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(54) SCROLL COMPRESSOR AND AIR CONDITIONER

KOMPRESSOR DER SPIRALBAUART UND KLIMAANLAGE

COMPRESSEUR A SPIRALE ET CONDITIONNEUR D'AIR

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(73) Proprietor: **Mitsubishi Heavy Industries, Ltd.**
Tokyo 108-8215 (JP)

(72) Inventors:
- **SATO, Hajime**
  Nagoya-shi
  Aichi 453-8515 (JP)
- **TATEISHI, Taichi**
  Nagoya-shi
  Aichi 453-8515 (JP)
- **MIZUNO, Hisao**
  Kiyosu-shi
  Aichi 452-8561 (JP)
- **TAKASU, Yogo**
  Kiyosu-shi
  Aichi 452-8561 (JP)

(74) Representative: **Intès, Didier Gérard André et al**
Cabinet Beau de Loménie
158 rue de l'Université
75340 Paris Cedex 07 (FR)

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Description

Technical Field

[0001] The present invention relates to a scroll compressor and an air conditioner.

Background Art

[0002] In general, as a compressor used in a refrigerating cycle in refrigerating and air conditioning apparatuses, compressors of a piston type, a rotary type, and a scroll type are known.

[0003] As a method of improving the performance of the refrigerating cycle using such rotary compressors or scroll compressors, gas injection (economizer cycle) in which two decompressors are provided between a radiator and a heatsink, refrigerant is expanded in two stages using these decompressors, and the refrigerant having an intermediate pressure after having passed through one of the decompressors is supplied to the compressor during a compression stroke thereof is known.

[0004] In the scroll compressor described above, when the amount of refrigerant to be supplied to a pair of compression chambers becomes uneven, the evenness of the pressure in these compression chambers is impaired, and hence the balance of power which acts on the scroll compressor in the compression process is impaired. In this manner, when the balance of power which acts on the scroll compressor is impaired, there is a problem of increase of vibrations of the scroll compressor.

[0005] Therefore, various technologies for supplying the refrigerant evenly to the pair of compression chambers of the scroll compressor (for example, see Patent Citation 1 or patent Citation 2).

Patent Citation 1: Japanese Unexamined Patent Application, Publication No. 7-103152 (pp. 3-4, see Fig. 3, etc.)
Patent Citation 2: US 2002/0114720.

Disclosure of Invention

[0006] In Patent Citation 1 described above, a configuration of a scroll compressor used in a gas injection cycle is disclosed. More specifically, a configuration in which a communication channel which is in communication with a pair of compression chambers is formed in an end panel of the scroll compressor, and refrigerant supplied from outside via the communication channel to the pair of compression chambers is disclosed.

[0007] In this configuration, the number of injection flow channels for supplying the refrigerant from the outside may be one. Therefore, in comparison with the case in which a plurality of injection flow channels are employed, the number of sealed positions between the injection flow channel and a housing of the scroll compressor is reduced.

[0008] However, in the configuration described above, it is necessary to form the communication channel which distributes the refrigerant to the pair of compression chambers and form ports for supplying the refrigerant to the compression chambers at two positions. Therefore, there is a problem that the configuration of the scroll compressor is complex, which leads to an increase in manufacturing cost.

[0009] In order to solve the above-described problem, it is an object of the present invention to provide a scroll compressor and an air conditioner in which the performance by a gas injection cycle is improved, and increase in manufacturing cost is prevented.

[0010] In order to achieve the above-described object, the present invention provides the following means.

[0011] A first aspect of the present invention is a scroll compressor comprising a fixed scroll and a turning scroll each having an end panel formed with a convoluted wall body extending upright from one side surface thereof, and forming a plurality of compression chambers for compressing refrigerant by being engaged with each other, wherein at least one of the fixed scroll and the turning scroll is formed on the one side surface of the end panel thereof with a shoulder which is high on the side of a center portion thereof and is low on the outer end side along the convolution of the wall body, and the other one of the fixed scroll and the turning scroll is formed on an upper edge of the wall body thereof with a misaligned portion corresponding to the shoulder on the end panel, the misaligned portion being divided into a plurality of portions and being low on the side of a center of the convolution and high on the outer end side thereof, a supply unit for supplying the refrigerant supplied from an outside of the scroll compressor is formed in the plurality of compression chambers while compressing the refrigerant, and the refrigerant is supplied from the supply unit while the plurality of compression chambers are in communication with each other via a clearance between the shoulder and the misaligned portion while the shoulder and the misaligned portion are apart from each other.

[0012] According to an aspect of the present invention, since the refrigerant is supplied from the supply unit to the plurality of compression chambers while the plurality of compression chambers include the shoulder and the misaligned portion apart from each other, the refrigerant can be supplied to the plurality of compression chambers by the supply unit provided at one position. Therefore, it is no longer necessary to provide the supply unit at a plurality of positions, so that increase in manufacturing cost is prevented.

[0013] The plurality of compression chambers which are in contact with the shoulder and the misaligned portion are in communication with each other via a clearance between the shoulder and the misaligned portion being apart from each other. Therefore, even when the supply unit is provided at one position, the refrigerant can be supplied to the plurality of compression chambers via the clearance.

[0014] Since the refrigerant is supplied from the outside to the plurality of compression chambers while at least the plurality of compression chambers are in communication with each other via the clearance, the refrigerant can be supplied to the compression chambers having a larger capacity than in the case where the refrigerant is supplied only when the plurality of compression chambers are independent from each other, and the amount of refrigerant to be supplied can be increased. Therefore, the amount of refrigerant per unit time to be discharged by the scroll compressor may be increased, so that the performance of refrigeration of the air conditioner in which the scroll compressor in the present invention is used is improved.

[0015] In the invention shown above, preferably, the supply unit is a through hole provided on the end panel of at least one of the fixed scroll and the turning scroll, and the through hole is provided at a position which communicates with the plurality of compression chambers while in communication with each other via a clearance between the plurality of compression chambers while the shoulder and the misaligned portion are apart from each other.

[0016] In this configuration, since the supply unit is the through hole provided on the end panel, and is provided at a position which communicates with the plurality of compression chambers while the plurality of compression chambers include the shoulder and the misaligned portion being apart from each other, the refrigerant can be supplied to the plurality of compression chambers via the through hole provided at one position.

[0017] In the invention described above, preferably, the supply unit is provided at a contact portion of the shoulder with respect to the misaligned portion.

[0018] In this configuration, since the supply unit is provided at the contact portion of the shoulder with respect to the misaligned portion, the period in which the refrigerant can be supplied is increased in comparison with the case where the supply unit is provided on one side surface of the end panel.

[0019] It is because the contact between the shoulder and the misaligned portion in the contact portion is a line contact, and the contact between the end panel and the wall body in the one side surface is a surface contact, and hence the period in which the supply of the refrigerant is hindered by the wall body is shortened by the provision of the supply unit on the contact portion.

[0020] In the invention described above, preferably, seal members which come into contact with the end panel are provided in an area on the upper edge of the wall body from the misaligned portion toward the center portion of the convolution, and in an area from the misaligned portion toward the outer end, and the supply unit is provided in an area of the end panel where the seal members do not slide.

[0021] In this configuration, since the supply unit is provided in an area where the seal member does not slide, the seal member is prevented from being broken by the supply unit. By preventing the seal member from being broken, the leakage of the refrigerant between the compression chambers being disposed side by side with the intermediary of the wall body and having different pressure may be prevented, so that the lowering of the performance of the scroll compressor is prevented.

[0022] In the invention described above, preferably, a control unit which controls the supply of the refrigerant from the supply unit to the plurality of compression chambers is provided and the control unit controls the refrigerant to be supplied from the supply unit while the shoulder and the misaligned portion are apart from each other.

[0023] In this configuration, since the control unit controls the refrigerant from being supplied from the supply unit while the shoulder and the misaligned portion are apart from each other, an event in which the refrigerant is supplied only to one of the compression chambers is avoided while the plurality of compression chambers are independent. Therefore, the pressures in the plurality of compression chambers are maintained to be even, so that an increase in vibrations of the scroll compressor is prevented.

[0024] A second aspect of the preset invention provides an air conditioner including: a scroll compressor of the present invention as described above, an oil separating unit for separating lubricant from refrigerant compressed by the scroll compressor, a radiator for radiating heat of the refrigerant compressed by the scroll compressor; a high-pressure-side decompression unit for decompressing the pressure of the radiated refrigerant; a low-pressure-side decompression unit for further decompressing the decompressed refrigerant; and a heatsink for causing the refrigerant decompressed by the low-pressure-side decompressing unit to absorb the heat, in which the refrigerant decompressed by the high-pressure-side decompressing unit and the lubricant separated by the oil separating unit are supplied to the supply unit of the scroll compressor.

[0025] According to the aspect of the present invention, the lubricant separated by the oil separating unit can be returned to the compression chambers of the scroll compressor via the supply unit. By returning the lubricant to the compression chambers, the refrigerant from the compression chambers is prevented from leaking, so that the improvement of the performance of the scroll compressor and improvement of the performance of the air conditioner are achieved.

[0026] According to the scroll compressor and the air conditioner in the present invention, since the refrigerant is supplied from the supply unit to the plurality of compression chambers while the plurality of compression chambers include the shoulder and the misaligned portion being apart from each other, the refrigerant can be supplied to the plurality of compression chambers by the supply unit provided at one position. Therefore, an advantage such that it is no longer necessary to provide the supply unit at a plurality of positions, so that increase in manufacturing cost is prevented, is achieved.

[0027] Since the refrigerant is supplied from the outside to the plurality of compression chambers while at least the plurality of compression chambers are in communication with each other via the clearance, the refrigerant can be supplied to the compression chambers having a larger capacity than the case where the refrigerant is supplied only when the plurality of compression chambers are independent from each other, the amount of refrigerant to be supplied can be increased. Therefore, there is an advantage in that the amount of refrigerant per unit time to be discharged by the scroll compressor may be increased, and thus the performance of refrigeration of the air conditioner in which the scroll compressor according to the present invention is used is improved is achieved.

Brief Description of Drawings

[0028]

[FIG. 1] Fig. 1 is a schematic drawing of explaining an air conditioner according to a first embodiment of the present invention.
[FIG. 2] Fig. 2 is a cross-sectional view for explaining a configuration of a scroll compressor in Fig. 1.
[FIG. 3] Fig. 3 is a perspective view for explaining a configuration of a fixed scroll in Fig. 2.
[FIG. 4] Fig. 4 is a perspective view for explaining a configuration of a turning scroll in Fig. 2.
[FIG. 5] Fig. 5 is a drawing for explaining the movement of the fixed scroll and the turning scroll and a change of compression chambers in Fig. 2.
[FIG. 6] Fig. 6 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 7] Fig. 7 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 8] Fig. 8 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 9] Fig. 9 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 10] Fig. 10 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 11] Fig. 11 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 12] Fig. 12 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 13] Fig. 13 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 14] Fig. 14 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 15] Fig. 15 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 16] Fig. 16 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 17] Fig. 17 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 18] Fig. 18 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 19] Fig. 19 is a drawing for explaining the movement of the fixed scroll and the turning scroll and the change of the compression chambers in Fig. 2.
[FIG. 20] Fig. 20 is a graph showing a change in capacity of the compression chambers to which a refrigerant is supplied from injection ports shown in Fig. 4 to Fig. 11.
[FIG. 21] Fig. 21 is a partly enlarged drawing of Fig. 3 for explaining another example of positions to form the injection ports.
[FIG. 22] Fig. 22 is a party enlarged drawing for explaining a configuration of the scroll compressor of the air-conditioner according to a second embodiment of the present invention.
[FIG. 23] Fig. 23 is a graph showing a change in capacity of the compression chambers to which the refrigerant is supplied from a through hole in Fig. 2.
[FIG. 24] Fig. 24 is a party enlarged drawing for explaining a configuration of the scroll compressor of the air-conditioner according to a third embodiment of the present invention.
[FIG. 25] Fig. 25 is a party enlarged drawing for explaining a configuration of the scroll compressor of the air-conditioner according to a fourth embodiment of the present invention.
[FIG. 26] Fig. 26 is a schematic drawing of explaining the air conditioner according to a fifth embodiment of the present invention.

[0029] Explanation of Reference:

1,101,301,401,501: air conditioner
3, 103, 303, 403: scroll compressor
5: capacitor (radiator)
7: first expansion valve (high-pressure-side decompression unit)
11: second expansion valve (low-pressure-side decompression unit)
13: evaporator (heatsink)
17, 117, 517; injection flow channel (supply unit) 17p, 121, 317p, 417p: injection port (supply unit, through hole)
23, 323, 423: fixed scroll
23a, 25a: end panel
23b, 25b: wall body

25, 125: turning scroll
42, 43: shoulder
44, 45: misaligned portion
119: valve structure (control unit)
323h: connected wall surface (contact portion)
503: oil separator (oil separating unit)
C, C1, C2: compression chamber

Best Mode for Carrying Out the Invention

[First Embodiment]

[0030] Referring now to Fig. 1 to Fig. 21, a first embodiment of the present invention will be described.

[0031] Fig. 1 is a schematic drawing explaining an air-conditioner according to this embodiment.

[0032] As shown in Fig. 1, an air conditioner 1 schematically includes a scroll compressor 3 for compressing refrigerant, a capacitor (radiator) 5 for radiating heat of the compressed refrigerant, a first expansion valve (high-pressure-side decompression unit) 7 for decompressing the pressure of the radiated refrigerant, a receiver 9 for separating the decompressed refrigerant into gas and liquid, a second expansion valve (low-pressure-side decompression unit) 11 for further decompressing the liquid refrigerant, and an evaporator (heatsink) 13 for causing the decompressed liquid refrigerant to absorb heat.

[0033] Between the receiver 9 and the scroll compressor 3, an injection flow channel (supply unit) 17 for supplying gas refrigerant separated from the liquid in the receiver 9 to the scroll compressor 3 is arranged.

[0034] Fig. 2 is a cross-sectional view for explaining a configuration of the scroll compressor in Fig. 1.

[0035] As shown in Fig. 2, the scroll compressor 3 schematically includes a housing 21 as a sealed container, a fixed scroll 23 and a turning scroll 25 which compress the refrigerant, and a motor 27 that drives and rotates the turning scroll 25.

[0036] The housing 21 includes a discharge cover 29 that separates the housing 21 into a high-pressure chamber HR and a low-pressure chamber LR, an intake tube 31 for conducting the refrigerant from the evaporator 13 to the low-pressure chamber LR, an outlet tube 33 for conducting the refrigerant from the high-pressure chamber HR to the capacitor 5, and a frame 35 for supporting the fixed scroll 23 and the turning scroll 25.

[0037] A rotary shaft 37 for transmitting the rotational force of the motor 27 to the turning scroll is provided between the turning scroll 25 and the motor 27.

[0038] An Oldham ring 39 for preventing the rotation of the turning scroll 25 on its own axis is provided between the frame 35 and the turning scroll 25.

