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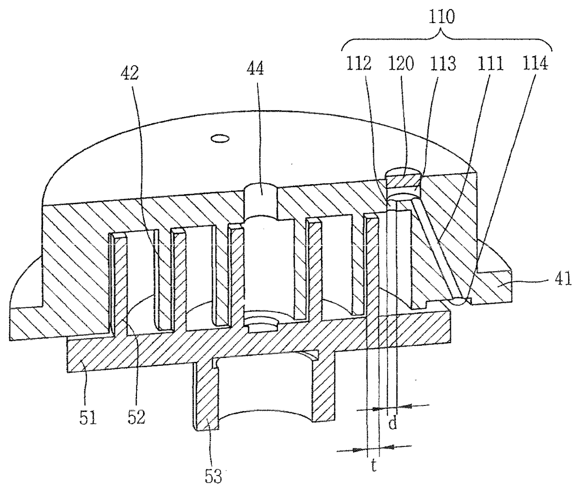
(54) **Scroll compressor and refrigerating machine having the same**

(57) A scroll compressor and a refrigerating machine including the scroll compressor are provided. An oil supply channel may be formed in a fixed scroll of the compressor so as to provide for communication between a back pressure chamber and compression chambers formed between the fixed scroll and an orbiting scroll. The oil supply channel enables oil to be smoothly introduced from the back pressure chamber into each compression chamber, so that frictional losses and refrigerant leakage in the compression chambers may be effectively prevented, and efficiency of the compressor and the refrigerating machine including the compressor may be enhanced.

FIG. 2



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Description

[0001] A scroll compressor is provided that is capable of allowing oil to be smoothly introduced into compression chambers.

[0002] In general, a scroll compressor compresses refrigerant gas by varying a volume of a compression chamber formed by a pair of inter-engaged scrolls. The scroll compressor provides high efficiency, low vibration and noise, small size and light weight, as compared to a reciprocating compressor or a rotary compressor, and thus may be widely used in numerous applications, such as, for example, air conditioners. Improvements in the supply of oil to frictional areas of these types of compressors would further enhance reliability and efficiency of both the compressor and the end application in which it is installed.

[0003] According to a first aspect, the invention provides a scroll compressor, comprising a casing that defines an interior space; a frame provided in the interior space of the casing; a fixed scroll fixed to the frame; an orbiting scroll positioned between the frame and the fixed scroll, wherein the fixed scroll comprises a fixed wrap that extends toward the orbiting scroll and the orbiting scroll comprises an orbiting wrap that extends toward the fixed scroll such that the fixed wrap and the orbiting wrap are inter-engaged so as to form compression chambers therebetween; a back pressure chamber defined by a portion of the orbiting scroll, a portion of the fixed scroll, and a recess formed in the frame; and at least one fluid supply channel formed in the fixed scroll so as to connect the back pressure chamber and at least one of the compression chambers.

[0004] The back pressure chamber is preferably defined by an outer peripheral edge of the orbiting scroll, a portion of a lower surface of the orbiting scroll adjacent to the outer peripheral edge thereof, a portion of a lower surface of the fixed scroll, and the recess which is formed in an upper surface of the frame.

[0005] The at least one fluid supply channel preferably comprises a first communicating groove formed in an upper surface of the fixed scroll; a first channel hole that extends at an incline from a lower portion of the fixed scroll corresponding to the back pressure chamber to the communicating groove; and a second channel hole that extends from the communicating groove to the at least one compression chamber of the compression chambers. Preferably, the scroll compressor further comprises a shielding member that isolates the communicating groove from the interior space formed in the casing. According to a further preferred embodiment, the first communicating groove comprises a substantially circular recess formed in the upper surface of the fixed scroll, and the shielding member comprises a bolt coupled to the fixed scroll and a washer positioned between the bolt and the fixed scroll.

[0006] The shielding member is preferably press fit into the first communicating groove so as to provide a seal between the first communicating groove and the interior space formed in the casing

[0007] The second channel hole is preferably positioned radially inward from the first channel hole in the fixed scroll, and wherein the first channel hole extends at an incline from a lower outer peripheral portion of the fixed scroll toward the first communicating groove and the second channel hole. More preferably, the second channel hole extends downward from the first communicating groove so as to alternately communicate with the at least one compression chamber.

[0008] The scroll compressor preferably further comprises a second communicating groove formed in a lower surface of the fixed scroll and extending into a bearing surface between the fixed scroll and the orbiting scroll, wherein the second communicating groove directs fluid from the back pressure chamber into the first channel hole. The second communicating groove preferably extends radially along the lower surface of the fixed scroll, and wherein a cross section of the second communicating groove is greater than a cross section of the first channel hole.

[0009] According to a further preferred embodiment, a thickness of the at least one fluid supply channel is less than or equal to a thickness of the orbiting wrap.

[0010] It is also preferred that the fluid supply channel conveys fluid comprising oil, refrigerant or a combination thereof between the back pressure chamber and the at least one compression chamber.

