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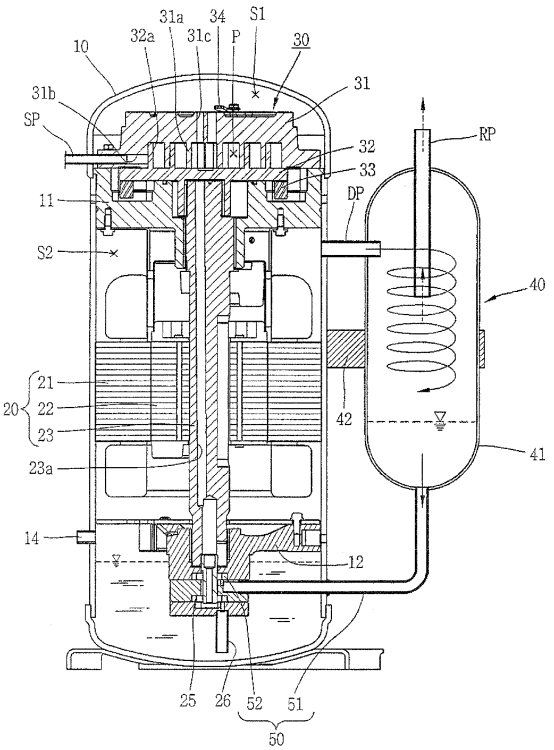
(54) **Compressor**

(57) A compressor is provided that includes a casing (10) defining an inner space, a suction pipe (SP) connected to the casing, a discharge pipe (DP) connected to the casing, a motor (20) located at the inner space of the casing, a compressing unit (30) driven by the motor to compress a refrigerant, an oil separating unit (40) configured to separate oil from the refrigerant discharged from the compressing unit, and an oil recollecting unit (50) configured to pump the oil separated by the oil separating unit and recollect the separated oil into the compressor main body.

FIG. 2



EP 2 020 577 A2

Description

[0001] The present invention relates generally to a compressor, and, more particularly, to an oil recollecting apparatus of a compressor capable of separating and recollecting oil from a refrigerant discharged from a compressing unit.

[0002] A compressor is a device for converting kinetic energy into compression energy of a compressive fluid. A hermetic compressor is configured such that a motor for generating a driving force and a compression unit for compressing fluid by the driving force received from the motor are all installed in an inner space of a hermetically sealed container.

[0003] When the hermetic compressor is provided as a component in a refrigerant compression refrigeration cycle, a certain amount of oil is stored in the hermetic compressor in order to cool the motor of the compressor or smooth and seal the compression unit. However, when the compressor is driven, the refrigerant discharged from the compressor into the refrigeration cycle includes oil mixed in with the refrigerant. Part of the oil discharged into the refrigeration cycle is not recollected to the compressor but remains in the refrigeration cycle, thereby causing a decrease in the amount of oil in the compressor. This may result in decrease in compressor reliability and also degradation of heat-exchange capability of the refrigeration cycle due to the oil remaining in the refrigeration cycle.

[0004] Accordingly, in the related art, an oil separator is disposed at a discharge side of the compressor to separate oil from the discharged refrigerant, and such separated oil is recollected to a suction side of the compressor, thereby avoiding the lack of oil in the compressor and also maintaining the heat-exchange capability of the refrigeration cycle.

[0005] However, when recollecting oil separated by the oil separator into the suction side of the compressor, the high pressure refrigerator is also recollected together with the oil, which results in decreasing the amount of refrigerant circulating in the refrigeration cycle, thereby lowering a cooling capability of the compressor. In addition, temperature of suction gas in the compressor is increased to thereby raise temperature of discharge gas. Accordingly, the reliability of the compressor is degraded. Also, as the temperature increases, a specific volume of the sucked refrigerant is increased, so as to decrease the actual amount of the sucked refrigerant, thereby degrading the cooling capability.

[0006] Specifically, during a low speed operation of the compressor, the lack of oil pumped causes cooling refrigerant gas to be more recollected than oil, whereby the amount of refrigerant circulating in the refrigeration cycle is decreased. Accordingly, the cooling capability of the compressor is further degraded.

[0007] Therefore, in order to solve those problems of the related art compressor, an object of the present invention is to provide a compressor having an oil recollecting apparatus for recollecting oil separated from a refrigerant discharged from a compressing unit.

[0008] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a compressor having a compressor main body including a casing defining an inner space, a suction pipe connected to the casing, a discharge pipe connected to the casing, a motor located at the inner space of the casing, a compressing unit driven by the motor to compress a refrigerant, an oil separating unit configured to separate oil from the refrigerant discharged from the compressing unit, and an oil recollecting unit configured to pump the oil separated by the oil separating unit and recollect the separated oil into the compressor main body.

[0009] According to a different aspect of the present invention, there is provided a compressor having a casing having an inner space, a suction pipe connected to the casing, a discharge pipe connected to the casing, a motor located in the inner space of the casing to generate a driving force, a compressing unit driven by the motor to compress a refrigerant, an oil separating unit configured to separate oil from the refrigerant discharged out of the compressing unit, and an oil recollecting unit including an oil recollecting pump driven by a rotation force of the motor to pump oil separated by the oil separating unit.

[0010] According to yet another aspect of the present invention, there is provided a compressor having a casing having an inner space, a suction pipe connected to the casing, a discharge pipe connected to the casing, a motor located in the inner space of the casing to generate a driving force, a compressing unit driven by the motor to compress a refrigerant, an oil separating unit configured to separate oil from the refrigerant discharged out of the compressing unit, and an oil recollecting unit. The oil recollecting unit includes an oil recollecting pipe for connecting the oil separating unit to the casing and an oil recollecting pump cooperating with the oil recollecting pipe to pump oil separated by the oil separating unit.

[0011] Further scope of applicability of the present application will become more apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the invention, are given by way of illustration only.

[0012] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention. In the drawings:

[0013] Fig. 1 is a perspective view showing an outer appearance of a scroll compressor having an oil separating unit disposed outside a casing according to the present invention;

[0014] Fig. 2 is a longitudinal sectional view showing an inside of the scroll compressor of Fig. 1;

[0015] Fig. 3 is a perspective view showing an oil sup-

plying pump and an oil recollecting pump of Fig. 1;

[0016] Fig. 4 is a longitudinal sectional view showing another exemplary embodiment of the oil recollecting unit according to the present invention, and Fig. 4A is a detailed view of the inlets of the oil recollecting unit as designated by call-out A of Fig. 4;

[0017] Fig. 5 is a schematic view showing an inlet of the oil recollecting pump of Fig. 4;

[0018] Fig. 6 is a longitudinal sectional view showing another exemplary embodiment of a scroll compressor having an oil separating unit disposed outside a casing according to the present invention;

[0019] Fig. 7 is a longitudinal sectional view showing an exemplary embodiment of a scroll compressor having an oil separating unit disposed inside a casing according to the present invention;

[0020] Fig. 8 is a horizontal sectional view showing a fluid flowing state in an oil separating cap of Fig. 7; and

[0021] Fig. 9 is a longitudinal section view showing another exemplary embodiment of a scroll compressor having an oil separating unit disposed outside a casing according to the present invention.