[0039] Fig. 3 and Fig. 4 are perspective views for explaining the configuration of the fixed scroll and the turning scroll in Fig. 2.

[0040] The fixed scroll 23 has a configuration in which a convoluted wall body 23b is provided upright on one side surface of an end panel 23a as shown in Fig. 3. As shown in Fig. 4, the turning scroll 25 has a configuration in which a convoluted wall body 25b is provided upright on one side surface of an end panel 25a as in the case of the fixed scroll 23 and, specifically, the wall body 25b has substantially the same shape as the wall body 23b on the side of the fixed scroll 23. The turning scroll 25 is assembled to the fixed scroll 23 in a state of being deviated from the fixed scroll 23 by the radius of orbital motion, and shifted in phase by 180° by the engagement of the wall bodies 23b, 25b with respect to each other.

[0041] In this case, as shown in Fig. 2, the turning scroll 25 is adapted to make an orbital motion with respect to the fixed scroll 23 by the action of an eccentric pin 37a and the Oldham ring 39 which are provided at an upper end of the rotary shaft 37 driven by the motor 27 and rotate.

[0042] On the other hand, the fixed scroll 23 is fixed to the housing 21, and an outlet port 32 for the compressed fluid is provided at the center of the back surface of the end panel 23a.

[0043] The end panel 23a of the fixed scroll 23 is provided with a shoulder 42 formed on the one side surface where the wall body 23b is provided upright along the direction of the convolution of the wall body 23b so as to be higher on the side of the center portion and lower on the side of the outer end. In the same manner as the end panel 23a of the fixed scroll 23, the end panel 25a on the side of the turning scroll 25 is also provided with a shoulder 43 formed on the one side surface where the wall body 25b is provided upright along the direction of the convolution of the wall body 25b so as to be higher on the side of the center portion and lower on the side of the outer end.

[0044] The bottom surface of the end panel 23a is divided into two portions of a shallow bottom surface 23f provided on the side of the center portion and a deep bottom surface 23g provided on the side of the outer end by the formation of the shoulder 42. The shoulder 42 is formed between the adjacent bottom surfaces 23f, 23g, so that a connecting wall surface 23h which continues the bottom surfaces 23f, 23g and extends vertically is present therebetween.

[0045] The bottom surface of the end panel 25a is also divided into two portions of a shallow bottom surface 25f provided on the side of the center portion and a deep bottom surface 25g provided on the side of the outer end by the formation of the shoulder 43 as in the case of the end panel 23a described above. The shoulder 43 is formed between the adjacent bottom surfaces 25f, 25g, so that a connecting wall surface 25h which continues the bottom surfaces 25f, 25g and extends vertically is present therebetween.

[0046] The wall body 23b on the side of the fixed scroll 23 corresponds to the shoulder 43 of the turning scroll 25, and the convoluted upper edge is divided into two portions, and forms a misaligned portion 44 which is lower on the side of the center portion of the convolution and higher on the side of the outer end thereof. The wall body

25b on the side of the turning scroll 25 corresponds to the shoulder 42 of the fixed scroll 23, and the convoluted upper edge is divided into two portions, and forms a misaligned portion 45 which is lower on the side of the center portion of the convolution and higher on the side of the outer end thereof as in the case of the wall body 23b.

[0047] More specifically, the upper edge of the wall body 23b is divided into two portions of a lower upper edge 23c provided at a position little to the center portion and a higher upper edge 23d provided at a position little to the upper edge 23c, and a connecting edge 23e is formed between the adjacent upper edges 23c, 23d so as to continue therebetween and extend in the direction vertical to the surface of rotation. The upper edge of the wall body 25b is divided into two portions of a lower upper edge 25c provided at a position little to the center portion and a higher upper edge 25d provided at a position little to the upper edge 25c, and a connecting edge 25e is formed between the adjacent upper edges 25c, 25d so as to continue therebetween and extend in the direction vertical to the surface of rotation in the same manner as the wall body 23b described above.

[0048] The connecting edge 23e has a semi-circular shape continuing smoothly to the inner and outer side surfaces of the wall body 23b and having a diameter equal to the thickness of the wall body 23b when viewing the wall body 23b in the direction from the turning scroll 25. The connecting edge 25e also has a semi-circular shape continuing smoothly to the inner and outer side surfaces of the wall body 25b and having a diameter equal to the thickness of the wall body 25b as in the case of the connecting edge 23e.

[0049] The connecting wall surface 23h has an arc shape which matches an envelope curve which is drawn by the connecting edge 25e in association with the turning motion of the turning scroll when viewing the end panel 23a in the direction of the axis of the turning motion. The connecting wall surface 25h also has an ark shape which matches an envelope curve which is drawn by the connecting edge 23e in the same manner as the connecting wall surface 23h.

[0050] The wall body 23b of the fixed scroll 23 is provided with tip seals 24a, 24b divided into two by the upper edges 23c, 23d in the vicinity of the connecting edge 23e. In the same manner, the wall body 25b of the turning scroll 25 is provided with tip seals 26a, 26b divided into two by the upper edges 25c, 25d in the vicinity of the connecting edge 25e. The tip seals serve to seal a tip seal gap defined between an upper edge (tooth tip) and a bottom surface (tooth bottom) between the turning scroll 25 and the fixed scroll 23 to minimize leakage of compressed gas fluid.

[0051] In other words, when the turning scroll 25 is assembled to the fixed scroll 23, the tip seal 26b provided on the lower upper edge 25c comes into contact with the shallow bottom surface 23f, and the tip seal 26a provided on the higher upper edge 25d comes into contact with the deep bottom surface 23g. Simultaneously, the tip seal 24a provided on the lower upper edge 23c comes into contact with the shallow bottom surface 25f, and the tip seal 24b provided on the higher upper edge 23d comes into contact with the deep bottom surface 25g.

[0052] Consequently, a plurality of compression chambers C divided by the end panels 23a, 25a and the wall bodies 23b, 25b which are opposed to each other are formed between the scrolls 23, 25.

[0053] In Fig. 3 and Fig. 4, the fixed scroll 23 is shown upside down for showing the shape of the disalignment of the fixed scroll 23.

[0054] As shown in Fig. 3, an injection port (supply unit, through hole) 17p connected to the injection flow channel 17 is formed on the bottom surface of the end panel 23a of the fixed scroll 23. The injection port 17p is formed in the deep bottom surface 23g in the bottom surface in an area near the connecting wall surface 23h of the shoulder 42.

[0055] Subsequently, an operation of the air conditioner 1 described above will be described.

[0056] The refrigerant which is compressed by the scroll compressor 3 to a high pressure is discharged toward the capacitor 5 as shown in Fig. 1. The refrigerant flowing into the capacitor 5 radiates the heat thereof outward and is condensed, and then flows toward the first expansion valve 7. The refrigerant is decompressed by the first expansion valve 7 and flows into the receiver 9 as the refrigerant at an intermediate pressure. The refrigerant is separated into liquid refrigerant and gas refrigerant in the receiver 9, and the liquid refrigerant flows toward the second expansion valve 11. The liquid refrigerant is decompressed by the second expansion valve 11 to be the refrigerant at a low pressure, and flows into the evaporator 13. The refrigerant at a low pressure takes the heat from the outside air in the evaporator 13, evaporated to the gas refrigerant, and flows into the scroll compressor 3, where the gas refrigerant is compressed again.

[0057] On the other hand, the gas refrigerant separated in the receiver 9 flows into the scroll compressor 3 via the injection flow channel 17. The refrigerant flowing into the scroll compressor 3 is compressed again.

[0058] The refrigerant compressed by the scroll compressor 3 again is discharged into the capacitor 5 and repeats the above-described cycle.

[0059] Subsequently, an operation of the scroll compressor 3 will be described.

[0060] Fig. 5 to Fig. 19 are drawings for explaining an operation of the fixed scroll and the turning scroll in Fig. 2, and a change of the compression chambers. Fig. 5 to Fig. 19 are perspective views of the fixed scroll and the turning scroll viewed from the fixed scroll side. Fig. 20 is a graph showing a change in capacity of the compression chambers to which the refrigerant is supplied from the injection ports shown in Fig. 5 to Fig. 19.

[0061] Fig. 5 is shows a relative position between the fixed scroll 23 and the turning scroll 25 at a certain turning angle. The compression chamber C is positioned in the vicinity of the outer terminal of the fixed scroll 23 and the turning scroll 25, and is not completely sealed with respect to the low-pressure chamber LR (see Fig. 2).

[0062] The shoulder 42 of the fixed scroll 23 and the misaligned portion 45 of the turning scroll 25 are apart from each other, and the shoulder 43 of the turning scroll 25 and the misaligned portion 44 of the fixed scroll 23 are apart from each other.

[0063] When the turning angle is increased thereafter, as shown in Fig. 6 and Fig. 7, the compression chamber C is moved toward the center portion of the respective scrolls 23, 25 along the direction of the convolutions of the wall bodies 23b, 25b.

[0064] The shoulder 42 and the misaligned portion 45, and the shoulder 43 and the misaligned portion 44 come into contact with each other in the state shown in Fig. 7.

[0065] When the turning angle is further increased thereafter, as shown in Fig. 8 and Fig. 9, the compression chamber C is moved toward the center portion of the respective scrolls 23, 25 along the direction of the convolutions of the wall bodies 23b, 25b.

[0066] When the outermost wall surface of the one scroll comes into contact with the wall surface of the other scroll, the compression chamber C is completely sealed with respect to the low-pressure chamber LR, and a pair of independent spaces C1, C2 are formed. The capacity of the compression chamber C1 at this time is D in Fig. 20. Thereafter, the capacity of the compression chamber C (C1, C2) is decreased as shown in Fig. 20 as the turning angle is increased, and the refrigerant in the compression chamber is compressed.

[0067] Immediately after that, the end of the one compression chamber C1 on the side of the center portion comes into communication with the injection port 17p, and the refrigerant at the intermediate pressure decompressed by the first expansion valve 7 is started to be supplied to the compression chamber C1 via the injection flow channel 17 (point E in Fig. 20).

[0068] When the compression is further increased thereafter, as shown in Fig. 10 to Fig. 12, the compression chambers C1, C2 are moved toward the center portion of the respective scrolls 23, 25 along the direction of the convolutions of the wall bodies 23b, 25b.

[0069] Since the shoulder 42 and the misaligned portion 45, and the shoulder 43 and the misaligned portion 44 are still in contact with each other, the compression chambers C1, C2 are isolated as independent spaces. The refrigerant at the intermediate pressure is still being supplied to the injection port 17p of the compression chamber C1.

[0070] When the compression is continued until the position shown in Fig. 13 is assumed, the contact between the shoulder 42 and the misaligned portion 45, and between the shoulder 43 and the misaligned portion 44 are terminated.

[0071] The shoulder 42 and the misaligned portion 45, and the shoulder 43 and the misaligned portion 44 are then moved apart from each other. Then, the compression chambers C1, C2 which are arranged side by side with the intermediary of the wall body 23b of the fixed scroll 23 and the wall body 25b of the turning scroll 25 come into communication with each other via the portion between the shoulder 42 and the misaligned portion 45 and between the shoulder 43 and the misaligned portion 44 both being apart from each other (point I in Fig. 20).

[0072] When the compression is further increased thereafter, as shown in Fig. 14 to Fig. 18, the compression chambers C1, C2 in communication with each other are moved toward the center portion of the respective scrolls 23, 25 along the direction of the convolutions of the wall bodies 23b, 25b.

[0073] During this movement, the refrigerant at the intermediate pressure supplied from the injection port 17p to the compression chamber C1 is circulated freely in the compression chambers C1, C2 via the portions between the shoulder 42 and the misaligned portion 45 and between the shoulder 43 and the misaligned portion 44 both being apart from each other. Therefore, the pressures in the compression chambers C1, C2 are kept in an even pressure.

[0074] When the compression is continued until the position shown in Fig. 19 is assumed, the shoulder 42 and the misaligned portion 45, and the shoulder 43 and the misaligned portion 44 are brought into contact with each other again, and the compression chambers C1, C2 return to independent spaces again (point O in Fig. 20).

[0075] Immediately before this, the wall body 25b of the turning scroll 25 is moved onto the injection port 17p. Therefore, the communication with the compression chamber C1 is blocked, and the compression chamber C1 is moved further toward the center in the direction of convolution, so that the supply of the refrigerant at the intermediate pressure to the compression chamber C1 is terminated (point M in Fig. 20).

[0076] Thereafter, the compression chambers C1, C2 move toward the center in the direction of convolution with increase in turning angle, and are brought into communication with the outlet port 32, so that the compressed refrigerant is discharged toward the high-pressure chamber HR (see Fig. 2).

[0077] In the configuration as descried above, the refrigerant at the intermediate pressure decompressed by the first expansion valve 7 can be supplied from the injection port 17p provided at one position to the compression chamber C1 even while the compression chambers C1, C2 are in communication with each other via the clearances between the shoulder 42 and the misaligned portion 45 and between the shoulder 43 and the misaligned portion 44 being apart from each other. In other words, the refrigerant at the intermediate pressure supplied from the injection port 17p is supplied to the compression chamber C1, and also to the compression chamber C2 1 via the above-described clearances, the pressure balance between the compression chambers C1, C2 is achieved.

[0078] Consequently, an increase in vibrations due to the imbalance in pressure between the compression chambers C1, C2 in the scroll compressor 3 is prevented.

[0079] Since the refrigerant at the intermediate pressure is supplied from the injection port 17p even when the compression chambers C1, C2 are in communication with each other via the clearances, the refrigerant can be supplied to the compression chambers C1, C2 having a larger capacity in comparison with the case of supplying the refrigerant only when the compression chambers C1, C2 are independent, respectively, so that the amount of refrigerant to be supplied may be increased.

[0080] Therefore, the amount of the refrigerant per unit time to be discharged by the scroll compressor 3 may be increased, so that the performance of refrigeration of the air conditioner 1 is improved.

[0081] Fig. 21 is a partly enlarged drawing of Fig. 3 for explaining another example of the positions to form the injection port.

[0082] The injection port 17p may be formed in an area on the bottom surface 23g of the fixed scroll 23 in the vicinity of the connecting wall surface 23h of the shoulder 42 as shown in Fig. 3, or may be formed in an area on the bottom surface 23f of the fixed scroll 23 in the vicinity of the connecting wall surface 23h as shown in Fig. 21.

[0083] Furthermore, the injection port 17p may be formed in an area on the bottom surface 23f apart from the connecting wall surface 23h. However, the injection port 17p needs to be formed at a position at which the injection port 17p and the compression chamber C1 come into communication at least while the compression chambers C1, C2 are in communication.

[Second Embodiment]

[0084] Referring now to Fig. 22 and Fig. 23, a second embodiment of the present invention will be described.

[0085] The basic configuration of the air conditioner in this embodiment is the same as that in the first embodiment, except for the configuration of the periphery of the injection port of the scroll compressor. Therefore, in this embodiment, only the configuration of the periphery of the injection port will be described referring to Fig. 22 and Fig. 23, and description of other configurations will be omitted.