[0011] According to a further preferred embodiment, a first pressure at a contact area between the fixed scroll and the orbiting scroll is greater than a second pressure at a contact area between the orbiting scroll and the frame, and a third pressure in the back pressure chamber is between the first pressure and the second pressure.

[0012] Preferably, the fixed wrap and the orbiting wrap are symmetrical, with compression chambers formed therebetween such that fluid is supplied alternately to a first compression chamber and a second compression chamber through the fluid supply channel.

[0013] According to a further aspect, the invention provides a refrigerating apparatus, comprising: a compressor; a condenser coupled to a discharge side of the compressor; an expander coupled to the condenser; and an evaporator coupled to the expander and to a suction side of the compressor, wherein the compressor is configured according to the first aspect.

[0014] The embodiments will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

[0015] FIG. 1 is a partial cross-sectional view of a scroll compressor as embodied and broadly described herein;

[0016] FIG. 2 is a disassembled view of a compression part of the scroll compressor shown in FIG. 1;

[0017] FIG. 3 is an enlarged view of an oil supply channel that may be provided in the scroll compressor shown in FIG. 1;

[0018] FIG. 4 is a cross-sectional view of another oil supply channel that may be provided in the scroll compressor shown in FIG. 1;

[0019] FIG. 5 is a lower view of a second communicating groove which may be provided in the scroll compressor shown in FIG. 1;

[0020] FIG. 6 is a cross-sectional view showing an oil supply channel in communication with a back pressure chamber during an orbiting motion of an orbiting scroll in the scroll compressor shown in FIG. 1;

[0021] FiG. 7 is a schematic view of an exemplary air conditioner including the scroll compressor shown in FIG. 1; and

[0022] FIG 8 is a schematic view of an exemplary refrigerating cycle.

[0023] Scroll compressors may be classified into a high pressure type scroll compressor and a low pressure type scroll compressor based on how refrigerant is supplied to a compression chamber. That is, the low pressure type scroll compressor is configured such that a refrigerant is indirectly introduced in the compression chamber via an inner space of a casing, and thus the inner space of the casing is divided into a suction space and a discharge space. On the other hand, the high pressure type scroll compressor is configured such that a refrigerant is directly supplied into the compression chamber without flowing through the inner space of the casing, and is then discharged into the inner space of the casing, and thus substantially all of the inner space of the casing serves as a discharge space.

[0024] Scroll compressors may also be classified as either a high pressure type scroll compressor or a low pressure type scroll compressor based on how the compression chamber is sealed. That is, in the low pressure type scroll compressor, as a large part of the inner space of the casing is configured as a suction space, a tip chamber may be disposed at an end of a pair of wraps that form the compression chamber, and the tip chamber rises in response to pressure of the compression chamber so as to seal the compression chamber. On the other hand, in the high pressure type scroll compressor, as the majority of the inner space of the casing serves as a discharge chamber, a rear surface of an orbiting scroll may be supported by high pressure refrigerant and oil contained in the discharge space, and accordingly the orbiting scroll may be closely adhered to a fixed scroll, so as to seal the compression chamber.

[0025] To this end, the high pressure type scroll compressor may include a back pressure groove formed at a frame on which the orbiting scroll is placed, and may define a back pressure chamber by covering an upper side and inner circumferential surface of the back pressure groove with the fixed scroll and the orbiting scroll, respectively. Oil contained in a bottom of the casing may be supplied to the back pressure chamber so as to support the orbiting scroll and provide lubrication as appropriate.

[0026] However, when oil is not smoothly supplied to the back pressure chamber, the orbiting scroll is spaced apart from the fixed scroll, and refrigerant may leak from the compression chamber, thus lowering compressor efficiency. In addition, during low speed operation, oil is not smoothly drawn from the bottom of the casing, and thus an amount of oil supplied to the back pressure chamber may be insufficient. As a result, the oil in the back pressure chamber may not stably support the orbiting scroll, thus increasing the amount of refrigerant leaked out of the compression chamber, and further lowering compressor efficiency.

[0027] On the other hand, during a high speed operation, an excessive amount of oil may be supplied to the back pressure chamber, thus excessively pushing the orbiting scroll up and causing contact between a bearing surface of the fixed scroll and the orbiting scroll that impedes oil supply to the compression chamber. As a result, an oil shortage is caused in the compression chamber, which causes an increase in frictional losses. Furthermore, refrigerant may leak from side wall surfaces between the wraps, thereby lowering the compressor efficiency.

[0028] The high pressure type scroll compressor shown in FIG. 1 may include a casing 10 that forms a hermetic inner space, a main frame 20 and a sub frame (not shown) respectively fixed to upper and lower portions of the inner space of the casing 10, a driving motor 30 provided between the main frame 20 and the sub frame, a fixed scroll 40 fixed to an upper surface of the main frame 20 and directly coupled to a gas suction pipe SP, and an orbiting scroll 50 provided on the upper surface of the main frame 20. Compression chambers P may be formed through inter-engagement of the orbiting scroll 50 with the fixed scroll 40, and an Oldham ring (not shown) may be installed between the orbiting scroll 50 and the main frame 20 to allow orbiting motion of the orbiting scroll 50 and simultaneously prevent rotation of the orbiting scroll 50. A sealing member 60 may be disposed between the orbiting scroll 50 and the main frame 20 to block a flow of oil.