[0022] Description will now be given in detail of the present invention, with reference to the accompanying drawings. Although the description of the present invention is given with reference to scroll compressors, the present invention is not limited to scroll compressors, but can be equally applied to other so-called hermetic compressors, such as rotary compressors, having a motor and a compressing unit disposed in the same casing.

[0023] Fig. 1 is a perspective view showing an outer appearance of a scroll compressor according to a first exemplary embodiment of the present invention where an oil separating unit is disposed outside a casing, Fig. 2 is a longitudinal sectional view showing an inside of the scroll compressor of Fig. 1, and Fig. 3 is a perspective view showing an oil supplying pump and an oil recollecting pump of Fig. 1

[0024] As shown in Figs. 1 to 3, the scroll compressor according to the present invention may include a compressor casing (hereinafter, referred to as 'casing') 10 having a hermetic inner space, a motor 20 located in the inner space of the casing 10, and a compressing unit 30 driven by the motor 20. The compressing unit 30 includes a fixed scroll 31 and an orbiting scroll 32 driven by the motor 20 to compress a refrigerant.

[0025] The inner space of the casing 10 is configured to hold a refrigerant at a suitable discharge pressure. A suction pipe SP is formed through one side of the casing 10 to be in communication with a suction chamber formed by the fixed scroll 31 and the orbiting scroll 32. A discharge pipe DP is connected to another side of the casing 10 to guide a refrigerant discharged out of the inner space of the casing 10 to a refrigeration cycle.

[0026] The motor 20 may be a constant speed motor rotating at a uniform speed, or an inverter motor rotating at variable speed depending on the needs of a refrigerating device to which the compressor is applied. A crankshaft 23 of the motor 20 is supported by a main frame 11 and a sub-frame 12 fixedly installed at both upper and lower ends of the casing 10.

[0027] An oil passage 23a is formed through the crankshaft 23 in an axial direction. An oil supplying pump 25 for pumping oil contained in the casing 10 is disposed below the oil passage 23a, in particular, below the crankshaft 23. A displacement pump may be used as the oil supplying pump 25 as shown in Fig. 2. An example of such a displacement pump includes a trochoid gear pump which forms a variable capacity between an inner gear and an outer gear so as to pump oil. An oil suction pipe 26 is connected to an inlet of the oil supplying pump 25 to suck oil located in a bottom of the casing 10. The oil suction pipe 26 has an inlet with a suitable length so as to extend into the oil contained at the bottom of the casing 10.

[0028] The compressing unit 30, as shown in Fig. 2, includes the fixed scroll 31 coupled to the main frame 11, the orbiting scroll 32 engaged with the fixed scroll 31 to provide a pair of compression chambers P which continuously move, an Oldham ring 33 disposed between the orbiting scroll 32 and the main frame 11 to induce the orbiting motion of the orbiting scroll 32, and a check valve 34 disposed to switch a discharge opening 31c of the fixed scroll 31 so as to block a backflow of discharge gas discharged through the discharge opening 31c. A fixed wrap 31a and an orbiting wrap 32a are spirally provided at the fixed scroll 31 and the orbiting scroll 32, respectively. The fixed wrap 31a and the orbiting wrap 32a are engaged with each other to form the compression chambers P. The suction pipe SP is directly connected to a suction opening 31b of the fixed scroll 31 for guiding a refrigerant from the refrigeration cycle into the compressor.

[0029] Operation of the compressor will be described with reference to the above configuration. When power is applied to the motor 20, the crankshaft 23 rotates together with a rotor 22 to forward such rotational force to the orbiting scroll 32. The orbiting scroll 32 receiving the rotational force applied is then orbited by the Oldham ring 33 on an upper surface of the main frame 11, thereby forming a pair of compression chambers P which are continuously moved between the fixed wrap 31a of the fixed scroll 31 and the orbiting wrap 32a of the orbiting scroll 32. Such compression chambers P are then moved to the center by the continuous orbiting motion of the orbiting scroll 32 such that their capacities decrease to thereby compress a sucked refrigerant. The compressed refrigerant is continuously discharged to an upper space S1 of the casing 10 through the discharge opening 31c of the fixed scroll 31 and then moved down to a lower space S2 of the casing 10, thereby being discharged into a refrigeration cycle system through the refrigerant discharge pipe DP. The compressed refrigerant may be moved from upper space S1 to lower space S2 using various approaches, such as, for example providing a passage (not shown) through the fixed scroll 31 and/or

main frame 11.

[0030] At the same time that the crankshaft 23 is rotated, the oil supplying pump 25 disposed below the crankshaft 23 pumps oil contained in the casing 10 using a variable capacity formed between the inner gear and outer gear of the oil supplying pump 25. Oil is sucked toward an upper end through the oil passage 23a of the crankshaft 23 and the oil is partially supplied to respective bearing surfaces of the sub-frame 12 and the main frame 11, and partially supplied to the compression chambers P through a bearing surface between the main frame 11 and the orbiting scroll 12 at the upper end of the crankshaft 23 so as to seal or smooth the compression chambers P.

[0031] An oil recollecting pump 52 coupled to the crankshaft 23 configured to operate in cooperation with the oil supplying pump 25 is also provided. The oil recollecting pump 52 pumps and recollects oil separated from a refrigerant discharged out of the compressing unit. A detailed description thereof will now be given.

[0032] As shown in Figs. 1 and 2, an oil separating unit 40 for separating oil from a refrigerant discharged into the refrigeration cycle through the discharge pipe DP is located at an outlet portion of the discharge pipe DP outside the casing 10. In addition, an oil recollecting unit 50 is connected to the oil separating unit 40. The oil recollecting unit 50 is configured to pump oil separated from a refrigerant by the oil separating unit 40 and to either recollect the separated oil in the inner space of the casing 10 (See Fig. 6) or to recollect such oil directly into the oil passage 23a of the crankshaft 23.