[0086] Fig. 22 is a partly enlarged drawing for explaining the configuration of the scroll compressor of the air-conditioner according to this embodiment.

[0087] The same components as those in the first embodiment are designated by the same reference numerals and description thereof is omitted.

[0088] A scroll compressor 103 in an air conditioner 101 includes the housing 21 as a sealed container, the fixed scroll 23 and a turning scroll 125 for compressing the refrigerant, and a frame 135 for supporting the fixed scroll 23 and the turning scroll 125 as shown in Fig. 22.

[0089] An injection flow channel 117 for supplying the refrigerant at the intermediate pressure separated into gas and liquid in the receiver 9 (see Fig. 1) to the scroll compressor 103 is connected to the scroll compressor 103. The injection flow channel 117 is configured to supply the refrigerant at the intermediate pressure from the turning scroll 125 to the compression chamber C via the housing 21 and the frame 135.

[0090] The injection flow channel 117 is provided with a valve structure (control unit) 119 for controlling the flow of the refrigerant at the intermediate pressure between the frame 135 and the turning scroll 125.

[0091] The valve structure 119 includes a groove 120 formed on the frame 135 and an injection port (supply unit, through hole) 121 as a through hole formed on the turning scroll 125. The groove 120 is formed into a shape which communicates with the injection port 121 only when the fixed scroll 23 and the turning scroll 125 are in a predetermined positional relationship.

[0092] More specifically, the shape of the groove 120 is determined such that the groove 120 and the injection port 121 communicate with each other only when the compression chamber C1 which communicates with the injection port 121 communicate with the other compression chamber C2 via the clearances formed between the shoulder 42 and the misaligned portion 45, and between the shoulder 43 and the misaligned portion 44.

[0093] Subsequently, an operation of the air conditioner 101 and an operation of the scroll compressor 103 will be described.

[0094] The operation of the air conditioner 101 is the same as that in the first embodiment, and thus the description will be omitted.

[0095] Since the movements of the fixed scroll 23 and the turning scroll 125 in the scroll compressor 103 and the change in capacity of the compression chambers C1, C2 in association therewith are the same as in the first embodiment, the description will be omitted.

[0096] Here, a change in capacity of the compression chambers C1, C2 and a timing of the supply of the refrigerant at the intermediate pressure from the injection port 121 in the scroll compressor 103 will be described.

[0097] Fig. 23 is a graph showing a change in capacity of the compression chambers to which the refrigerant is supplied from the through hole in Fig. 22.

[0098] The refrigerant at the intermediate pressure is not supplied from the injection port 121 to the compression chamber C1 in the same manner as in the first embodiment from when the compression chamber C1 is completely sealed (point D in Fig. 23) to when the compression chamber C1 and the injection port 121 are brought into communication with each other (point E in Fig. 23).

[0099] After having brought the compression chamber C1 and the injection port 121 into communication until when the shoulder 42 and the misaligned portion 45, and the shoulder 43 and the misaligned portion 44 are moved apart from each other and the compression chamber C1 comes into communication (the point I in Fig. 23) with the other compression chamber C2 via the clearances therebetween, the groove 120 and the injection port 121 of the valve structure 119 do not communicate with each other (see Fig. 22). Therefore, from the point E to the point I in Fig. 23, the refrigerant at the intermediate pressure is not supplied from the injection port 121 to the compression chamber C1.

[0100] After having brought the compression chamber C1 and the compression chamber C2 into communication with each other, the groove 120 and the injection port 121 come into communication with each other (see Fig. 22), and the refrigerant at the intermediate pressure is supplied from the injection port 121 to the compression chamber C1 and the compression chamber C2.

[0101] Then, the communication between the groove 120 and the injection port 121 of the valve structure 119 is disconnected (see Fig. 22) when the shoulder 42 and the misaligned portion 45, and the shoulder 43 and the misaligned portion 44 are brought into communication with each other again, and the compression chambers C1, C2 become the independent spaces again (point O in Fig. 23).

[0102] Thereafter, the compression chambers C1, C2 move toward the center in the direction of convolution with an increase in turning angle, and are brought into communication with the outlet port 32, so that the compressed refrigerant is discharged toward the high-pressure chamber HR (see Fig. 2).

[0103] In this configuration, the refrigerant at the intermediate pressure is controlled to be supplied from the injection port 121 only when the valve structure 119 is in communication with the compression chambers C1, C2. Therefore, while the compression chambers C1, C2 are independent, the refrigerant at the intermediate pressure is not supplied, and hence the pressures in the compression chambers C1, C2 are maintained evenly, so that the increase in vibrations of the scroll compressor 103 is prevented.

[Third Embodiment]

[0104] Referring now to Fig. 24, a third embodiment of the present invention will be described.

[0105] The basic configuration of the air conditioner in this embodiment is the same as that in the first embodiment, except for the configuration of the injection port of the scroll compressor. Therefore, in this embodiment, only the configuration of the periphery of the injection port will be described referring to Fig. 24, and description of other configurations will be omitted.

[0106] Fig. 24 is a partly enlarged drawing for explaining the configuration of the scroll compressor of the airconditioner according to this embodiment.

[0107] The same components as those in the first embodiment are designated by the same reference numerals and description thereof is omitted.

[0108] A scroll compressor 303 in an air conditioner 301 includes a fixed scroll 323 and the turning scroll 25 for compressing the refrigerant as shown in Fig. 24.

[0109] A connecting wall surface (contact portion) 323h of the fixed scroll 323 is formed with an injection port (supply unit, through hole) 317p as a through hole for supplying the refrigerant at the intermediate pressure supplied from the injection flow channel 17 (see Fig. 1) to the compression chamber C.

[0110] The injection port 317p is formed substantially in parallel to the wall body 23b and the bottom surfaces 23f, 23g, and is formed at a position little to the wall body 23b.

[0111] Subsequently, an operation of the air conditioner 301 and an operation of the scroll compressor 303 will be described.

[0112] The operation of the air conditioner 301 is the same as that in the first embodiment, the description will be omitted.

[0113] Since the movements of the fixed scroll 323 and the turning scroll 25 in the scroll compressor 303, the change in capacity of the compression chambers C1, C2 in association therewith, and the timing to supply the refrigerant at the intermediate pressure from the injection port 317p are the same as in the first embodiment, the description will be omitted.

[0114] Here, the opening and closing of the injection port 317p by the wall body 25b, which is a characteristic of this embodiment will be described.

[0115] The injection port 317p is formed on the connecting wall surface 323h as shown in Fig. 24, and is opened and closed by the connecting edge 25e (see Fig. 4) of the wall body 25b by the turning scroll 25.

[0116] In this configuration, since the injection port 317p is provided on the connecting wall surface 323h, the period in which the refrigerant can be supplied may be increased in comparison with the case in which the injection port 317p is formed on the bottom surface of the end panel 23a (for example, the bottom surface 23f or the bottom surface 23g).

[0117] It is because the contact of the connecting wall surface 323h with the connecting edge 25e is a line contact, and the contact of the bottom surface of the end panel 23a with the wall body 25b is a surface contact and hence the period in which the supply of the refrigerant is hindered by the wall body 25b is shortened by the provision of the injection port 317p on the connecting wall surface 323h.

[Fourth Embodiment]

[0118] Referring now to Fig. 25, a fourth embodiment of the present invention will be described.

[0119] The basic configuration of the air conditioner in this embodiment is the same as that in the first embodiment, except for the configuration of the injection port of the scroll compressor. Therefore, in this embodiment, only the configuration in the periphery of the injection port will be described referring to Fig. 25, and description of other configurations will be omitted.

[0120] Fig. 25 is a party enlarged drawing for explaining the configuration of the scroll compressor of the air-conditioner according to this embodiment.

[0121] The same components as those in the first embodiment are designated by the same reference numerals and description thereof is omitted.

[0122] A scroll compressor 403 in an air conditioner 401 includes a fixed scroll 423 and the turning scroll 25 for compressing the refrigerant as shown in Fig. 25.

[0123] The bottom surface 23f of the fixed scroll 423 is formed with an injection port (supply unit, through hole) 417p as a through hole for supplying the refrigerant at the intermediate pressure supplied from the injection flow channel 17 (see Fig. 1) to the compression chamber C.

[0124] More specifically, the injection port 417p is formed in an area in the vicinity of the shoulder 42 of the bottom surface 23f in a range L in which the tip seal 26b (see Fig. 4) of the turning scroll 25 does not slide.

[0125] Subsequently, an operation of the air conditioner 401 and an operation of the scroll compressor 403 will be described.

[0126] The operation of the air conditioner 401 is the same as that in the first embodiment, the description will be omitted.

[0127] Since the movements of the fixed scroll 423 and the turning scroll 25 in the scroll compressor 403, the change in capacity of the compression chambers C1, C2 in association therewith, and the timing to supply the refrigerant at the intermediate pressure from the injection port 417p are the same as in the first embodiment, the description will be omitted.

[0128] In this configuration, since the injection port 417p is provided in an area in which the tip seal 26b does not slide, and hence the tip seal 26b is prevented from being broken by the contact with respect to the injection port 417p. By preventing the tip seal 26b from being broken, the leakage of the refrigerant between the compression chambers C1, C2 being disposed side by side with the intermediary of the wall body 25b and having different pressures may be prevented, so that the lowering of the performance of the scroll compressor 403 is prevented.

[Fifth Embodiment]

[0129] Referring now to Fig. 26, a fifth embodiment of the present invention will be described.

[0130] The basic configuration of the air conditioner in this embodiment is the same as that in the first embodiment, except for the configuration of the injection flow channel for supplying the refrigerant at the intermediate pressure to the scroll compressor. Therefore, in this embodiment, only the configuration of the periphery of the injection flow channel will be described referring to Fig. 26, and description of other configurations will be omitted.

[0131] Fig. 26 is a schematic drawing for explaining an air-conditioner according to this embodiment.

[0132] The same components as those in the first embodiment are designated by the same reference numerals and description thereof is omitted.

[0133] As shown in Fig. 26, an air conditioner 501 schematically includes the scroll compressor 3 for compressing the refrigerant, an oil separator (oil separating unit) 503 for separating lubricant from the compressed refrigerant, the capacitor 5 for radiating heat of refrigerant separated from the lubricant, the first expansion valve 7 for decompressing the pressure of the radiated refrigerant, the receiver 9 for separating the decompressed refrigerant into gas and liquid, the second expansion valve 11 for further decompressing the liquid refrigerant, and the evaporator 13 for causing the decompressed liquid refrigerant to absorb heat.

[0134] Between the receiver 9 and the scroll compressor 3, an injection flow channel (supply unit) 517 is provided for supplying the gas refrigerant separated from liquid by the receiver 9 to the scroll compressor 3.

[0135] Between the oil separator 503 and the injection flow channel 517, an oil flow channel 519 for supplying lubricant separated by the oil separator 503 to the injection flow channel 517 is arranged. An aperture 521 is provided in the oil flow channel 519, and the aperture 521 adjusts the pressure difference between the interior of the oil separator 503 and the interior of the injection flow channel 517.

[0136] Subsequently, an operation of the air conditioner 501 will be described.

[0137] The refrigerant which is compressed by the scroll compressor 3 to a high pressure is discharged toward the oil separator 503 as shown in Fig. 26. The refrigerant flowing into the oil separator 503 is separated into the lubricant and the refrigerant for the scroll compressor 3, and the separated refrigerant is discharged toward the capacitor 5.

[0138] The refrigerant flowing into the capacitor 5 radiates the heat thereof outward and is condensed, and flows toward the first expansion valve 7. The refrigerant is decompressed by the first expansion valve 7 and flows into the receiver 9 as the refrigerant at an intermediate pressure. The refrigerant is separated into liquid refrigerant and gas refrigerant in the receiver 9, and the liquid refrigerant flows toward the second expansion valve 11. The liquid refrigerant is decompressed by the second expansion valve 11 and flows into the evaporator 13 as the refrigerant at a low pressure. The refrigerant at the low pressure takes heat from the outside air in the evaporator 13, is evaporated and transformed into the gas refrigerant, flows into the scroll compressor 3, and is compressed again.

[0139] On the other hand, the gas refrigerant separated in the receiver 9 flows into the scroll compressor 3 via the injection flow channel 517. The refrigerant flowing into the scroll compressor 3 is compressed again.

[0140] The lubricant separated by the oil separator 503 is supplied to the injection flow channel 517 through the oil flow channel 519. The lubricant supplied to the injection flow channel 517 flows into the scroll compressor 3 together with the refrigerant.

[0141] The refrigerant compressed by the scroll compressor 3 again is discharged into the capacitor 5 and repeats the above-described cycle.

[0142] In this configuration, the lubricant separated by the oil separator 503 can be returned to the compression chambers C1, C2 of the scroll compressor 3 via the injection port 17p. By returning the lubricant to the compression chambers C1, C2, the sealing property is improved, and the refrigerant from the compression chambers C1, C2 is prevented from leaking, so that improvement of the performance of the scroll compressor 3 and improvement of the performance of the air conditioner 501 are achieved.

[0143] The technical scope of the present invention is not limited to the embodiments shown above, and various modifications may be made without departing the scope of the present invention.

[0144] Although the invention has been described as an air conditioner in the embodiments shown above, more specifically, the invention is applicable to apparatuses to which the air conditioners such as refrigerators, air conditioners, and other various devices are applied.

Claims

1. A scroll compressor (3, 103, 303, 403) that comprises a fixed scroll (23, 323, 423) and a turning scroll (25, 125) each having an end panel (23a, 25a) formed with a convoluted wall body (23b, 25b) extending upright from one side surface thereof, and forming a plurality of compression chambers (C, C1, C2) for compressing refrigerant by being engaged with each other,
wherein at least one of the fixed scroll and the turning scroll is formed on the one side surface of the end panel thereof with a shoulder (42, 43) which is high on the side of a center portion thereof and is low on the outer end side along the convolution of the wall body, and
the other one of the fixed scroll and the turning scroll is formed on an upper edge of the wall body thereof with a misaligned portion (44, 45) corresponding to the shoulder (42) on the end panel, the misaligned portion being divided into a plurality of portions, and being low on the side of a center of the convolution and high on the outer end side thereof,
the scroll compressor being **characterized in that** it comprises a supply unit (17, 117, 517) for supplying the refrigerant supplied from an outside of the scroll compressor (3, 103, 303, 403) which is formed in the plurality of compression chambers while compressing the refrigerant, and **in that** the refrigerant is supplied from the supply unit while the plurality of compression chambers (C, C1, C2) are in communication with each other via a clearance between the shoulder (42) and the misaligned portion (45) while the shoulder (42) and the misaligned portion (45) are apart from each other.

2. The scroll compressor according to Claim 1, wherein the supply unit (17, 117, 517) is a through hole provided on the end panel of at least one of the fixed scroll (23) and the turning scroll (25), and the through hole is provided at a position which communicates with the plurality of compression chambers (C, C1, C2) while in communication with each other via a clearance between the plurality of compression chambers (C, C1, C2) while the shoulder (42) and the misaligned portion (45) are apart from each other.