[0029] The hermetic inner space of the casing 10 may be divided into an upper space S1 and a lower space S2 by the main frame 20 and the fixed scroll 40. The upper space S1 and the lower space S2 may both be maintained in a high pressure state, and oil may be contained at the bottom of the lower space S2 of the casing 10. The gas suction pipe SP may be coupled to the upper space S1 of the casing 10 and penetrate therethrough, and a gas discharge pipe DP may be coupled to the lower space S2 of the casing 10.

[0030] A shaft receiving hole 21 may be formed through the center of the main frame 20, and an oil pocket 22 may be formed at an upper end portion of the shaft receiving hole 21 to receive oil drawn upward through the driving shaft 32. A back pressure groove 23 may be formed at an edge of the upper surface of the main frame 20. The back pressure groove 23 may define a back pressure chamber S3 in which refrigerant and oil may be mixed at an intermediate pressure. An annular sealing groove (not shown) having the sealing member 60 inserted therein may be formed inside the back pressure groove 23 to seal the oil pocket 22 and maintain high pressure.

[0031] The driving motor 30 may include a stator 31 fixed to an inside of the casing 10 to receive power from an external source, a rotor (not shown) disposed in the stator 31 that rotates in cooperation with the stator 31, and a driving shaft 32 coupled to the rotor to transfer a rotational force of the driving motor 30 to the orbiting scroll 50. An oil passage 32a may be formed through the driving shaft 32 in an axial direction, and an oil pump (not shown) may be installed at a lower end of the oil passage 32a to draw oil from the bottom of the lower space S2 up into the oil passage 32a.

[0032] The fixed scroll 40 may include fixed wraps 42 spirally formed at a lower surface of a plate portion 41 of the fixed scroll 40 so as to form a pair of compression chambers P. An inlet 43 in direct communication with the gas suction pipe SP may be formed at a side surface of the plate portion 41. An outlet 44 through which a compressed refrigerant may be discharged to the upper space S1 of the casing 10 may be formed in the plate portion 41 at a center of an upper surface thereof. An oil supply channel 110 through which the compression chambers P may communicate with the back pressure chamber S3 may be formed between two wraps 42 on the fixed scroll 40 that form the compression chambers P at a lower surface of the plate portion 41, namely, at a surface that forms a thrust bearing surface together with the orbiting scroll 50.

[0033] The oil supply channel 110, as shown in FIGS. 2 to 4, may include a first channel hole 111 that communicates with the back pressure chamber S3, a second channel hole 112 that communicates with the compression chambers P and a first communicating groove 113 that is formed as a recess in an upper surface of the fixed scroll 40 having a certain depth and extending in an axial direction so as to provide for communication between the first channel hole 111 and the second channel hole 112.

[0034] The first and second channel holes 111 and 112 and the first communicating groove 113 are configured to form one passage. This one passage may alternately communicate with the pair of compression chambers P. That is, one second channel hole 111 may be located in the middle of a pair of adjacent fixed wraps 42. In order to prevent refrigerant from leaking from inside of the compression chambers P to outside of the compression chambers P due to pressure difference, an internal diameter d of the second channel hole 112 may be formed not to be greater than a thickness t of a wrap 52 of the orbiting scroll 50.

[0035] The first and second channel holes 111 and 112 may have substantially the same diameter such that a diameter of the first communicating groove 113 cannot become too wide. In certain embodiments, the first channel hole 111 may be formed to be parallel with the second channel hole 112. However, in alternative embodiments, as shown in FIGS. 2 to 4, an upper end of the first channel hole 111 may be inclined toward the second channel hole 112, which prevents the diameter of the first communicating groove 113 from being enlarged, thus facilitating fabrication and providing for steadier oil lifting.

[0036] The first communicating groove 113 may be recessed by a certain depth from the upper surface of the fixed scroll 40 to an area where the first and second channel holes 111 and 112 are connected to each other. Also, to allow the first channel hole 111 to communicate with the second channel hole 112, a width of the first communicating groove 113 may be greater than at least the whole cross section of the first and second channel holes 111 and 112.

[0037] A shielding member 120 may be coupled to the first communicating groove 113. The shielding member 120 may be inserted from the upper end of the first communicating groove 113 to a certain depth so as to separate the first communicating groove 113 from the inner space. The shielding member 120, as shown in FIGS. 2 and 3, may be formed of a relatively elastic non-ferrous metal so as to be press-fitted into and seal the first communicating groove 113. Alternatively, as shown in FIG. 4, the shielding member 120 may be coupled to the first communicating groove 113 to a certain depth using a threaded fastener, such as, for example, a metallic bolt. As shown in FIG. 4, a sealing washer 121 may be inserted at a head portion of the metallic bolt and coupled to the first communicating groove 113 for sealing.