[0033] As shown in Figs. 1 and 2, the oil separating unit 40 may include an oil separator 41 disposed in parallel with one side of the casing 10, and an oil separating member (not shown) disposed at the oil separator 41 to separate oil from a refrigerant discharged from the compressing unit 30. The oil separator 41 may be supported by being connected to the discharge pipe DP at its middle portion or supported by a supporting member 42 (e.g., a clamp) separately disposed between the casing 10 and the oil separator 41. A refrigerant pipe RP is connected to an upper end of the oil separator 41 to allow the separated refrigerant to flow toward a condenser of the refrigeration cycle. An oil recollecting pipe 51 is connected to a lower end of the oil separator 41 such that oil separated by the oil separator 41 can be recollected into the casing 10 of the compressor or directly into the compressing unit 30 via the oil passage 23a.

[0034] The oil separating unit 40 may use various methods for separating oil. For example, a mesh screen may be installed inside the oil separator 41 to thereby separate oil from a refrigerant, or the discharge pipe DP may be connected to the oil separator 41 at an incline such that a refrigerant rotates in a form of cyclone to thereby separate relatively heavy oil from the refrigerant.

[0035] The oil recollecting unit 50 may include the oil recollecting pipe 51 connected to the oil separating unit 40 to guide oil, and an oil recollecting pump 52 installed at the oil recollecting pipe 51 to pump oil from the oil separator 41. One end of the oil recollecting pipe 51 is connected to the lower end of the oil separator 41, and the other end thereof penetrates through the casing 10 to be connected to an inlet of the oil recollecting pump 52. The oil recollecting pipe 51 may be a metallic pipe having a suitable strength so as to stably support the oil separator 41. Also, the oil recollecting pipe 51 may be curved through an angle so that the oil separator 41 is oriented parallel with the casing 10, thus to reduce a vibration of the compressor.

[0036] The oil recollecting pump 52 may be installed above or below the oil supplying pump 25 to be driven by a driving force from the motor 20. For example, as shown in Fig. 3, the oil recollecting pump 52 may be a trochoid gear pump in which an inner gear is coupled to the crankshaft 23 of the motor 20 and the inner gear is engaged with an outer gear to provide a variable capacity. An outlet of the oil recollecting pump 52 is in communication with an outlet of the oil supplying pump 25 such that oil recollected through the oil recollecting pump 52 can be introduced into the oil passage 23a of the crankshaft 23 together with oil sucked through the oil supplying pump 25. In some cases, the outlet of the oil recollecting pump 52 and the outlet of the oil supplying pump 25 may be independently formed to allow oils from each of them to be independently introduced into the oil passage 23a of the crankshaft 23.

[0037] In the scroll compressor according to this exemplary embodiment, the oil separator 41 separates oil from a refrigerant discharged out of the inner space of the casing 10. Such separated oil is recollected into the inner space of the casing 10 via the oil recollecting pump 52, or may be directly be supplied into the oil passage 23a of the crankshaft 23. For example, oil introduced into the compression chamber P is discharged together with a refrigerant to be introduced into the oil separator 41 via the discharge pipe DP. Such oil and refrigerant are separated from each other in the oil separator 41. The separated refrigerant then flows up to a condenser of the refrigeration cycle via the refrigerant pipe RP whereas the separated oil is collected at the bottom of the oil separator 41. As the crankshaft 23 of the motor 20 rotates, the inner gear of the oil recollecting pump 52 rotates so as to configure a variable capacity between the inner gear and the outer gear, thereby generating a pumping force. The oil separated by the oil separator 41 is pumped by such pumping force. The oil pumped by the oil recollecting pump 52 is recollected into the inner space of the casing 10 through the oil recollecting pipe 51 and the oil recollecting pump 52. Such recollected oil is accordingly re-supplied to each bearing surface and the compression chamber P by the oil supplying pump 52 via the oil passage 23a of the crankshaft 23. This process may be continuously repeated as the crankshaft 23 rotates.

[0038] An oil supplying hole 14 for injecting oil into the inner space of the casing 10 may be formed at a lower portion of the casing 10. When a plurality of compressors

are used, the oil supplying hole 14 may be used as an oil equalizing hole to place the plurality of compressors in communication with each other in order to match liquid-level heights of each of the compressors.

[0039] While the first exemplary embodiment of the compressor includes an oil supplying pump, a second exemplary embodiment is provided where a single oil recollecting pump is used to perform the function of the oil supplying pump. For example, the second exemplary embodiment of the scroll compressor may be implemented as follows. As shown in Figs. 4 and 5, the oil recollecting pump 52, which may be a trochoid gear pump, is installed below the crankshaft 23, and a first inlet 52a of the oil recollecting pump 52 is connected to an outlet of the oil recollecting pipe 51 while a second inlet 52b of the oil recollecting pump 52 is sunk in oil collected at the bottom of the casing 10.

[0040] The scroll compressor in accordance with this exemplary embodiment is similar to that of the aforesaid embodiment in the basic configuration and operations, and accordingly a detailed description thereof will not be repeated. However, the inlet of the oil recollecting pump 52 is divided into the first inlet 52a and the second inlet 52b. Accordingly, oil separated by the oil separator 41 is sucked through the first inlet 52a while oil collected at the bottom of the casing 10 is sucked through the second inlet 52b. Such oils sucked through the first and second inlets 52a and 52b are all collected into the oil passage 23a of the crankshaft 23 to be supplied to each bearing surface or the compression chamber P.

[0041] Still another embodiment of a scroll compressor according to the present invention will be described hereafter. While the aforementioned exemplary embodiments are configured such that the oil recollecting pump is installed inside the casing or coupled to the motor to use the driving force of the motor, a third exemplary embodiment of the scroll compressor, as shown in Fig. 6, is configured such that an oil recollecting pump 152 of an oil recollecting unit 150 is installed outside the casing 10, and is driven by a separate driving force, other than the driving force of the motor. To this end, the oil recollecting pump 152 is installed at an intermediate portion of the oil recollecting pipe 151 at the outside of the casing 10, and an inverter motor having a rotation velocity, which can be changed (increase or decrease), in proportion to the rotation velocity of the motor 20 is provided. The oil recollecting pipe 151 may have an outlet which is directly connectable to the oil passage 23a of the crankshaft 23, however, in some cases, it may be connected to the inner space of the casing 10. As shown in this exemplary embodiment, when the oil recollecting pipe 151 is in communication with the inner space of the casing 10 instead of directly with the oil passage 23a, foreign materials contained in the oil may be filtered upward in the inner space of the casing 10 so as to prevent contamination of the oil supplied to each bearing surface or the compression chambers P.