3. The scroll compressor according to Claim 1, wherein the supply unit (17, 117, 517) is provided at a contact portion of the shoulder (42) with respect to the misaligned portion (45).

4. The scroll compressor according to Claim 1, wherein seal members which come into contact with the end panel (23a) are provided in an area on the upper edge of the wall body from the misaligned portion (45) toward the center portion of the convolution, and an area from the misaligned portion toward the outer end, and the supply unit is provided in an area of the end panel where the seal members do not slide.

5. The scroll compressor according to any one of Claims 1 to 4, wherein a control unit (119) which controls the supply of the refrigerant from the supply unit to the plurality of compression chambers (C, C1, C2) is provided and the control unit (119) controls the refrigerant to be supplied from the supply unit while the shoulder and the misaligned portion are apart from each other.

6. An air conditioner (1, 101, 301, 401, 501) comprising:

a scroll compressor (3, 103, 303, 403) according to any one of Claims 1 to 5;
an oil separating unit (503) for separating lubricant from refrigerant compressed by the scroll compressor;
a radiator (5) for radiating heat of the refrigerant compressed by the scroll compressor;
a high-pressure-side decompression unit (7) for decompressing the pressure of the radiated refrigerant;
a low-pressure-side decompression unit (11) for further decompressing the decompressed refrigerant; and
a heatsink (13) for causing the refrigerant decompressed by the low-pressure-side decompressing unit to absorb the heat, wherein the refrigerant decompressed by the high-pressure-side decompressing unit and the lubricant separated by the oil separating unit are supplied to the supply unit of the scroll compressor.

Patentansprüche

1. Scrollverdichter (3, 103, 303, 403), der eine ortsfeste Spiralschnecke (23, 323, 423) und eine sich drehende Spiralschnecke (25, 125) umfasst, die jeweils ein Endpaneel (23a, 25a) aufweisen, das mit einem gewundenen Wandkörper (23b, 25b) ausgebildet ist, der sich von einer Seitenfläche davon aufrecht erstreckt, und mehrere Verdichtungskammern (C, C1, C2) zum Verdichten von Kältemittel bildet, indem sie miteinander in Eingriff gebracht werden,
wobei mindestens eine der ortsfesten Spiralschnecke und der sich drehenden Spiralschnecke an der einen Seitenfläche ihres Endpaneels mit einer Schulter (42, 43) ausgebildet ist, die auf der Seite eines Mittelabschnitt davon hoch ist und auf der Außenendseite entlang der Windung des Wandkörpers niedrig ist, und
wobei die andere der ortsfesten Spiralschnecke und der sich drehenden Spiralschnecke an einer Oberkante ihres Wandkörpers mit einem fehlausgerichteten Abschnitt (44, 45) ausgebildet ist, welcher der Schulter (42) an dem Endpaneel entspricht, wobei der fehlausgerichtete Abschnitt in mehrere Abschnitte unterteilt ist und auf der Seite einer Mitte der Windung niedrig ist und auf seiner Außenendseite hoch ist,
wobei der Scrollverdichter **dadurch gekennzeichnet ist,**
dass er eine in den mehreren Verdichtungskammern ausgebildete Zuführeinheit (17, 117, 517) umfasst, um das Kältemittel, das von außerhalb des Scrollverdichters (3, 103, 303, 403) zugeführt wird, zuzuführen und das Kältemittel dabei zu verdichten, und dadurch,
dass das Kältemittel aus der Zuführeinheit zugeführt wird, während die mehreren Verdichtungskammern (C, C1, C2) miteinander über einen Freiraum zwischen der Schulter (42) und dem fehlausgerichteten Abschnitt (45) in Strömungsverbindung stehen, während die Schulter (42) und der fehlausgerichtete Abschnitt (45) in einem Abstand voneinander angeordnet sind.

2. Scrollverdichter nach Anspruch 1, wobei die Zuführeinheit (17, 117, 517) eine Durchgangsöffnung ist, die in dem Endpaneel von mindestens einer der ortsfesten Spiralschnecke (23) und der sich drehenden Spiralschnecke (25) ausgebildet ist, und die Durchgangsöffnung an einer Position angeordnet ist, die mit den mehreren Verdichtungskammern (C, C1, C2) in Strömungsverbindung steht, während sie über einen Freiraum zwischen den mehreren Verdichtungskammern (C, C1, C2) miteinander in Strömungsverbindung stehen, während die Schulter (42) und der fehlausgerichtete Abschnitt (45) in einem Abstand voneinander angeordnet sind.

3. Scrollverdichter nach Anspruch 1, wobei die Zuführeinheit (17, 117, 517) an einem Kontaktabschnitt der Schulter (42) mit Bezug zu dem fehlausgerichteten Abschnitt (45) angeordnet ist.

4. Scrollverdichter nach Anspruch 1, wobei Dichtungselemente, die in Kontakt mit dem Endpaneel (23a) kommen, in einem Bereich an der Oberkante des Wandkörpers von dem fehlausgerichteten Abschnitt (45) in Richtung des Mittelabschnitts der Windung und einem Bereich von dem fehlausgerichteten Abschnitt in Richtung des äußeren Endes angeordnet sind, und die Zuführeinheit in einem Bereich des Endpaneels angeordnet ist, wo die Dichtungselemente nicht gleiten.

5. Scrollverdichter nach einem der Ansprüche 1 bis 4, wobei eine Steuereinheit (119), welche die Zufuhr des Kältemittels von der Zuführeinheit zu den mehreren Verdichtungskammern (C, C1, C2) steuert, bereitgestellt ist und die Steuereinheit (119) veranlasst, dass das Kältemittel aus der Zuführeinheit zugeführt wird, während die Schulter und der fehlausgerichtete Abschnitt in einem Abstand voneinander angeordnet sind.

6. Klimaanlage (1, 101, 301, 401, 501), umfassend:

    einen Scrollverdichter (3, 103, 303, 403) nach einem der Ansprüche 1 bis 5;
    eine Ölabscheidungseinheit (503) zum Trennen von Schmiermittel von durch den Scrollverdichter verdichtetem Kältemittel;
    einen Radiator (5) zum Abstrahlen von Wärme des durch den Scrollverdichter verdichteten Kältemittels;
    eine hochdruckseitige Dekompressionseinheit (7) zum Dekomprimieren des Drucks des abgestrahlten Kältemittels;
    eine niederdruckseitige Dekompressionseinheit (11) zum weiteren Dekomprimieren des dekomprimierten Kältemittels; und
    eine Wärmesenke (13), die bewirkt, dass das durch die niederdruckseitige Dekompressionseinheit dekomprimierte Kältemittel die Wärme absorbiert, wobei das durch die hochdruckseitige Dekompressionseinheit dekomprimierte Kältemittel und das durch die Ölabscheidungseinheit abgeschiedene Schmiermittel zu der Zuführeinheit des Scrollverdichters geleitet werden.

Revendications

1. Compresseur à spirales (3, 103, 303, 403) qui comporte une spirale fixe (23, 323, 423) et une spirale tournante (25, 125) ayant chacun un panneau d'ex-

trémité (23a, 25a) formé avec un corps de paroi convoluté (23b, 25b) s'étendant verticalement depuis une surface latérale, et formant une pluralité de chambres de compression (C, C1, C2) pour comprimer du réfrigérant en étant engagées l'une avec l'autre,
dans lequel au moins une de la spirale fixe et de la spirale tournante est formée sur la surface latérale du panneau d'extrémité avec un épaulement (42, 43) qui est haut sur le côté d'une partie centrale et est bas sur le côté d'extrémité extérieure le long de la convolution du corps de paroi, et
l'autre de la spirale fixe et de la spirale tournante est formée sur un bord supérieur du corps de paroi avec une partie désalignée (44, 45) correspondant à l'épaulement (42) sur le panneau d'extrémité, la partie désalignée étant divisée en une pluralité de parties, et étant basse sur le côté d'un centre de la convolution et haute sur le côté d'extrémité extérieure,
le compresseur à spirales étant **caractérisé en ce qu'**il comporte une unité d'alimentation (17, 117, 517) destinée à délivrer le réfrigérant délivré depuis un extérieur du compresseur à spirales (3, 103, 303, 403) qui est formé dans la pluralité de chambres de compression tout en comprimant le réfrigérant, et
le réfrigérant est délivré à partir de l'unité d'alimentation tandis que les chambres de la pluralité de chambres de compression (C, C1, C2) sont en communication l'une avec l'autre par l'intermédiaire d'un jeu entre l'épaulement (42) et la partie désalignée (45) tandis que l'épaulement (42) et la partie désalignée (45) sont espacés l'un de l'autre.

2. Compresseur à spirales selon la revendication 1, dans lequel l'unité d'alimentation (17, 117, 517) est un trou débouchant prévu sur le panneau d'extrémité d'au moins une de la spirale fixe (23) et de la spirale tournante (25), et le trou débouchant est prévu dans une position qui communique avec la pluralité de chambres de compression (C, C1, C2) alors qu'elles sont en communication l'une avec l'autre par l'intermédiaire d'un jeu entre la pluralité de chambres de compression (C, C1, C2) tandis que l'épaulement (42) et la partie désalignée (45) sont espacés l'un de l'autre.

3. Compresseur à spirales selon la revendication 1, dans lequel l'unité d'alimentation (17, 117, 517) est prévue au niveau d'une partie de contact de l'épaulement (42) par rapport à la partie désalignée (45).

4. Compresseur à spirales selon la revendication 1, dans lequel des éléments de joint qui entrent en contact avec le panneau d'extrémité (23a) sont prévus dans une zone sur le bord supérieur du corps de paroi depuis la partie désalignée (45) vers la partie centrale de la convolution, et une zone depuis la partie désalignée vers l'extrémité extérieure, et l'unité d'alimentation est prévue dans une zone du panneau d'extrémité où les éléments de joint ne glissent pas.

5. Compresseur à spirales selon l'une quelconque des revendications 1 à 4, dans lequel une unité de commande (119) qui commande l'alimentation en réfrigérant depuis l'unité d'alimentation jusqu'à la pluralité de chambres de compression (C, C1, C2) est prévue et l'unité de commande (119) commande le réfrigérant devant être délivré à partir de l'unité d'alimentation tandis que l'épaulement et la partie désalignée sont espacés l'un de l'autre.

6. Climatiseur (1, 101, 301, 401, 501) comportant :

un compresseur à spirales (3, 103, 303, 403) selon l'une quelconque des revendications 1 à 5 ;
une unité de séparation d'huile (503) destinée à séparer le lubrifiant du réfrigérant comprimé par le compresseur à spirales ;
un radiateur (5) destiné à rayonner de la chaleur du réfrigérant comprimé par le compresseur à spirales ;
une unité de décompression du côté haute pression (7) destinée à décomprimer la pression du réfrigérant rayonné ;
une unité de décompression du côté basse pression (11) destinée à décomprimer davantage le réfrigérant décomprimé ; et
un dissipateur thermique (13) destiné à amener le réfrigérant décomprimé par l'unité de décompression du côté basse pression à absorber la chaleur, le réfrigérant décomprimé par l'unité de décompression à haute pression et le lubrifiant séparé par l'unité de séparation d'huile étant délivrés à l'unité d'alimentation du compresseur à spirales.