[0038] A second communicating groove 114 may be provided at an opposite end of the first channel hole 111. The second communicating groove 114, as shown in FIG. 5, may be formed at a bearing surface between the fixed scroll 40 and the orbiting scroll 50, and may extend in a radial direction. In certain embodiments, the second communicating groove 114 may be formed in a circular shape having a diameter greater than that of the second channel hole 112.

[0039] The orbiting scroll 50, as shown in FIG. 2, may include orbiting wraps 52 spirally formed on an upper surface of a plate portion 51 of the orbiting scroll so as to form a pair of compression chambers P together with the fixed wraps 42 of the fixed scroll 40. A boss portion 53 of the orbiting scroll 50 may be coupled to the driving shaft 32 to transfer a driving force to the driving motor 30. The boss portion 53 may be formed at a central portion of a lower surface of the plate portion 51.

[0040] The fixed wrap 42 and the orbiting wrap 52 may be substantially symmetrically formed to have substantially the same length. Alternatively, they may be asymmetrically formed to have different lengths. For example, in certain embodiments, the orbiting wrap 52 may be approximately 180° longer than the fixed wrap 42.

[0041] Operation of a scroll compressor as embodied and broadly described herein will now be discussed.

[0042] Upon applying power to the driving motor 30, the driving shaft 32 rotates together with the rotor to transfer a rotational force to the orbiting scroll 50. The orbiting scroll 50 having received the rotational force orbits on the main frame 20, and a pair of compression chambers P consecutively move between the fixed wrap 42 of the fixed scroll 40 and the orbiting wrap 52 of the orbiting scroll 50. While this pair of compression chambers P moves toward a center of the scrolls 40 and 50 in cooperation with the consecutive orbiting motion of the orbiting scroll 50, a volume of the compression chambers P is decreased so as to compress a refrigerant held therein.

[0043] Simultaneously, an oil pump (not shown) installed at the lower end of the driving shaft 32 pumps up oil contained in the casing 10. The oil is lifted up through the oil passage 32a of the driving shaft 32, where it is partially supplied to the shaft receiving hole 21 of the main frame 20 and partially scattered at the upper end of the driving shaft 32 to be introduced in the back pressure chamber S3 of the main frame 20. The oil introduced into the back pressure chamber S3 supports the orbiting scroll 50, causing the orbiting scroll 50 to rise toward the fixed scroll 40. Accordingly, the fixed wraps 42 and the orbiting wraps 52 are closely adhered to a respective plate portion 51 and 41 to seal the compression chambers P.

[0044] In this state, refrigerant is compressed by the continuous orbiting motion of the orbiting scroll 50. The compressed refrigerant partially moves to the back pressure chamber S3 via the oil supply channel 110, so as to constantly maintain the pressure in the back pressure chamber S3. In the embodiment shown in FIG. 6, one outlet out of the oil supply channel 110, namely, one second channel hole 112, is provided. However, the second channel hole 112, as shown in FIG. 6, alternately communicates with the pair of compression chambers P with the orbiting wrap 52 interposed therebetween. Hence, the oil may be uniformly supplied to each compression chamber P via the oil supply channel 110 and the second channel hole 112.

[0045] Accordingly, the orbiting wrap 52 of the orbiting scroll 50 and the fixed wrap 42 of the fixed scroll 40 may maintain close contact with its respective plate portion 41 and 51, thus effectively preventing refrigerant leakage from the compression chambers P in an axial direction, namely, in a height direction of the wraps 42 and 52. In particular, even if oil in the bottom of the casing 10 is not smoothly drawn up through the oil supply passage 32a due to a low speed operation of the compressor, thereby causing a delay of an increase in pressure of the back pressure chamber S3, since the refrigerant in the compression chambers P can rapidly increase the pressure of the back pressure chamber S3, the orbiting scroll 50 can be quickly elevated, resulting in an increase in compressor efficiency.

[0046] In addition, this oil can be introduced from the back pressure chamber S3 into the compression chambers P due to the continuous orbiting motion of the orbiting scroll 50, whereby a frictional loss in the compression chambers P may be reduced. Additionally, the side surfaces of adjacent wraps, namely, in the radial direction, may be sealed so as to improve compressor efficiency. In particular, during a low speed operation of the compressor, even if oil is not smoothly drawn into the compression chambers P via the bearing surface between the fixed scroll 40 and the orbiting scroll 50 due to insufficient oil in the back pressure chamber S3 or an insufficient increase in pressure of the back pressure chamber S3, oil may be directly supplied to each compression chamber P via the oil supply passage 110, whereby frictional loss or leakage in the compression chambers P may be prevented and accordingly performance of the compressor may be improved.