[0042] According to yet another exemplary embodiment of the present invention, the oil separating unit may be located at the inside of the casing of the compressor. For example, as shown in Fig. 7, an oil separating unit 240 may include an oil separating cap 241 fixedly installed in the inner space of the casing 10 and an oil separating pipe 242 formed through one side wall surface of the oil separating cap 241 such that oil and refrigerant inside the casing 10 can be separated from each other while being introduced into the oil separating cap 241. The oil separating cap 241 may have a gap spaced apart from the inner surface of the casing 10.

[0043] A guide cover 15 having a certain inner space to accommodate a discharge side of the compressing unit 30 is installed between the compressing unit 30 and the oil separating unit 240. An inlet side fluid passage (not shown) is formed at a portion of the compressing unit 30 which is accommodated in the guide cover 15, whereas an outlet side fluid passage (not shown) is formed at a portion of the compressing unit 30 which is not accommodated in the guide cover 15. Accordingly, refrigerant and oil discharged from the compression chamber P is allowed to flow toward a lower space S2 of the casing 10, namely, toward the motor 20 and then to flow toward an upper space S1 of the casing 10, in particular, toward the oil separating cap 241.

[0044] The discharge pipe DP for guiding the refrigerant separated by the oil separating cap 241 to the refrigeration cycle is connected to another side wall surface of the oil separating cap 241. The discharge pipe DP is then connected to the refrigeration cycle through the casing 10. An oil recollecting pipe 251 for guiding oil separated by the oil separating cap 241 to the bottom of the casing 10 is connected to a lower end of the oil separating cap 241. An oil recollecting pump 252 for pumping oil separated by the oil separating cap 241 is located at an outlet of the oil recollecting pipe 251.

[0045] The oil separating pipe 242 includes an inlet in communication with the upper space S1 of the casing 10 and an outlet in communication with the inner space of the oil separating cap 241. The oil separating pipe 242 may be formed to be curved or bent, as shown in Fig. 8, such that refrigerant and oil guided into the oil separating cap 241 are separated from each other while spirally orbiting together.

[0046] The inlet of the oil recollecting pipe 251, as shown in Fig. 7, is in communication with the lower end of the oil separating cap 241 and then penetrates through the compressing unit 30, thereby being in communication with the inlet of an oil supplying pump 252. In this configuration, an oil passage (not shown) for connecting the oil separating cap 241 to the oil recollecting pipe 251 is formed through the fixed scroll 31 and the main frame 11.

[0047] The oil recollecting pump 252 may be a trochoid gear pump having inner gear and outer gear as described above. In particular, the inner gear may be configured as same as in the aforementioned embodiments, such as being coupled to the crankshaft 23 of the motor 20.

[0048] In general, the operation of this exemplary em-

bodiment of the present invention, the process in which oil is separated from the refrigerant to be recollected is the same or similar to those described above, so a detailed explanation thereof will not be repeated. However, because the oil separating unit 240 is installed inside the casing 10, the flow direction of the refrigerant and oil is different from that in the previous embodiments. That is, refrigerant and oil, after being discharged from the compression chamber P into the inner space of the guide cover 15, flow to the lower space S2 via the inlet side fluid passage. Thereafter, the refrigerant and oil flow to the upper space S 1 through the outlet side fluid passage. The refrigerant and oil are then introduced into the oil separating cap 241 through the oil separating pipe 242 to orbit inside the oil separating cap 241. Accordingly, the refrigerant and the oil are separated from each other. Afterwards, the separated refrigerant then flows to the refrigeration cycle through the discharge pipe DP whereas the separated oil is recollected to the oil passage 23a of the crankshaft 23 through the oil recollecting pipe 251 by a pumping force of the oil recollecting pump 252. This process may be continuously repeated as the crankshaft 23 rotates.

[0049] In still another exemplary embodiment of the present invention, as shown in Fig. 9, the scroll compressor may be configured to draw the oil recollecting pipe 251 out of the casing 10 to be then connected to the inside of the casing 10. In this case, a radiating member (not shown) or a capillary tube (not shown) for lowering an oil temperature may be provided at the intermediate portion of the oil recollecting pipe 251. When the oil recollecting pipe 251 is connected to the casing 10 from the outside of the casing 10, an outlet of the oil recollecting pipe 251 may be connected to a wall surface of the casing 100 so as to be in communication with the lower space S2 of the casing 10. An oil recollecting pump 252 may include an inverter motor as described above with reference to Fig. 6, and may be located at the intermediate portion of the oil recollecting pipe 251.

[0050] As a result of one or more of the exemplary embodiments, oil separated by the oil separator is recollected by the oil recollecting pump. The recollected oil is mixed with a refrigerant again, whereby it is allowed to prevent a backflow of such oil into the compressor. Accordingly, the reduction of the amount of refrigerant circularly supplied into the refrigeration cycle can be avoided, thereby preventing a degradation of a cooling capacity of the compressor beforehand. Also, the simplification of the oil recollecting unit allows the decrease of manufacturing cost. In addition, as the driving force of the motor may be used to drive the oil recollecting pump, the configuration of the compressor can be further simplified.

[0051] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

Claims

1. A compressor comprising:

a compressor main body including a casing defining an inner space;
a suction pipe connected to the casing;
a discharge pipe connected to the casing;
a motor installed at the inner space of the casing;
a compressing unit driven by the motor to compress a refrigerant;
an oil separating unit configured to separate oil from the refrigerant discharged from the compressing unit; and
an oil recollecting unit configured to pump the oil separated by the oil separating unit and recollect the separated oil into the compressor main body.

2. The compressor of claim 1, wherein the oil recollecting unit includes an oil recollecting pump driven by a rotation force of the motor to pump oil separated by the oil separating unit.

3. The compressor of claim 2, wherein the motor includes a crankshaft,
wherein the oil recollecting pump includes:

an inner gear coupled to the crankshaft of the motor;
an outer gear engaged with the inner gear to generate a variable capacity; and
an inlet to receive oil separated by the oil separating unit.

4. The compressor of claim 2 or 3, wherein the oil recollecting pump includes a first inlet connected to the oil separating unit and a second inlet in communication with the inner space of the casing.

5. The compressor of claim 4, wherein the crankshaft of the motor includes an oil passage located therein, the oil passage extending in an axial direction of the crankshaft, and
wherein the oil recollecting pump includes an outlet in communication with the first and second inlets, the outlet being in communication with the oil passage located in the crankshaft.