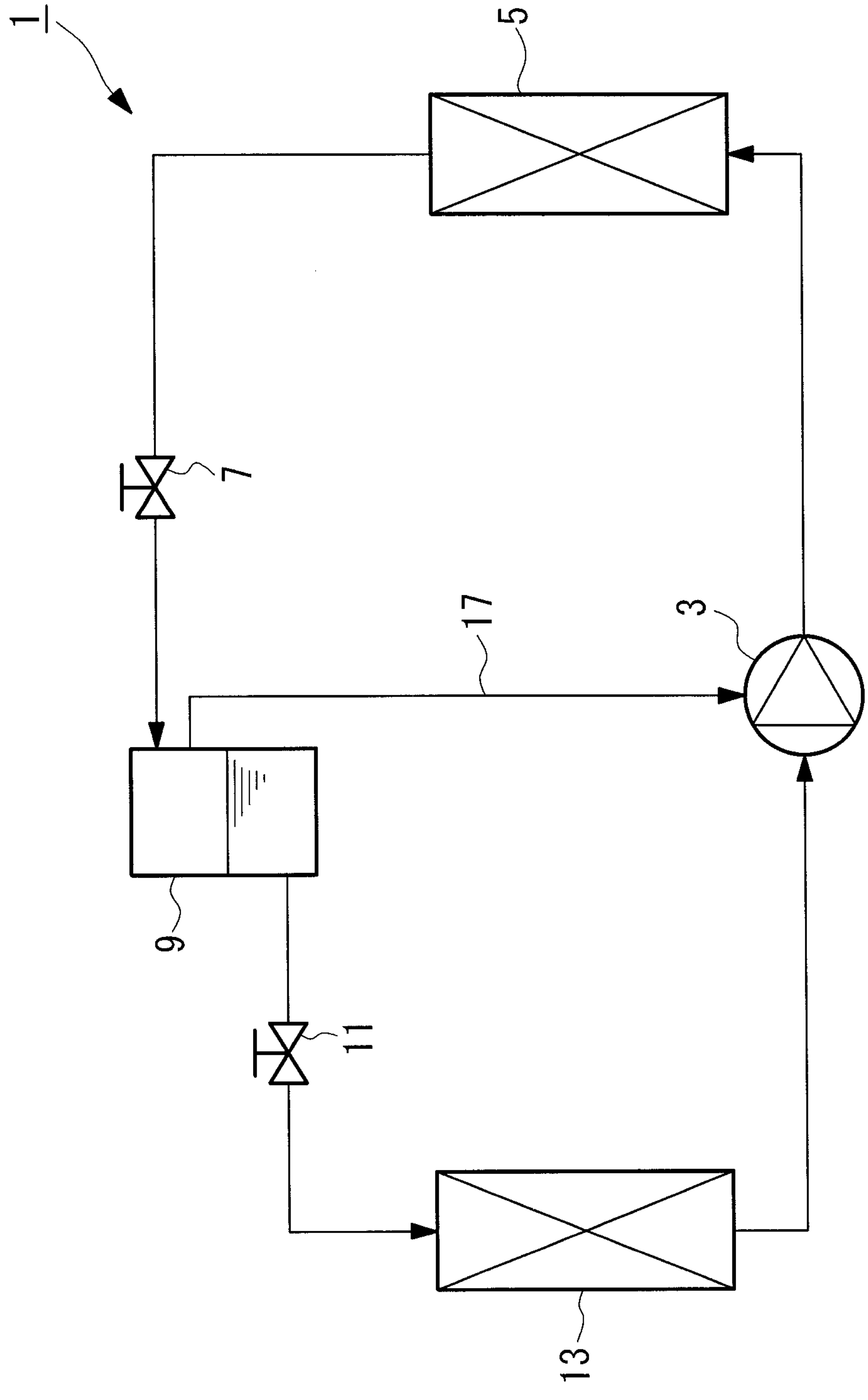


FIG. 1

FIG. 2

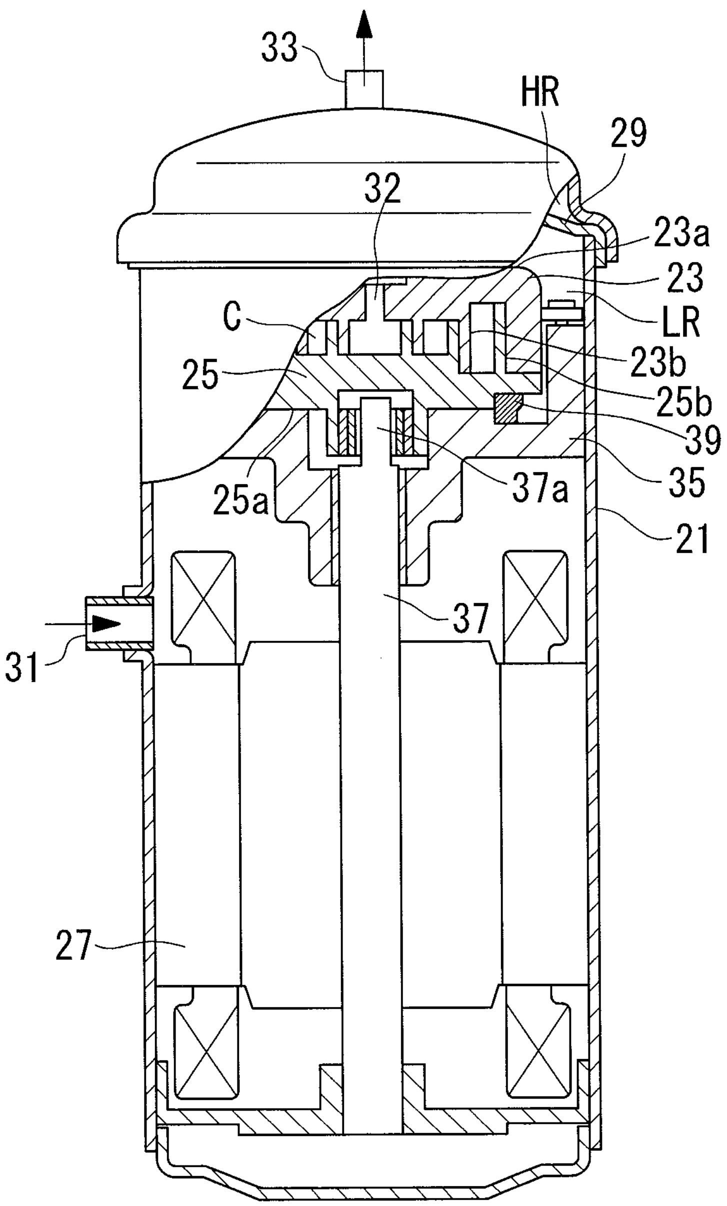
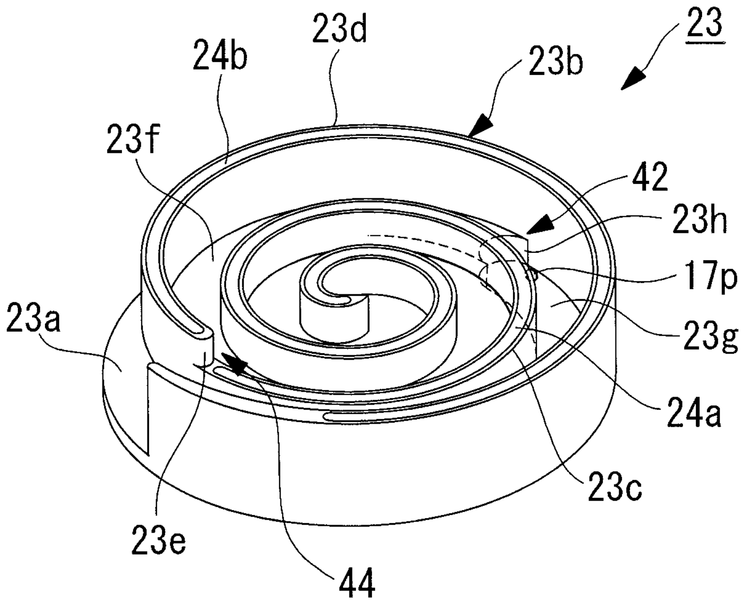


FIG. 3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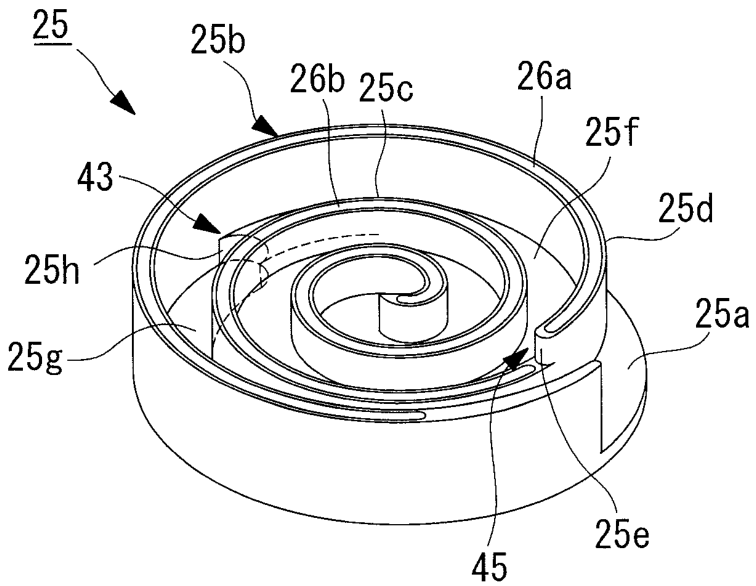
23d
24b
23b
23f
42
23h
17p
23g
23a
24a
23c
23e
44

FIG. 4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25d
25h
25a
25g
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25e

FIG. 5

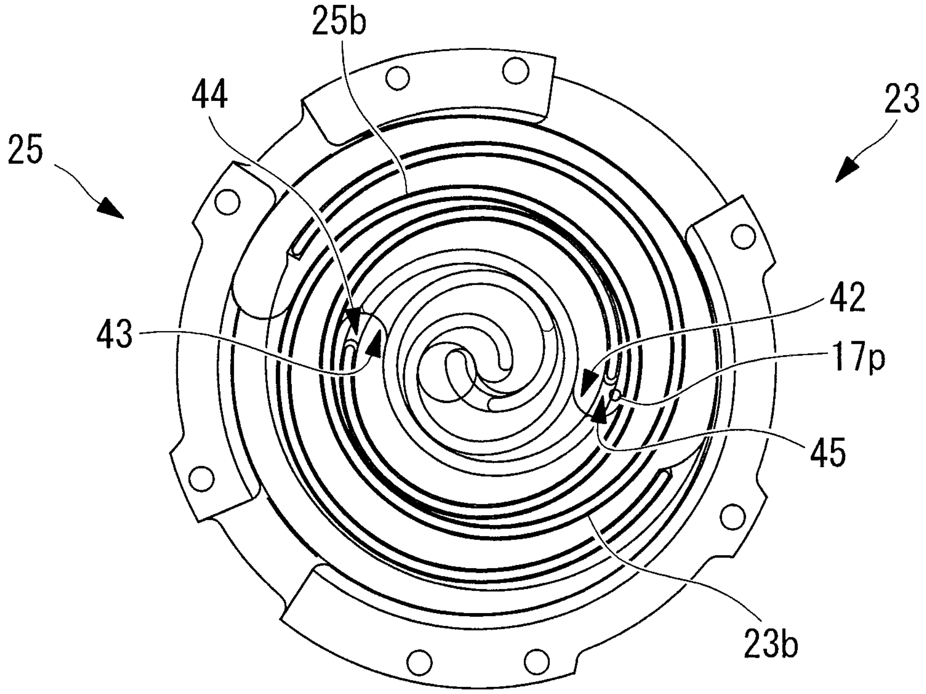


FIG. 6

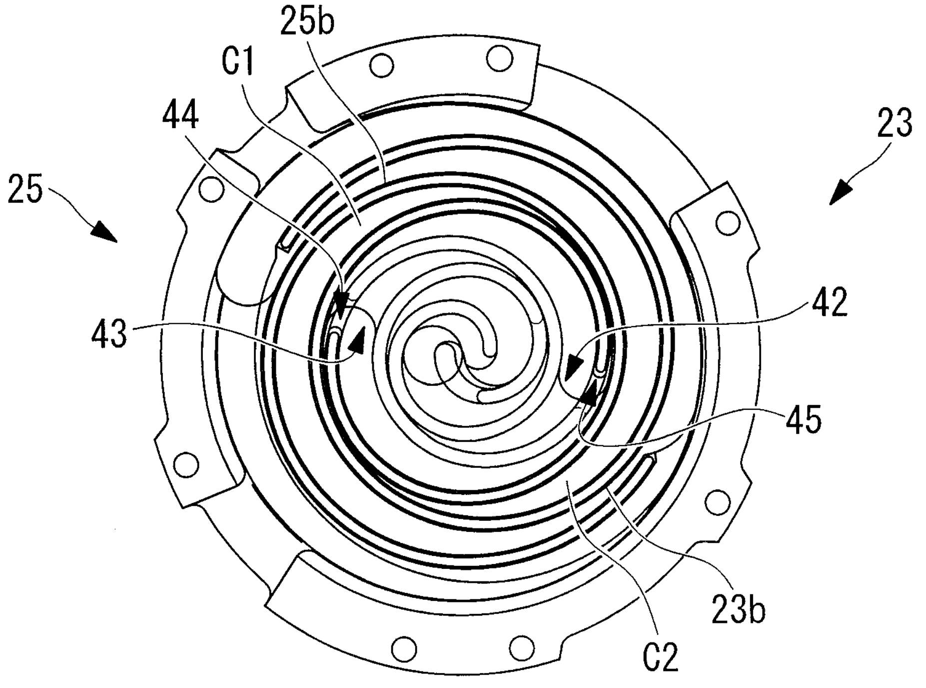


FIG. 7

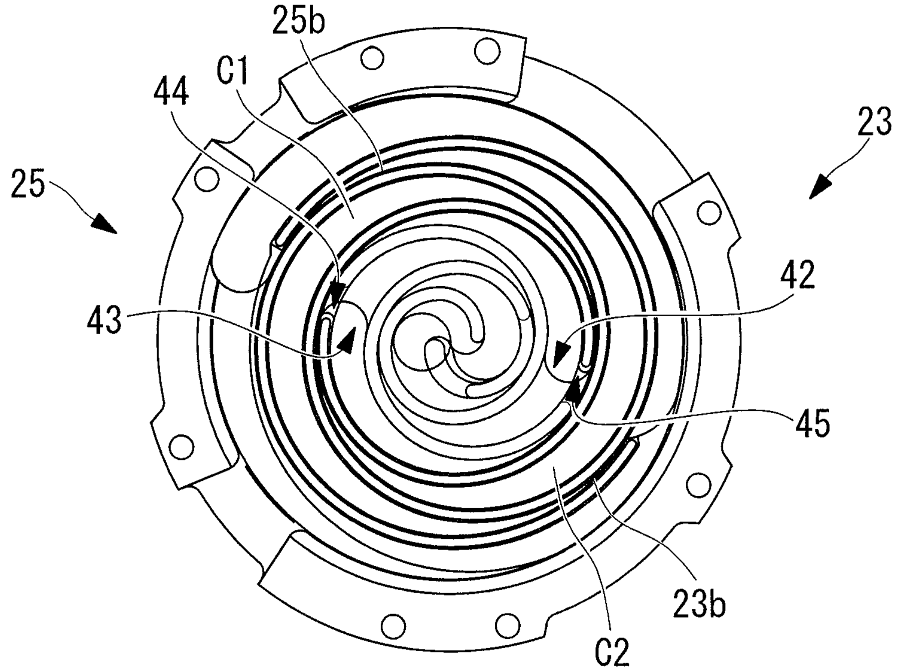


FIG. 8

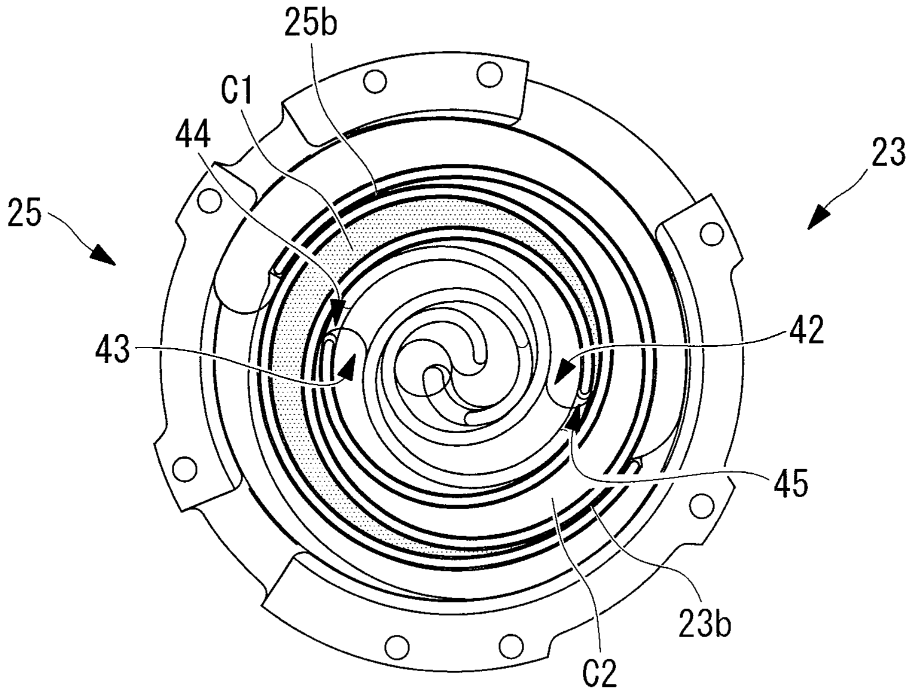
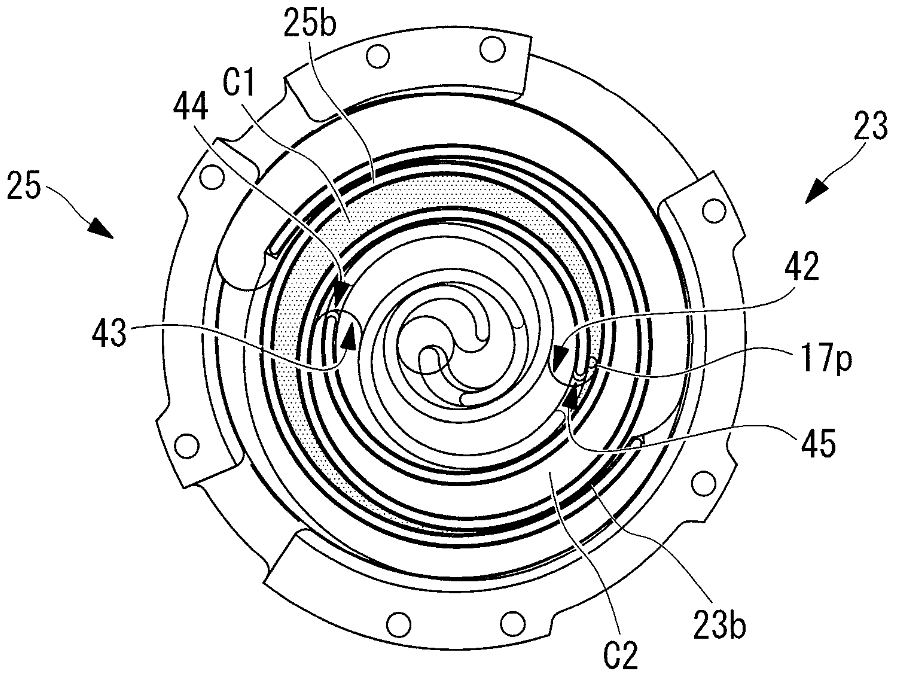