[0047] In addition, during a high speed operation of the compressor, as the fixed scroll 40 and the orbiting scroll 50 closely contact each other due to excessive oil introduced in the back pressure chamber S3, even if the oil is not introduced between the fixed scroll 40 and the orbiting scroll 50, the oil is supplied to the compression chambers P via the oil supply channel 110, whereby frictional loss due to lack of oil in the compression chambers P or leakage in the radial direction may be prevented.

[0048] When a scroll compressor as embodied and broadly described herein is applied to, for example, a refrigerating machine, efficiency of the refrigerating machine may be enhanced. For example, as shown in FIGs. 7 and 8, an air conditioner 700 may have a refrigerant compressing refrigerating cycle including a compressor, a condenser, an expander and an evaporator. A scroll compressor C may be connected to a main board 710 that controls overall operation of the air conditioner 700, and an oil supply channel may be formed in the fixed scroll installed in the scroll compressor C to communicate the compression chambers with the back pressure chamber, as described in the aforementioned embodiment.

[0049] As such, frictional loss and refrigerant leakage in the compressor may effectively be prevented so as to improve compressor efficiency, resulting in improved energy efficiency of the refrigerating machine having such a compressor. In addition, the oil supply channel of the compressor may be easily fabricated, thus improving productivity of the refrigerating machine having the compressor.

[0050] A scroll compressor as embodied and broadly described herein may be widely applied to various types of refrigerating machines such as, for example, air conditioners, refrigerators/ freezers, and the like.

[0051] A scroll compressor is provided that is capable of preventing leakage in an axial direction between both scrolls by allowing a constant maintenance of pressure in a back pressure chamber, and simultaneously preventing a frictional loss and a leakage in a radial direction between both scrolls by allowing oil to be smoothly uniformly supplied in a compression chamber, and a refrigerating machine having the same.

[0052] A scroll compressor as embodied and broadly described herein may include a casing having a hermetic inner space; a frame fixed to the casing; a fixed scroll fixed to the frame and having spiral wraps formed on one side surface; and an orbiting scroll installed between the frame and the fixed scroll and having spiral wraps for configuring a pair of compression chambers with being engaged with the wraps of the fixed scroll, the pair of compression chambers consecutively moving in cooperation with an orbiting motion of the orbiting scroll, wherein a back pressure chamber formed at a rear surface of the orbiting scroll by the orbiting scroll, the fixed scroll and the frame, so as to seal the fixed scroll and the orbiting scroll in an axial direction, wherein an oil supply channel through which the compression chambers are communicated with the back pressure chamber is formed in the fixed scroll.

[0053] A refrigerating machine as embodied and broadly described herein may include a compressor; a condenser connected to a discharge side of the compressor; an expander connected to the condenser; and an evaporator connected to the expander and to a suction side of the compressor, the compressor including an oil supply channel formed in a fixed scroll to communicated compression chambers with a back pressure chamber.

[0054] Any reference in this specification to "one embodiment," "an embodiment," "example embodiment," "alternative embodiment," "certain embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment as broadly described herein. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to effect such feature, structure, or characteristic in connection with other ones of the embodiments.

Claims

1. A scroll compressor, comprising:

a casing that defines an interior space;
a frame provided in the interior space of the casing;
a fixed scroll fixed to the frame;
an orbiting scroll positioned between the frame and the fixed scroll, wherein the fixed scroll comprises a fixed wrap that extends toward the orbiting scroll and the orbiting scroll comprises an orbiting wrap that extends toward the fixed scroll such that the fixed wrap and the orbiting wrap are inter-engaged so as to form compression chambers therebetween;
a back pressure chamber defined by a portion of the orbiting scroll, a portion of the fixed scroll, and a recess formed in the frame; and
at least one fluid supply channel formed in the fixed scroll so as to connect the back pressure chamber and at least one of the compression chambers.

2. The scroll compressor of claim 1, wherein the back pressure chamber is defined by an outer peripheral edge of the orbiting scroll, a portion of a lower surface of the orbiting scroll adjacent to the outer peripheral edge thereof, a portion of a lower surface of the fixed scroll, and the recess which is formed in an upper surface of the frame.

3. The scroll compressor of claim 1, wherein the at least one fluid supply channel comprises:

a first communicating groove formed in an upper surface of the fixed scroll;
a first channel hole that extends at an incline from a lower portion of the fixed scroll corresponding to the back pressure chamber to the communicating groove; and
a second channel hole that extends from the communicating groove to the at least one compression chamber of the compression chambers.

4. The scroll compressor of claim 3, further comprising a shielding member that isolates the communicating groove from the interior space formed in the casing.

5. The scroll compressor of claim 4, wherein the first communicating groove comprises a substantially circular recess formed in the upper surface of the fixed scroll, and the shielding member comprises a bolt coupled to the fixed scroll and a washer positioned between the bolt and the fixed scroll.

6. The scroll compressor of claim 4, wherein the shielding member is press fit into the first communicating groove so as to provide a seal between the first communicating groove and the interior space formed in the casing.