6. The compressor of any of claims 2 to 5, further comprising an oil supplying pump disposed at one side of the oil recollecting pump,
wherein the motor includes a crankshaft, and the oil

supplying pump is coupled to the crankshaft of the motor to rotate together with the oil recollecting pump, thereby pumping oil contained in the casing.

7. The compressor of claim 6, wherein the oil supplying pump includes an inlet and an outlet, the oil recollecting pump includes an inlet and an outlet, and the inlet and outlet of the oil supplying pump are arranged independent of the inlet and outlet of the oil recollecting pump.

8. The compressor of any of claims 1 to 7, wherein the oil recollecting unit includes an oil recollecting pump disposed at an intermediate portion of the oil recollecting pipe to pump oil separated by the oil separating unit.

9. The compressor of claim 8, wherein the oil recollecting pipe has an outlet in communication with the inner space of the casing.

10. The compressor of claim 9, wherein the motor includes a crankshaft and the oil recollecting pipe includes an outlet, the compressor further comprising:

an oil supplying pump having an inlet, the oil supplying pump being located at the crankshaft to pump oil contained in the casing while rotating together with the crankshaft,
and the outlet of the oil recollecting pipe being connected to the inlet of the oil supplying pump.

11. The compressor of claim 9, wherein the oil recollecting pump includes an inverter motor such that a pumping amount is variable in proportion to a rotation velocity of the motor.

12. The compressor of at least one of claims 1 to 11, wherein the oil separating unit is located outside of the casing of the compressor main body, the oil separating unit having an inlet connected to the compressor main body via the discharge pipe and an outlet connected to the compressor main body via the oil recollecting pipe.

13. The compressor of at least one of claims 1 to 11, wherein the oil separating unit is located inside the casing of the compressor main body.

14. The compressor of claim 12 or 13, wherein the oil recollecting unit includes an oil recollecting pipe located inside the casing of the compressor main body to guide oil separated by the oil separating unit.

15. The compressor of claim 12 or 13, wherein the oil recollecting unit includes an oil recollecting pipe located outside the casing of the compressor main body to guide oil separated by the oil separating unit.

FIG. 1

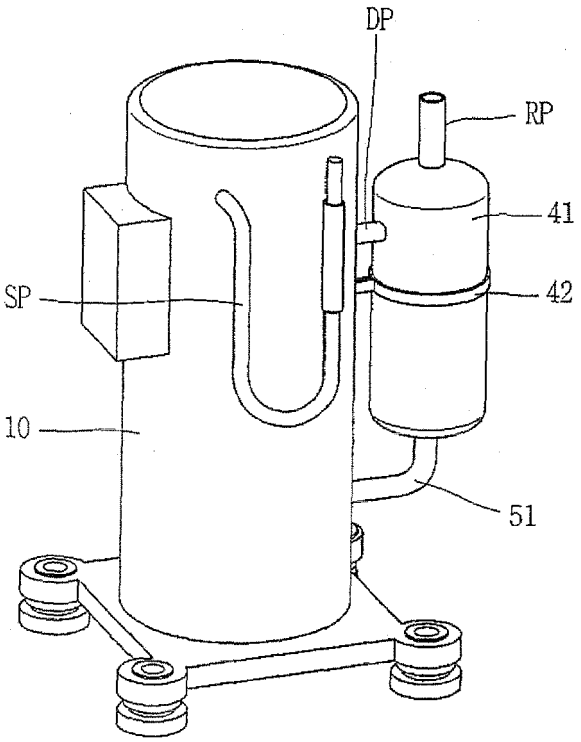
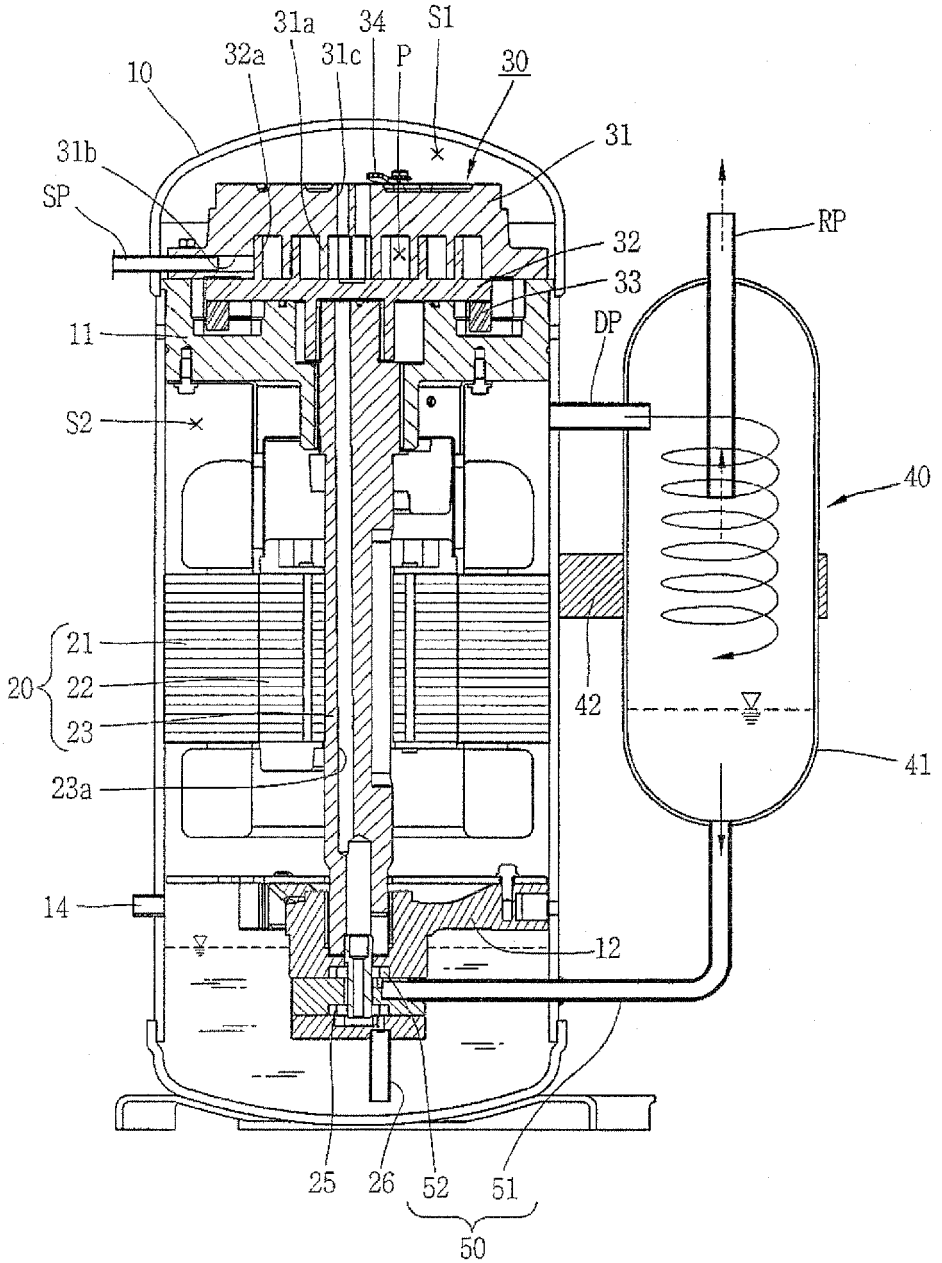