FIG. 9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C1
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23
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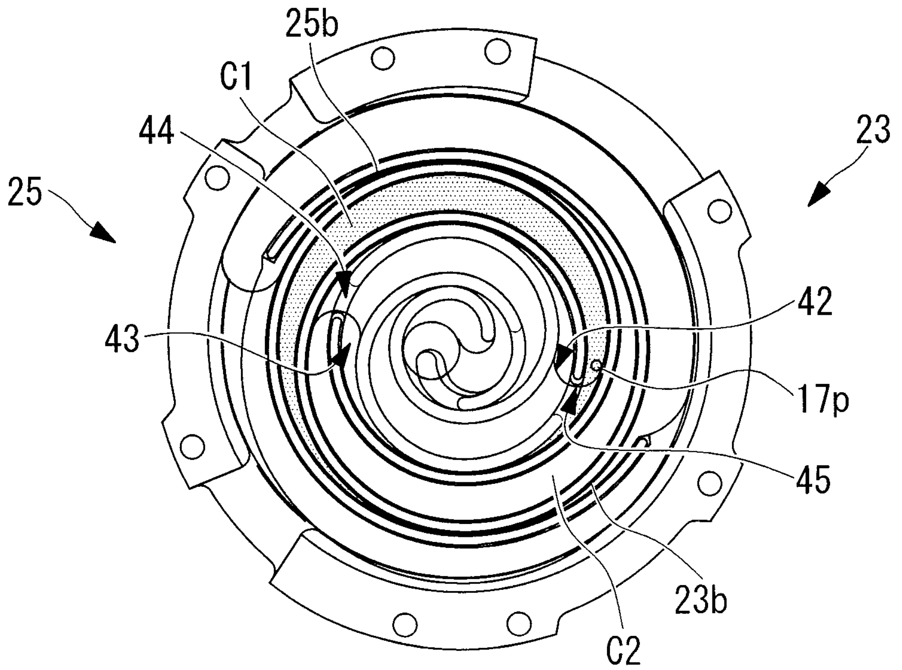
42
43
17p
45
23b
C2

FIG. 10


25b
C1
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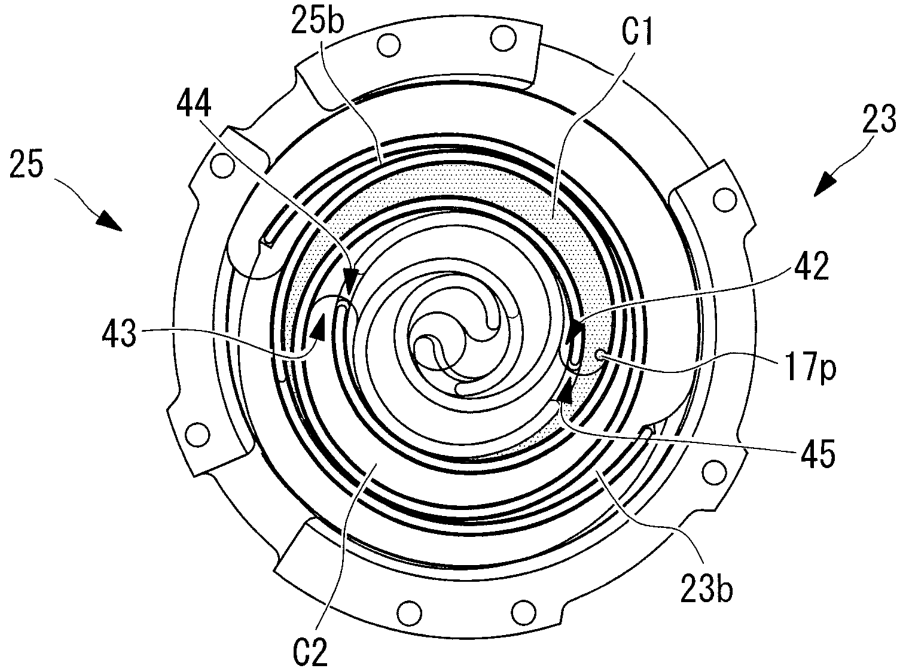
23
25
42
43
17p
45
23b
C2

FIG. 11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C1
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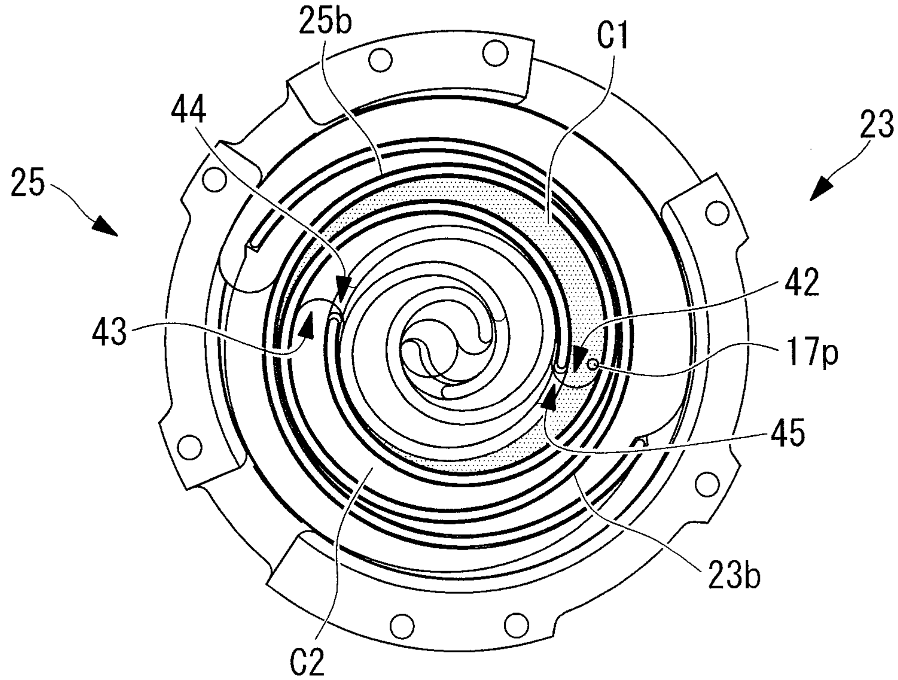
23
25
42
43
17p
45
23b
C2

FIG. 12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C1
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25
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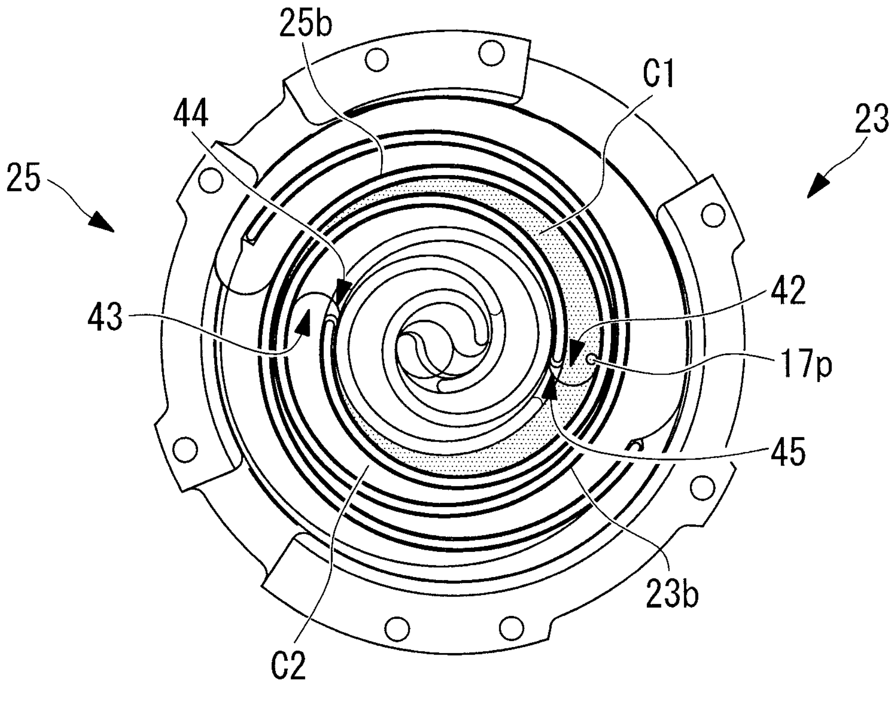
43
17p
45
23b
C2

FIG. 13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C1
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44
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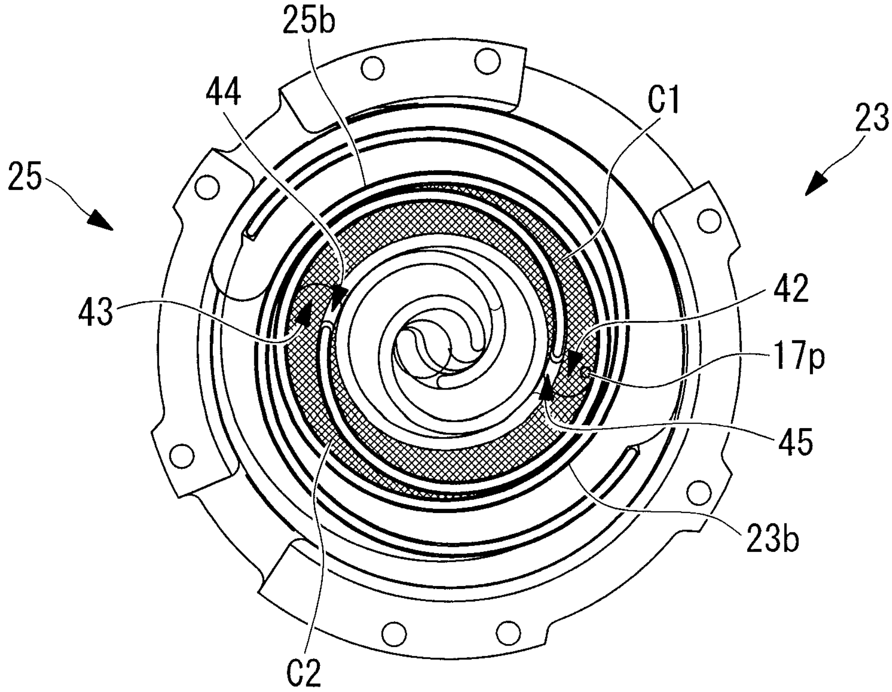
43
17p
45
23b
C2

FIG. 14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C1
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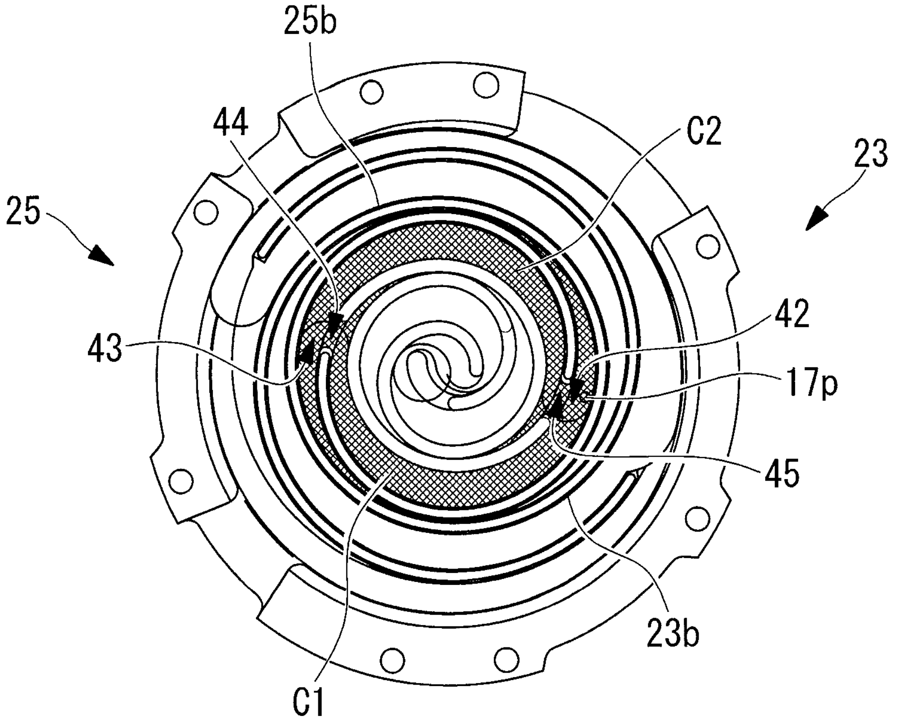
42
43
17p
45
23b
C2

FIG. 15


25b
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C2
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25
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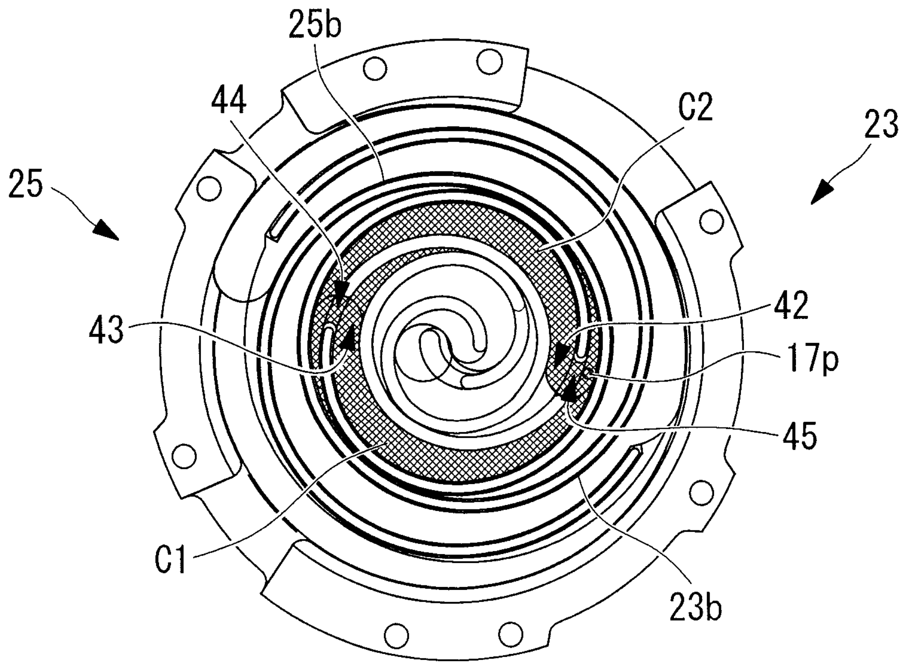
43
17p
45
23b
C1