7. The scroll compressor of claim 3, wherein the second channel hole is positioned radially inward from the first channel hole in the fixed scroll, and wherein the first channel hole extends at an incline from a lower outer peripheral portion of the fixed scroll toward the first communicating groove and the second channel hole.

8. The scroll compressor of claim 7, wherein the second channel hole extends downward from the first communicating groove so as to alternately communicate with the at least one compression chamber.

9. The scroll compressor of claim 3, further comprising a second communicating groove formed in a lower surface of the fixed scroll and extending into a bearing surface between the fixed scroll and the orbiting scroll, wherein the second communicating groove directs fluid from the back pressure chamber into the first channel hole.

10. The scroll compressor of claim 9, wherein the second communicating groove extends radially along the lower surface of the fixed scroll, and wherein a cross section of the second communicating groove is greater than a cross section of the first channel hole.

11. The scroll compressor of claim 1, wherein a thickness of the at least one fluid supply channel is less than or equal to a thickness of the orbiting wrap.

12. The scroll compressor of claim 1, wherein the fluid supply channel conveys fluid comprising oil, refrigerant or a combination thereof between the back pressure chamber and the at least one compression chamber.

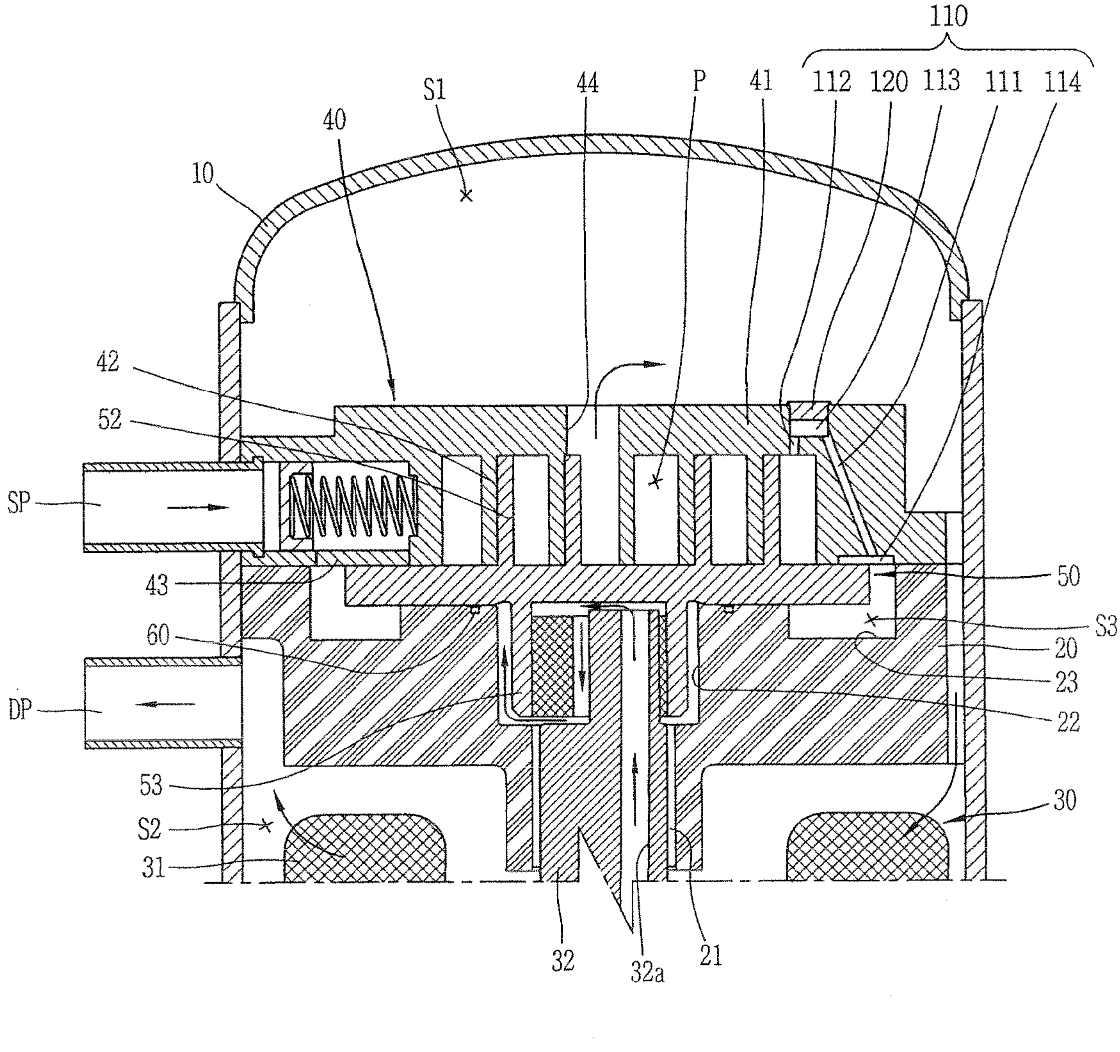
13. The scroll compressor of claim 1, wherein a first pressure at a contact area between the fixed scroll and the orbiting scroll is greater than a second pressure at a contact area between the orbiting scroll and the frame, and a third pressure in the back pressure chamber is between the first pressure and the second pressure.