FIG. 2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33
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DP
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51
50

FIG. 3

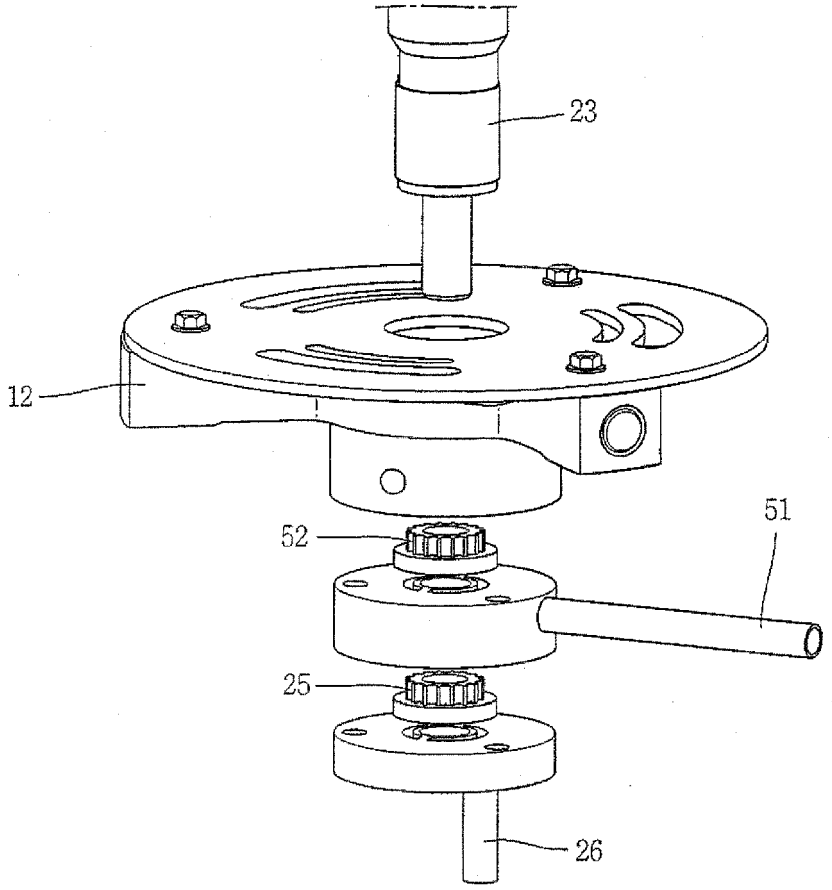


FIG. 4

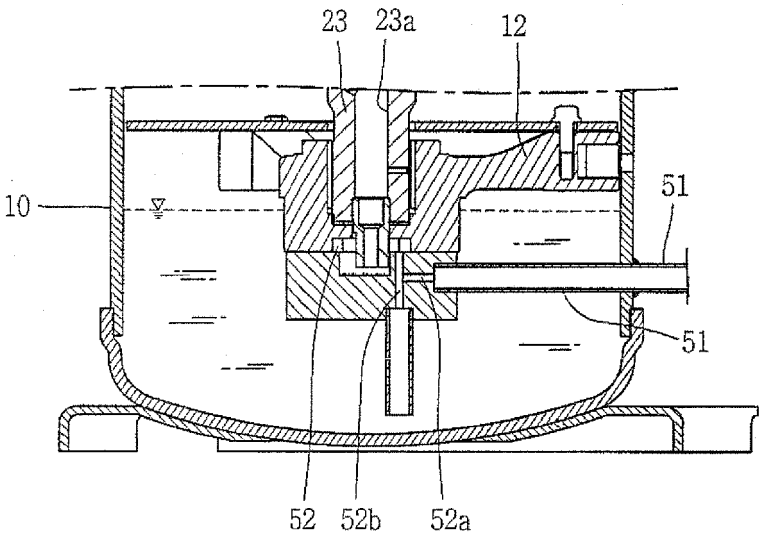