FIG. 16


25b
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C2
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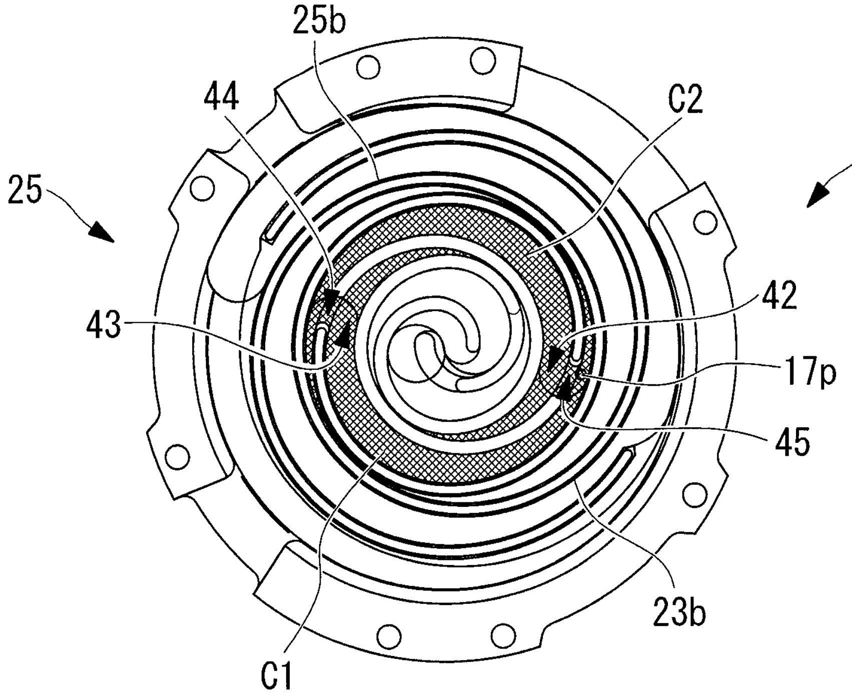
25
42
43
17p
45
C1
23b

FIG. 17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C2
23
25
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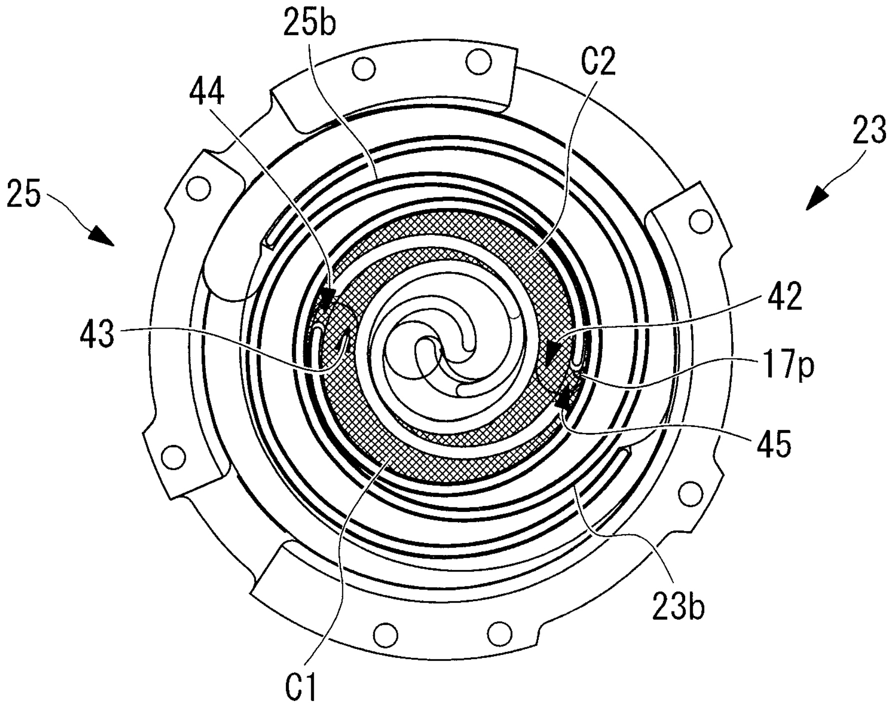
42
17p
45
23b
C1

FIG. 18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C2
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42
17p
45
23b
C1

FIG. 19

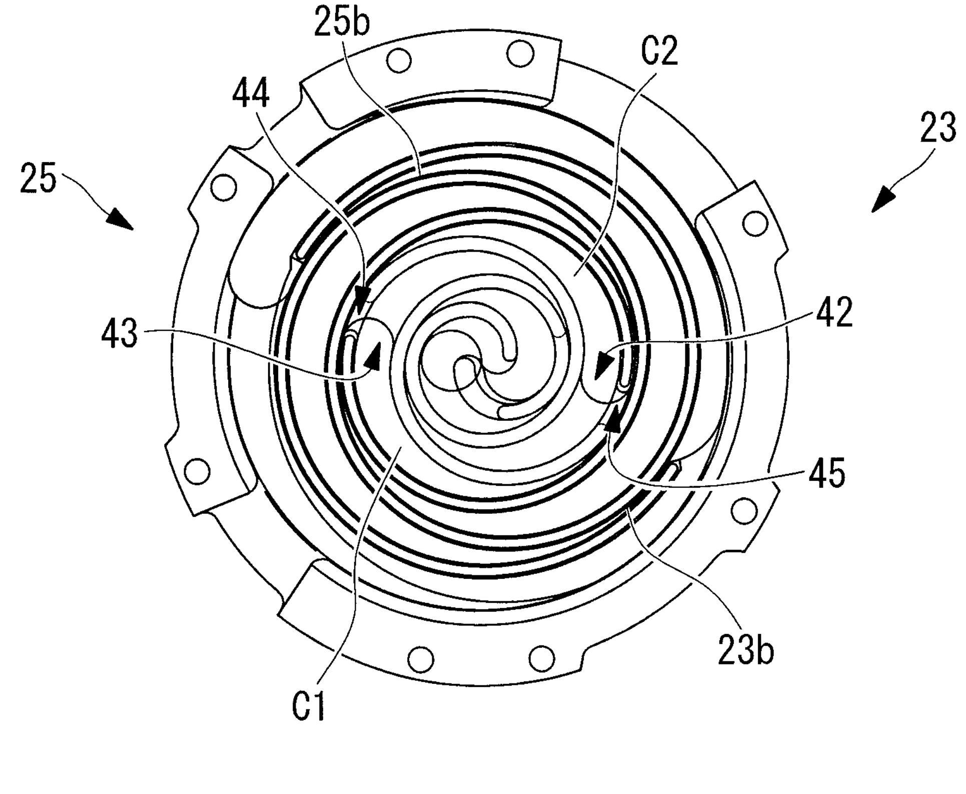


FIG. 20

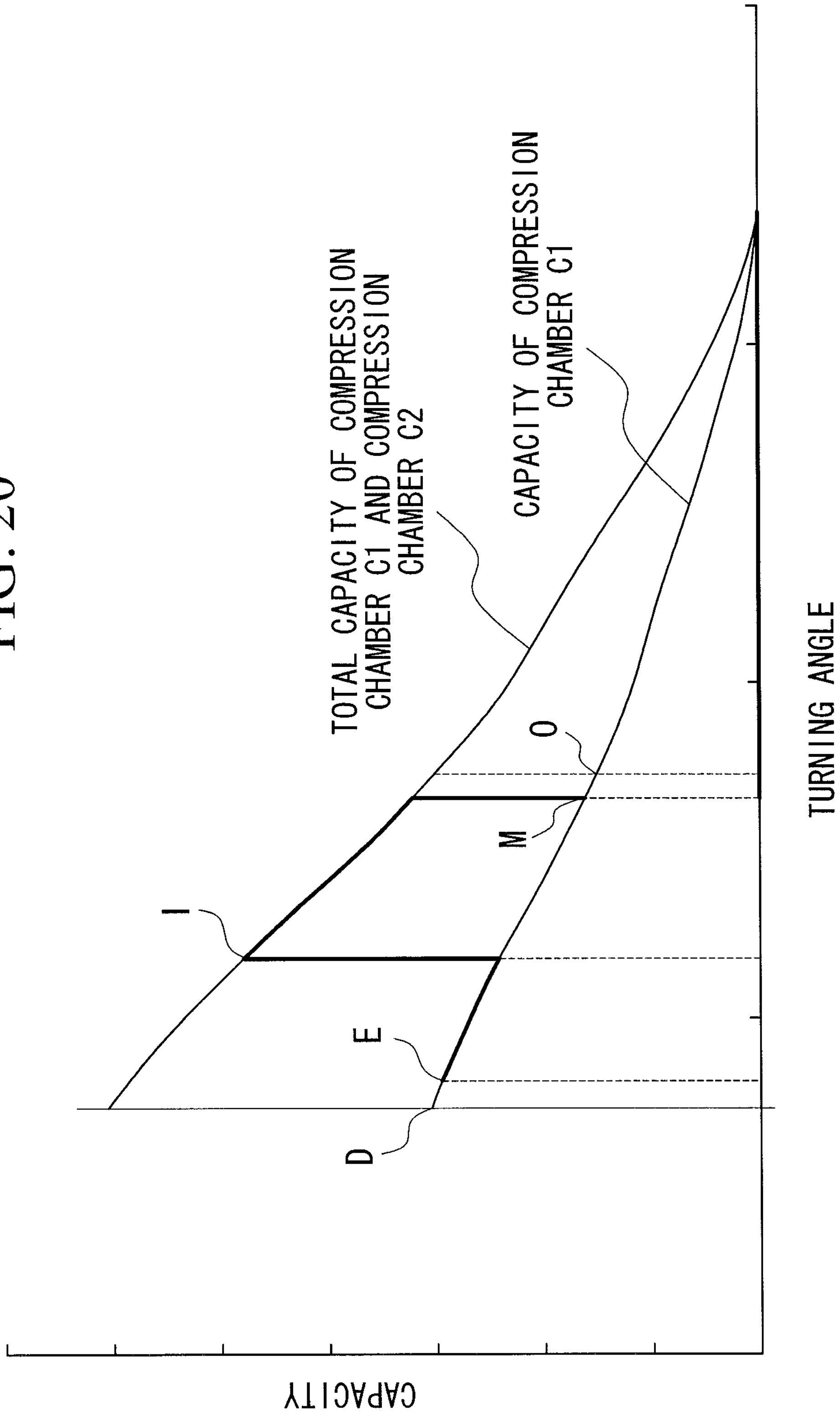

TOTAL CAPACITY OF COMPRESSION CHAMBER C1 AND COMPRESSION CHAMBER C2
CAPACITY OF COMPRESSION CHAMBER C1
I
E
D
M
O
TURNING ANGLE
CAPACITY

