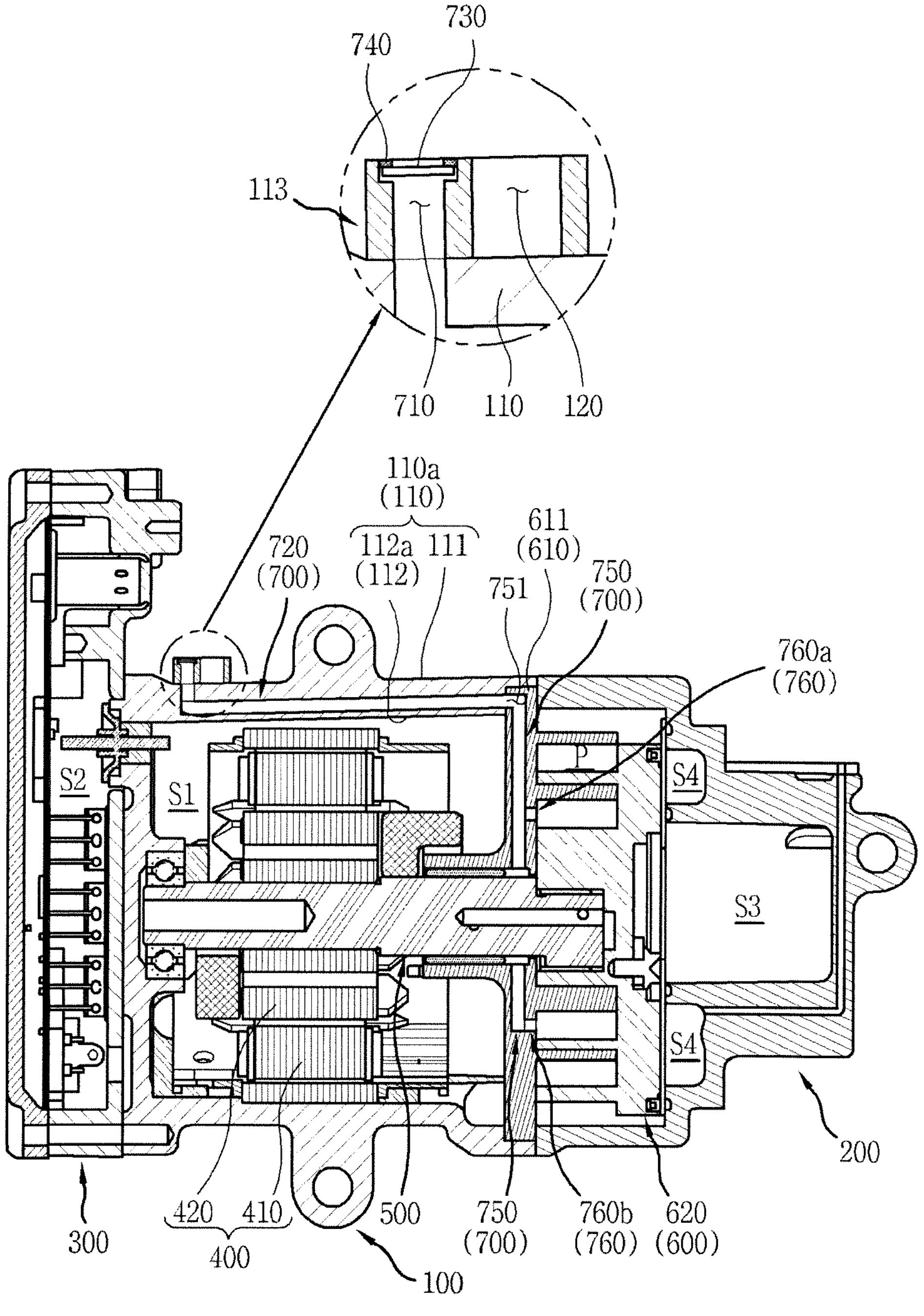
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FIG. 20B