FIG. 4A

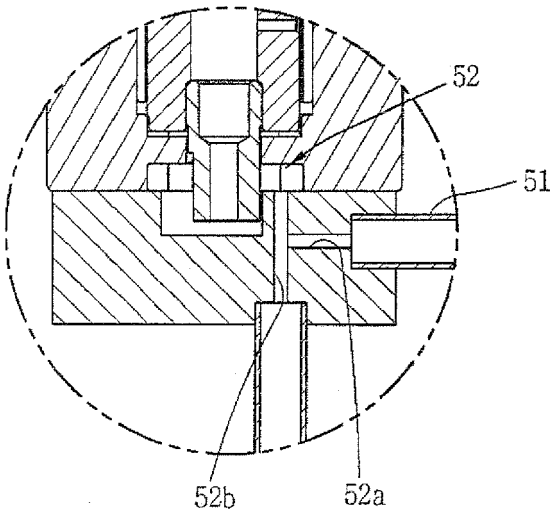


FIG. 5

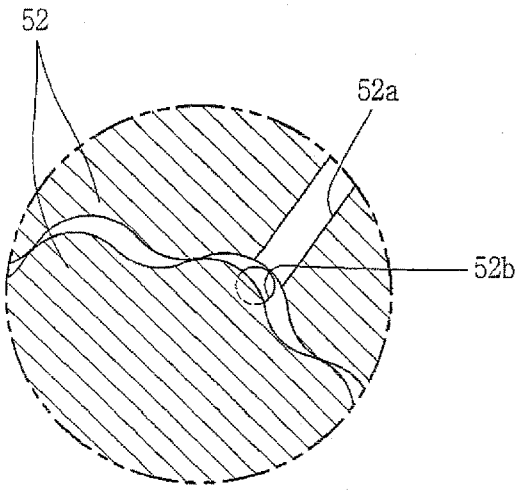


FIG. 6

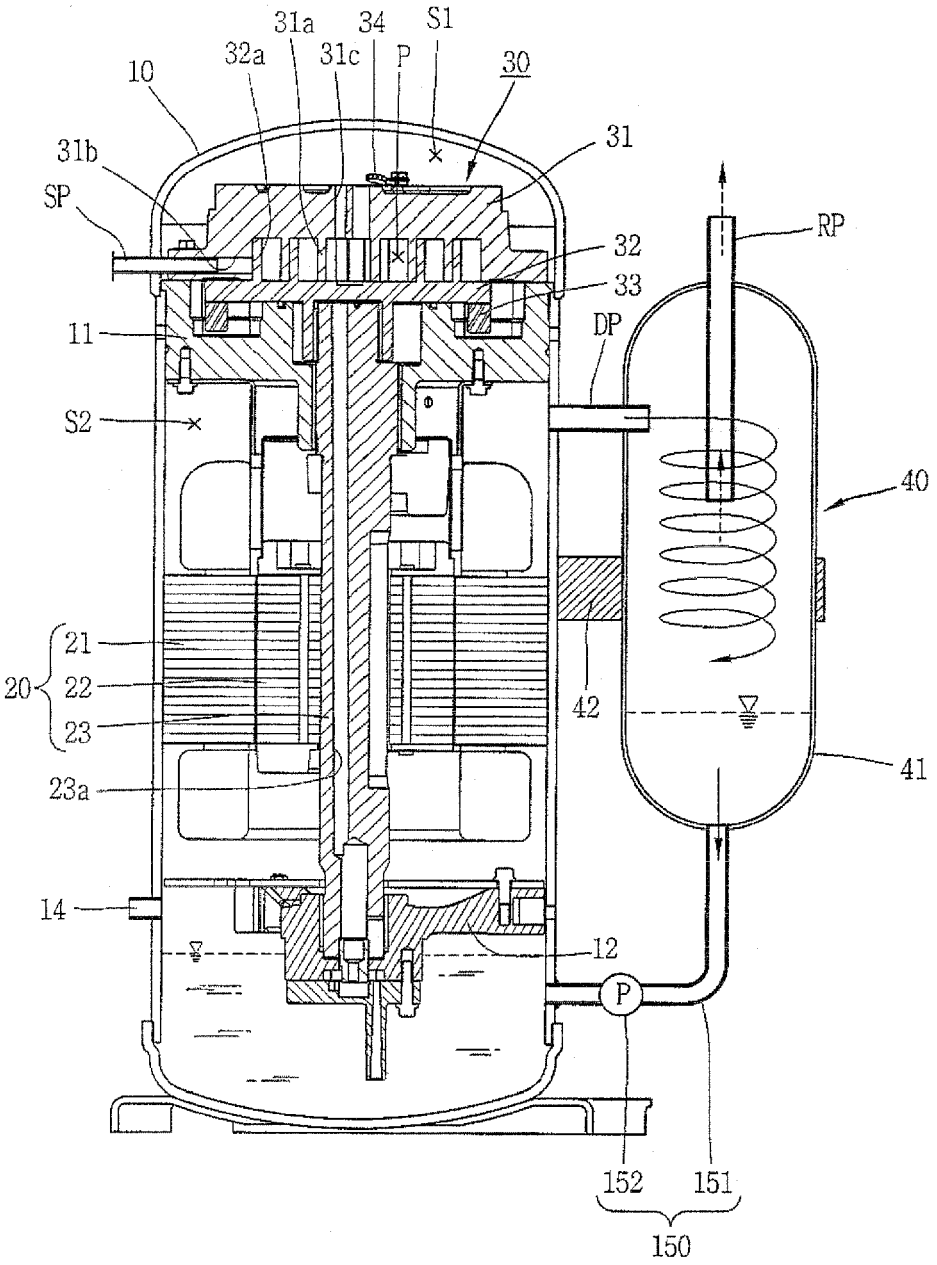

31a
34
S1
32a
31c
P
30
10
31
31b
SP
RP
32
33
11
DP
S2
40
21
20
22
23
42
41
23a
14
12
P
152
151
150