FIG. 21

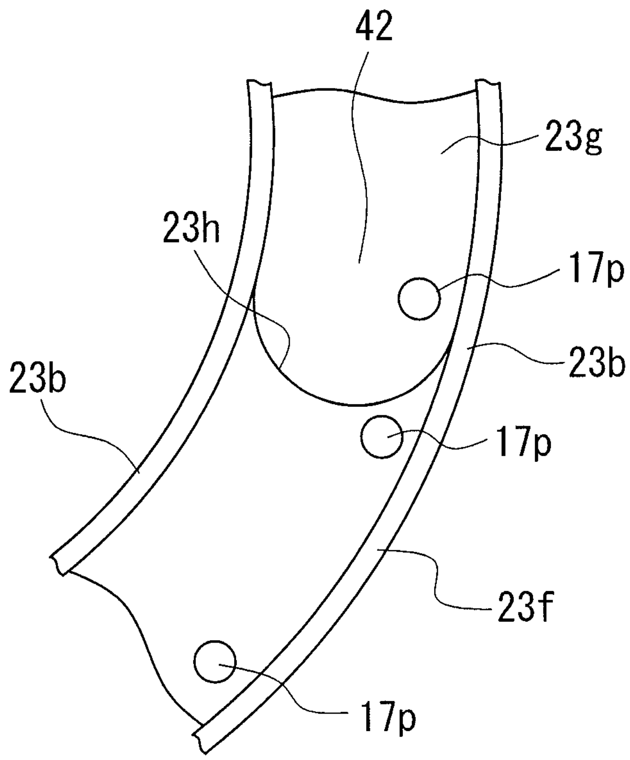


FIG. 22

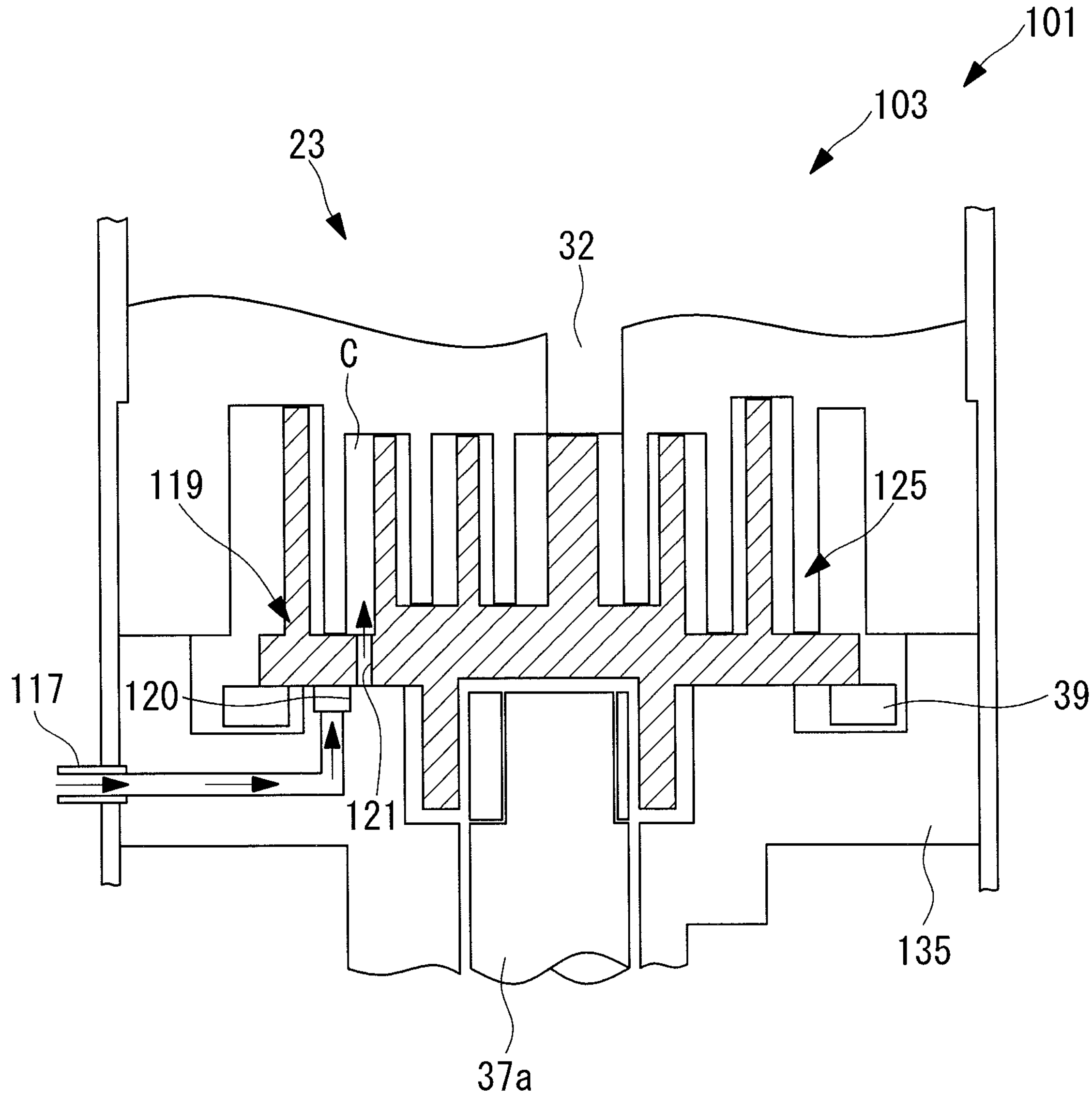


FIG. 23

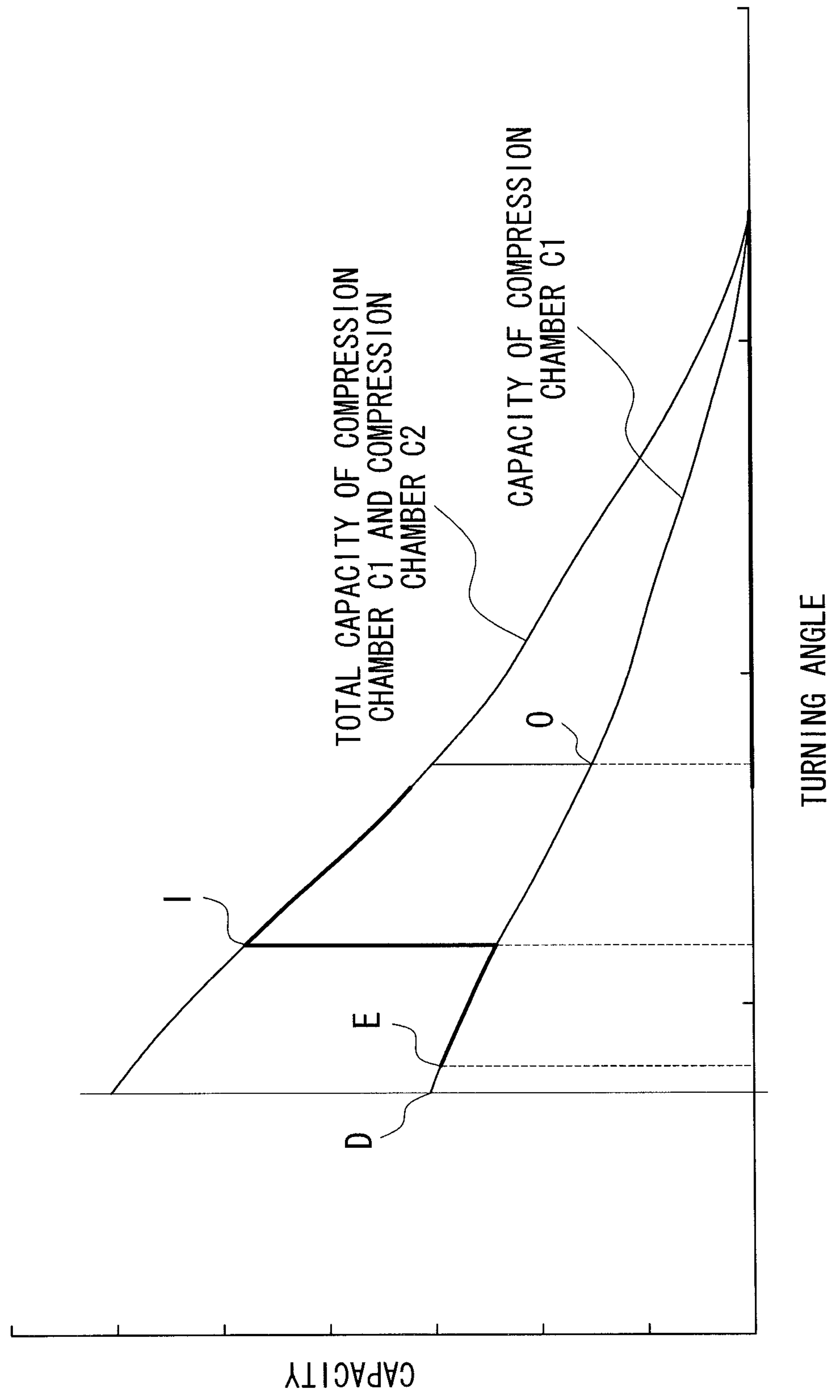

TOTAL CAPACITY OF COMPRESSION CHAMBER C1 AND COMPRESSION CHAMBER C2
CAPACITY OF COMPRESSION CHAMBER C1
O
I
E
D
TURNING ANGLE
CAPACITY

FIG. 24

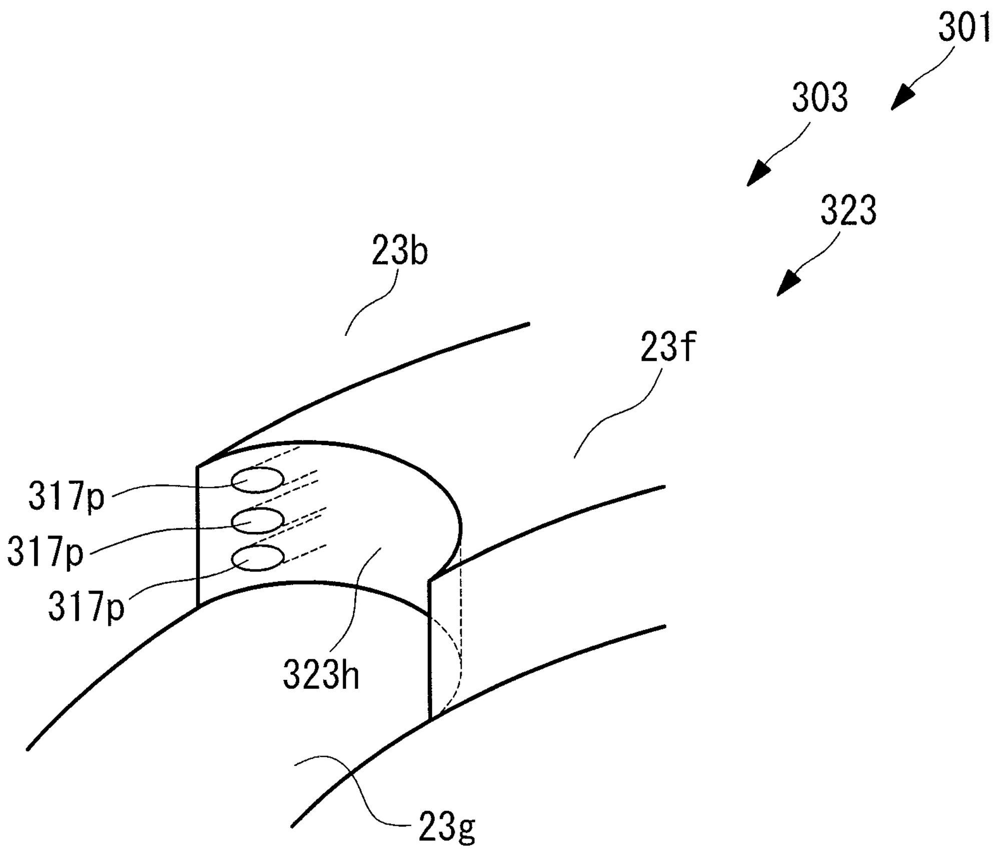


FIG. 25

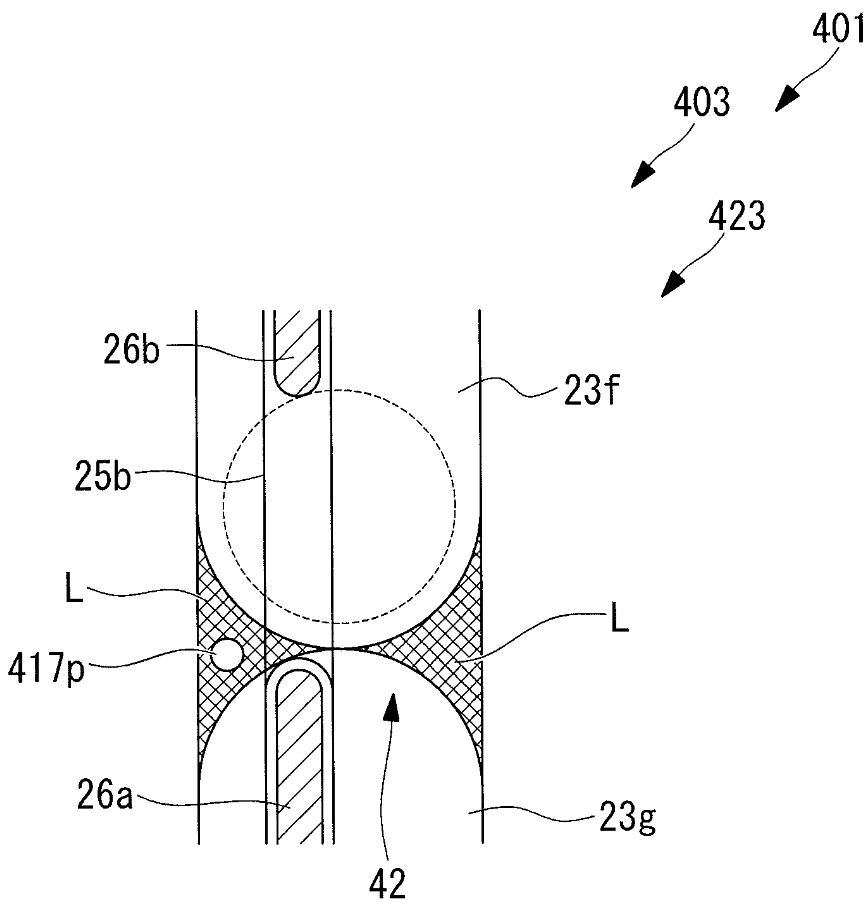
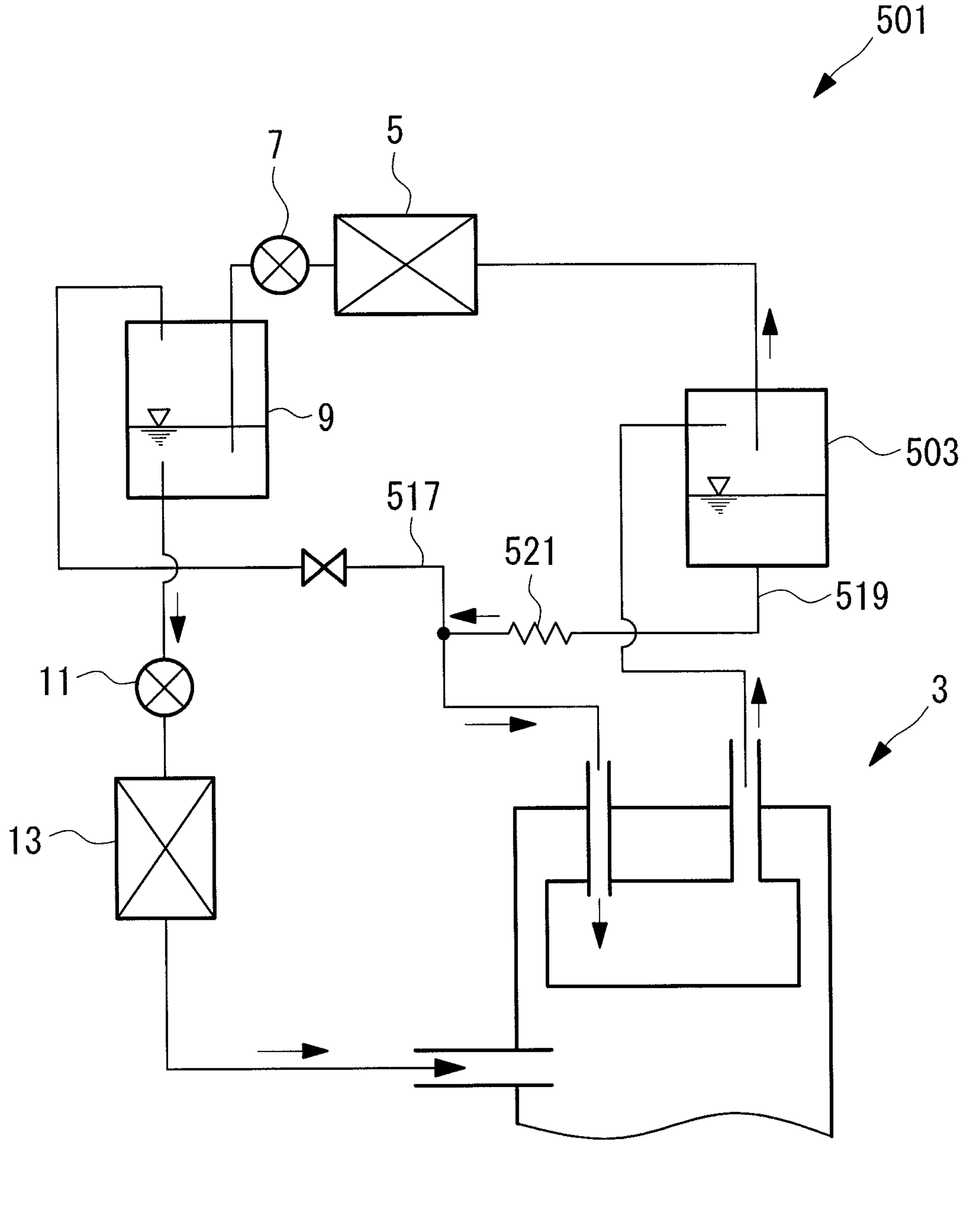


FIG. 26



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Patent documents cited in the description

- JP 7103152 A **[0005]**
- US 20020114720 A **[0005]**