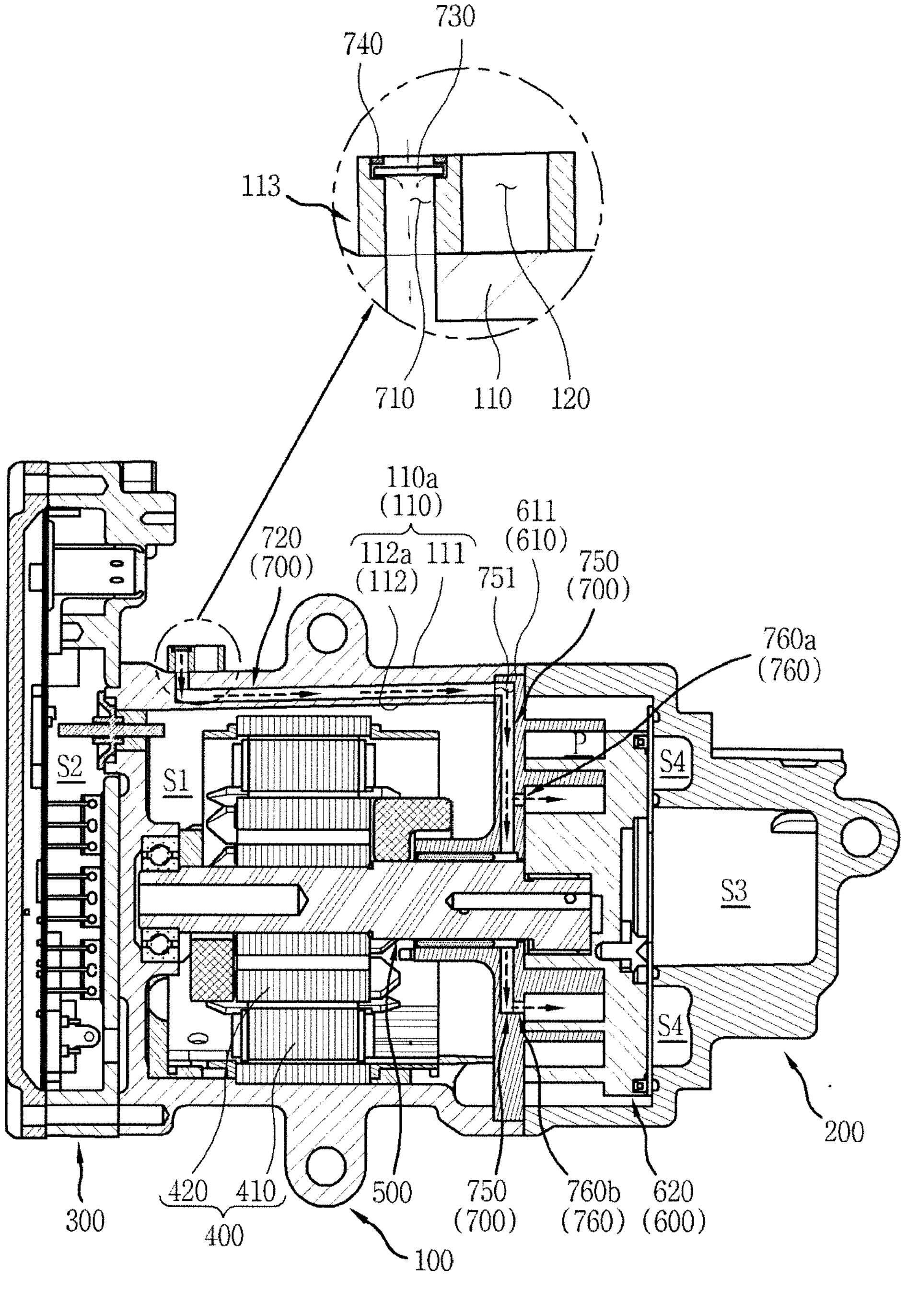
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FIG. 21