14. The scroll compressor of claim 1, wherein the fixed wrap and the orbiting wrap are symmetrical, with compression chambers formed therebetween such that fluid is supplied alternately to a first compression chamber and a second compression chamber through the fluid supply channel.

15. A refrigerating apparatus, comprising:

a compressor;
a condenser coupled to a discharge side of the compressor;
an expander coupled to the condenser; and
an evaporator coupled to the expander and to a suction side of the compressor, wherein the compressor configured as one of the claims 1 to 14.

FIG. 1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114
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SP
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DP
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S2
31
32
32a
21

FIG. 2

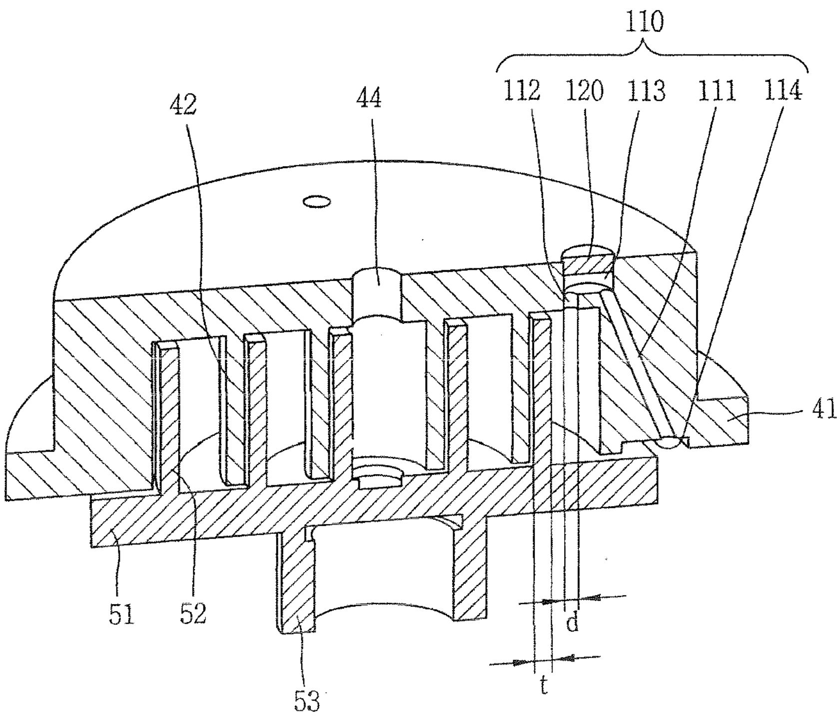

FIG. 3

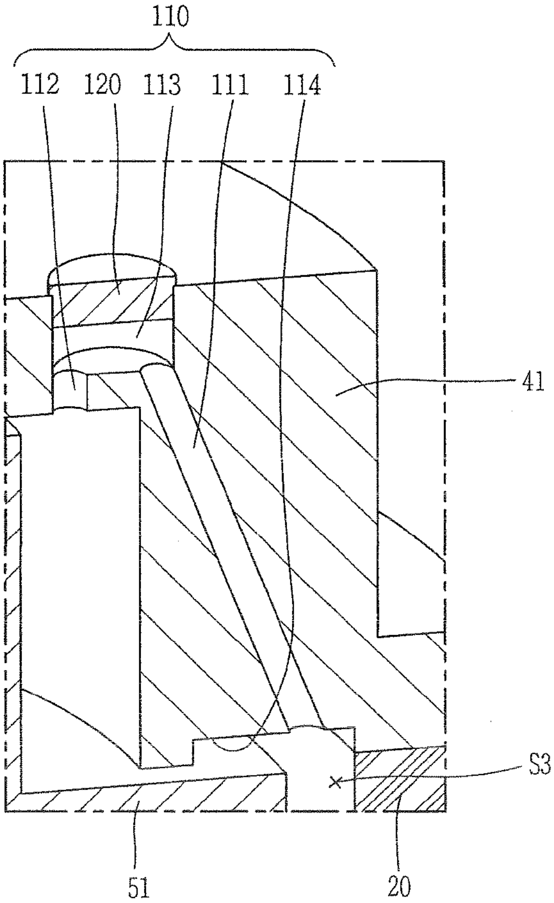

FIG. 4

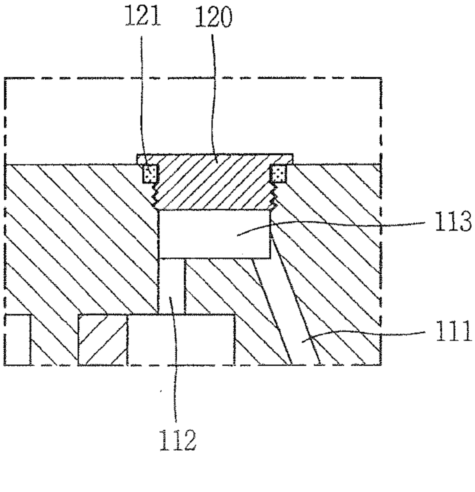

FIG. 5

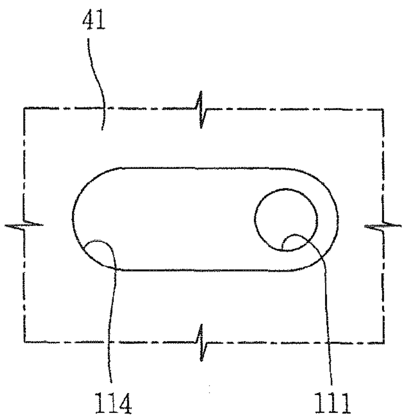

FIG. 6

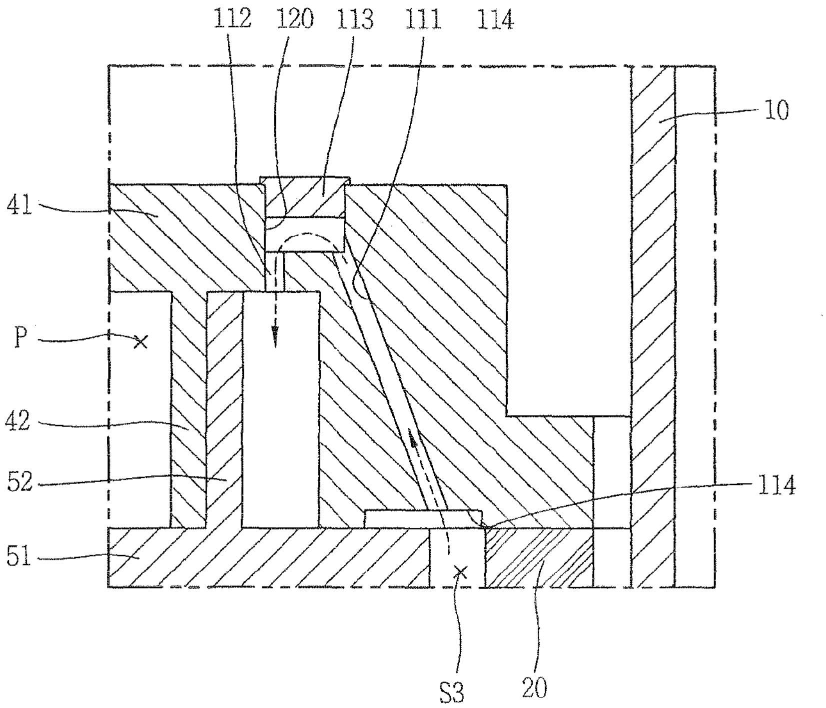

FIG. 7

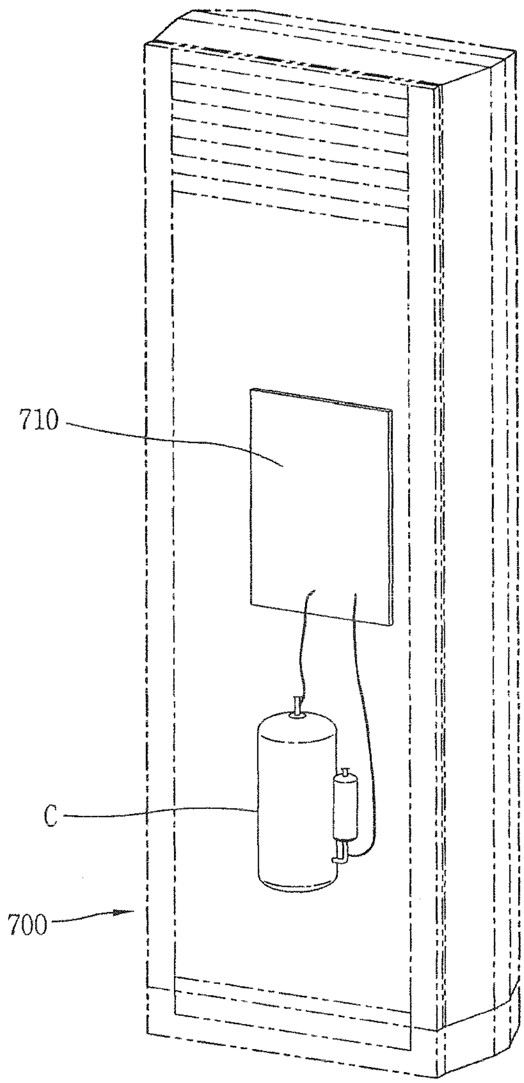

FIG. 8