FIG. 7

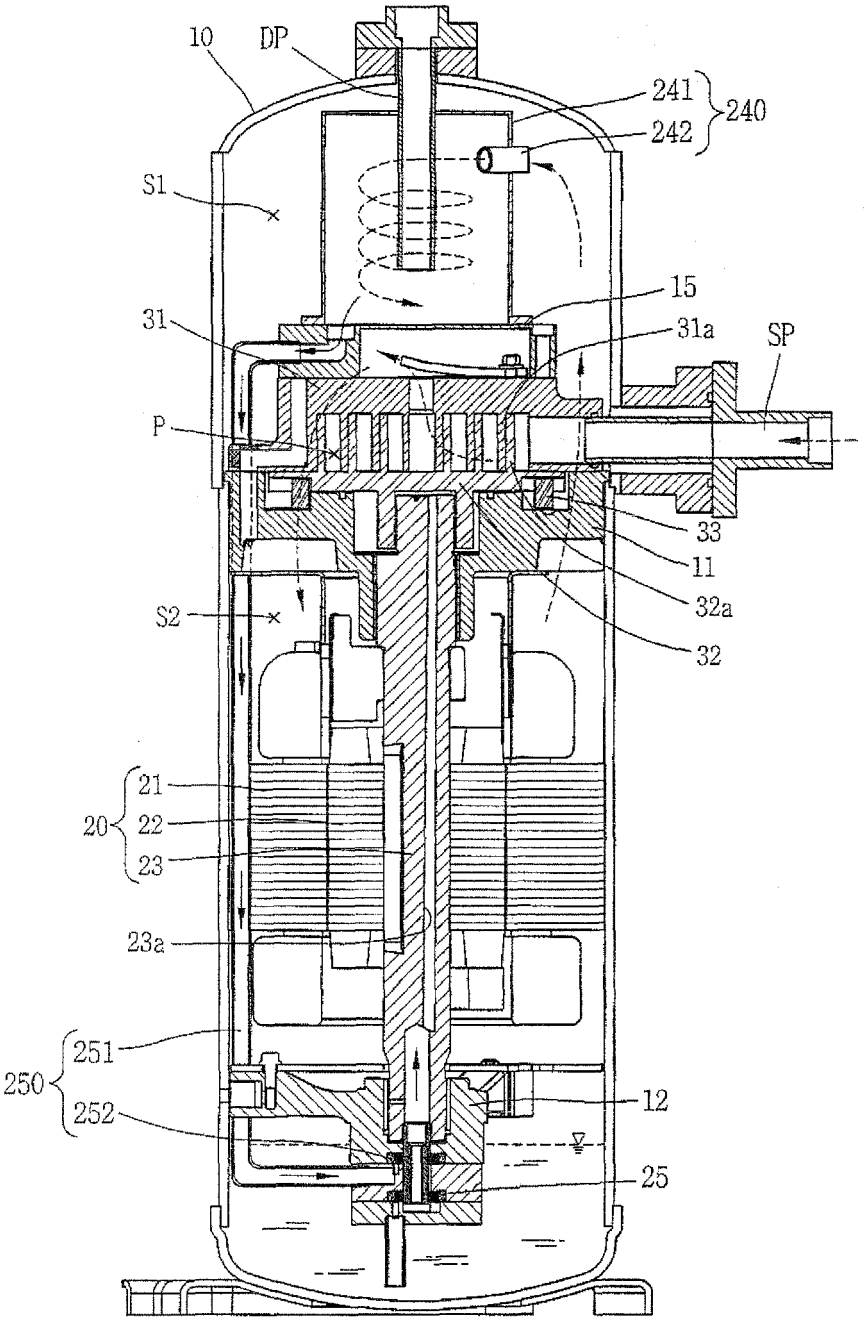

10
DP
241
240
242
S1
15
31
31a
SP
P
33
11
32a
S2
32
21
20
22
23
23a
251
250
252
12
25

FIG. 8

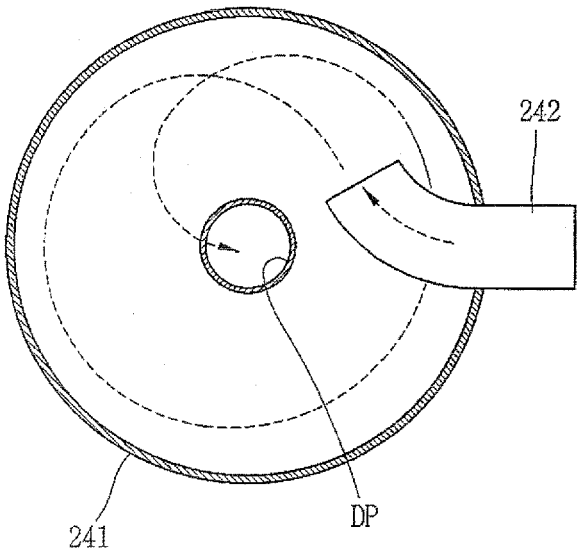
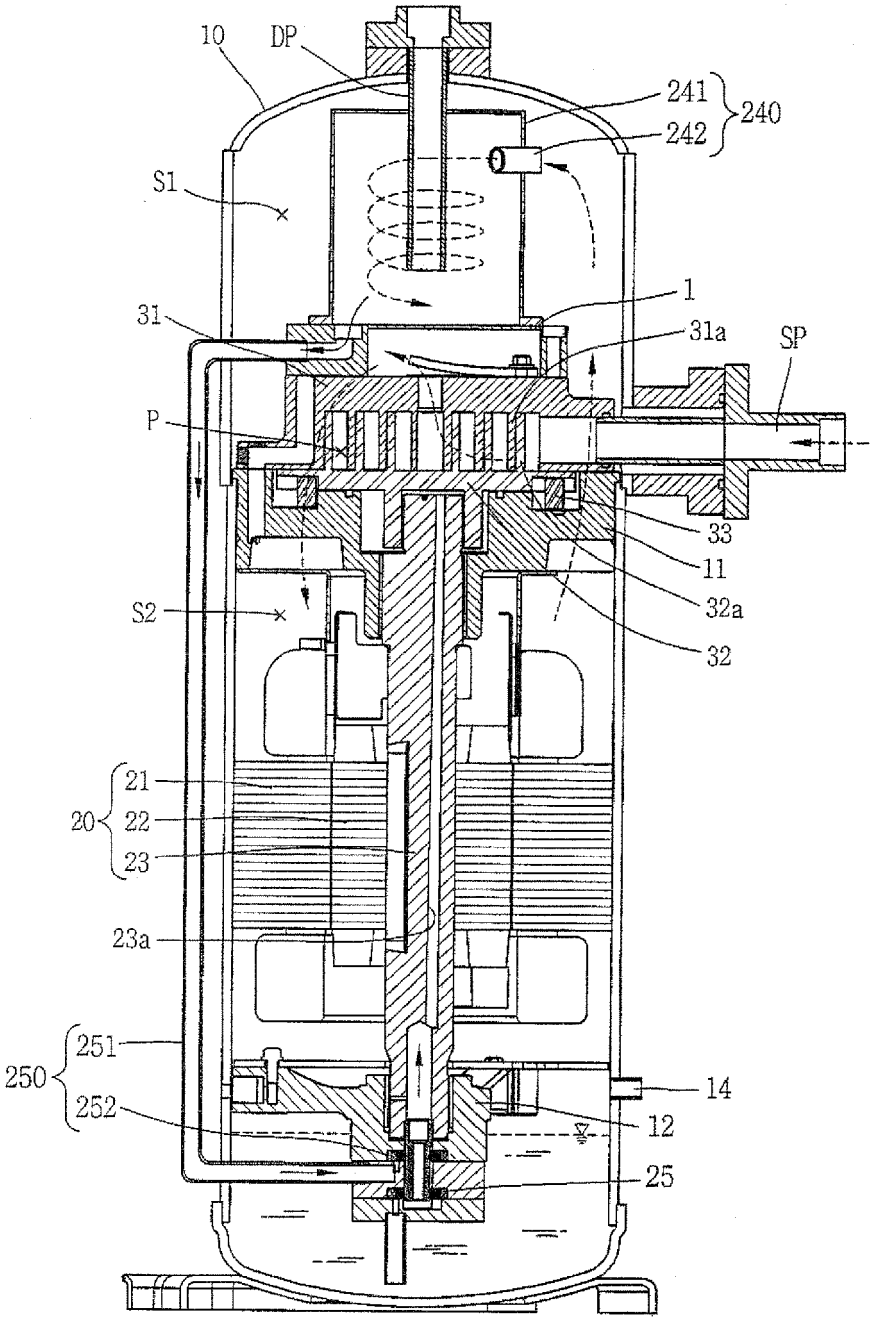


FIG. 9


10
DP
241
240
242
S1
1
31
31a
SP
P
33
11
32a
S2
32
21
20
22
23
23a
251
250
252
14
12
25