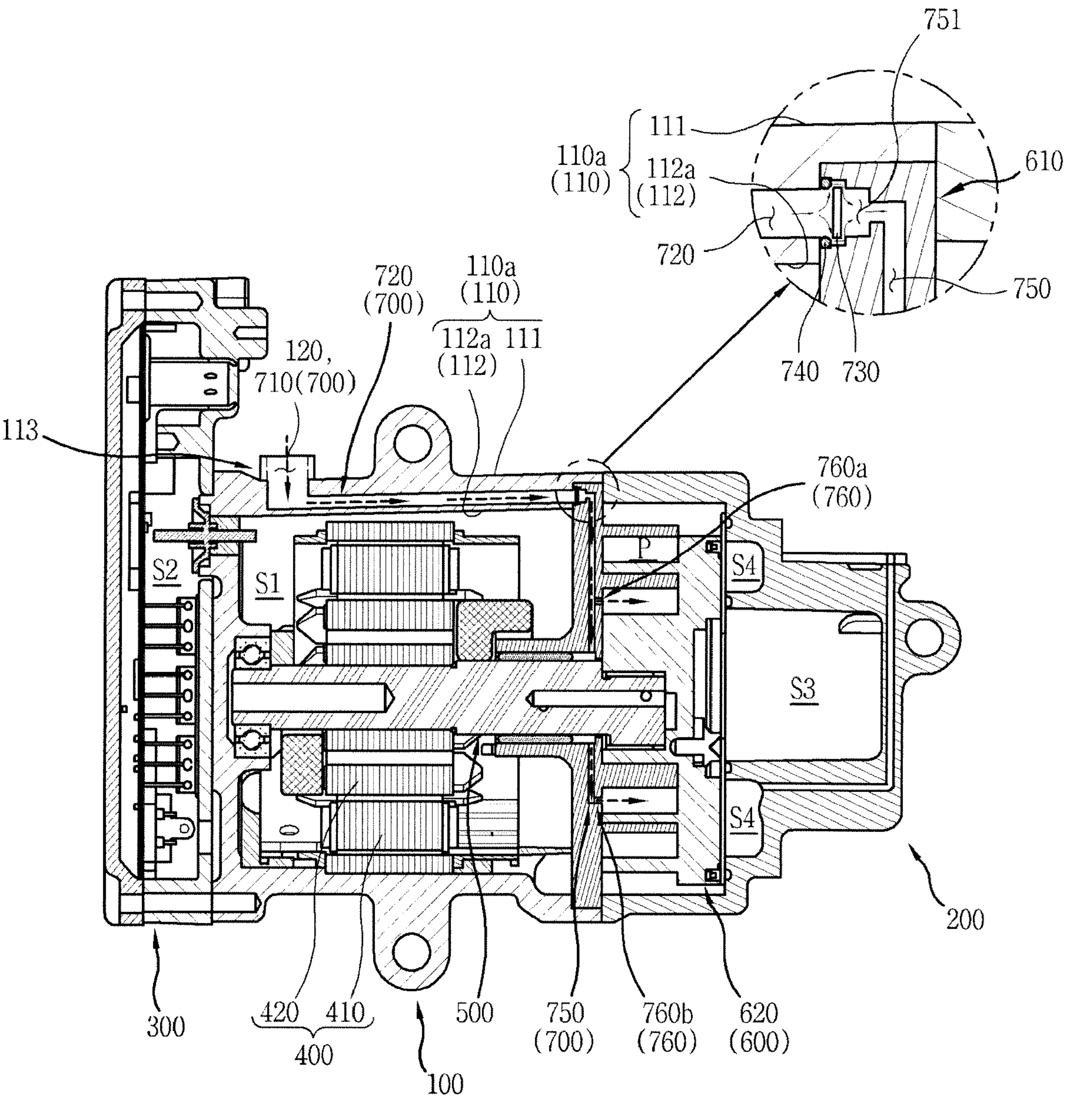
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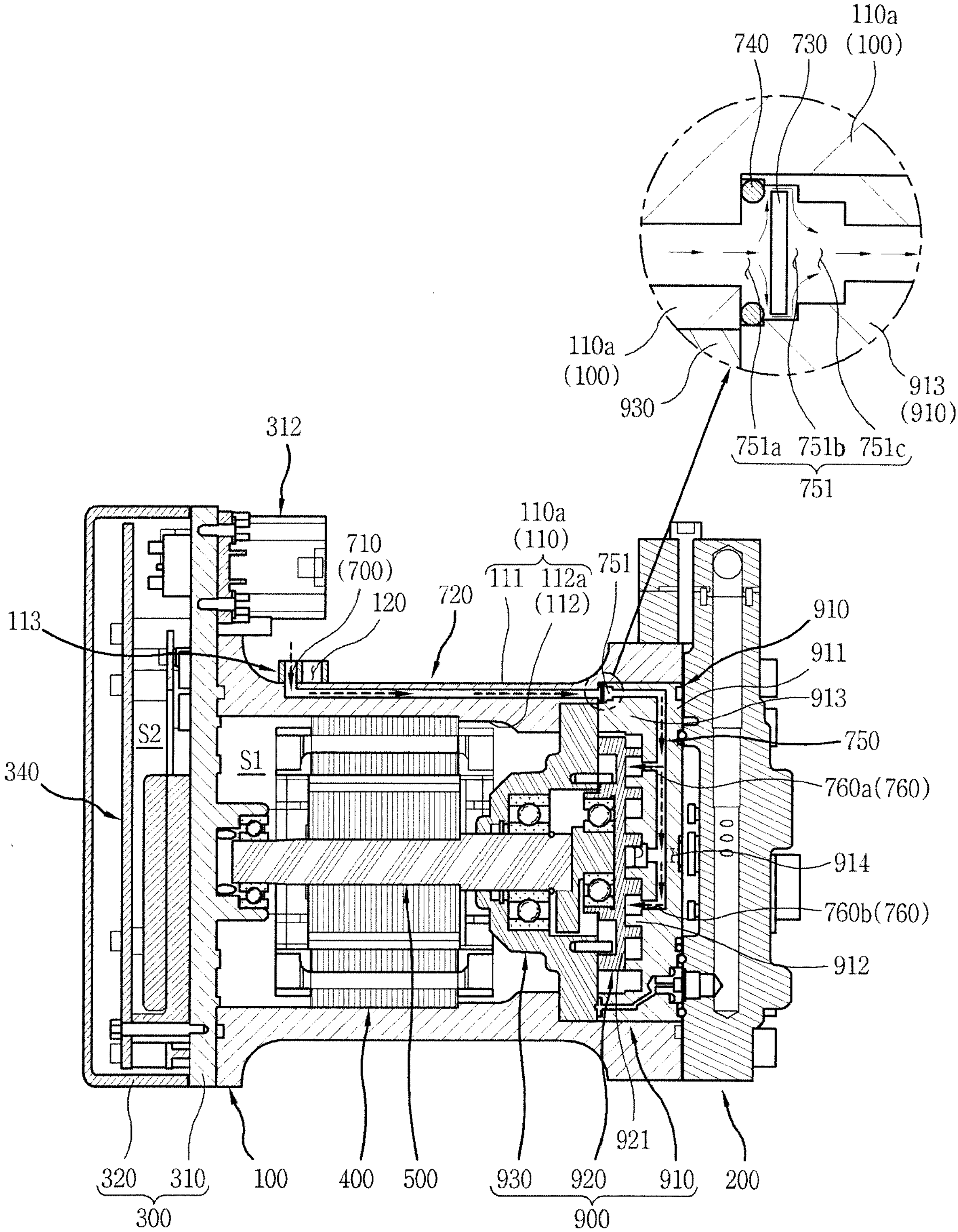
FIG. 22



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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 8548

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 644 892 A2 (TOYOTA JIDOSHOKKI KK [JP]) 2 October 2013 (2013-10-02) * paragraph [0014]; figure 1 * -----	1-3,9	INV. F04C29/00 F04C29/04
X	EP 1 921 320 A2 (SCROLL TECH [US]) 14 May 2008 (2008-05-14) * paragraph [0012] - paragraph [0013]; figure 1 * -----	1-3,9	

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F04C

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	19 June 2020	Grilli, Muzio

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19-06-2020

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- KR 1020160081431 **[0010] [0017]**