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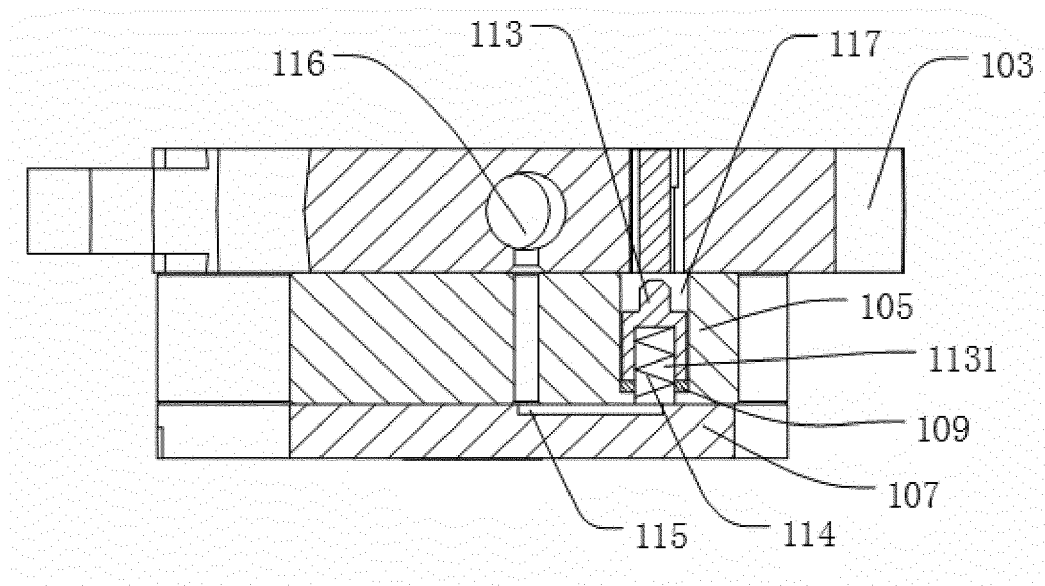
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(54) **SLIDING VANE CONTROL STRUCTURE FOR VARIABLE-CAPACITY AIR CYLINDER, VARIABLE-CAPACITY AIR CYLINDER AND VARIABLE-CAPACITY COMPRESSOR**

(57) Provided is a sliding vane control structure for a variable-capacity cylinder, including a pin (113, 213) provided on a lower side of a sliding vane (11), the pin (113, 213) having a first position capable of stopping the sliding vane (11) and a second position capable of being separated from the sliding vane (11), wherein a low-pressure passage (115, 215) is provided under the pin (113, 213); and a surface seal structure is provided between the pin (113, 213) and the low-pressure passage (115, 215), and when the pin (113, 213) is at the second position, a surface seal is formed at a lower end of the pin (113, 213). Since the sliding vane control structure is provided with

a surface seal structure, a seal effect of the surface seal is much better than that of a clearance seal, thereby greatly reducing a leakage of a refrigerant. Consequently, an efficiency of a compressor is increased when a variable-capacity cylinder is in a working mode, and a performance of the compressor is optimized. Also provided is the variable-capacity cylinder with the sliding vane control structure and a variable-capacity compressor.

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Description

Cross-reference to Related Applications

[0001] The present application claims benefit of Chinese Patent Application No. 201510965018.X, entitled "sliding vane control structure for variable-capacity cylinder, variable-capacity cylinder and variable-capacity compressor", filed to China Patent Office on December 18, 2015, the contents of which are hereby incorporated by reference in its entirety.

Technical Field

[0002] The present invention relates to a technical field of compressors, and more particularly to a sliding vane control structure for a variable-capacity cylinder, a variable-capacity cylinder with the sliding vane control structure, and a variable-capacity compressor.

Background

[0003] A common structure of existing variable-capacity compressors is that a compressor body comprises a main cylinder and a variable-capacity cylinder, and the variable-capacity cylinder may be selectively operated or not operated, so as to achieve a change in a working displacement to meet different load requirements of a refrigeration system, thereby achieving a purpose of energy saving. Existing variable-capacity cylinders usually adopt a so-called pin-sliding vane switching mode: a sliding vane, a cylinder, and a bearing and a division plate covering two ends of the cylinder form a sealed cavity at a tail of the sliding vane, and the sealed cavity may be selectively introduced with high-pressure/low-pressure gas; and a pin locking/unlocking device is provided on a side of the sliding vane, the device is consisted of a pin hole, a pin, a spring, etc., wherein a head of the pin communicates with the above-mentioned sealed cavity, a low pressure is introduced into a tail of the pin via a low-pressure passage, and the pin has a pre-approaching force approaching the sliding vane by means of a physical device (such as spring and magnet). The defects of the above-mentioned mode are as follows. When it is required that the variable-capacity cylinder is normally operated, high-pressure refrigerant gas needs to be introduced into the sealed cavity, the high-pressure refrigerant gas leading to discharge of refrigeration oil in the sealed cavity; in order to ensure that the pin is slidably up and down in the pin hole, there is a certain clearance between the pin and the pin hole, so that a lubrication oil clearance seal cannot be realized; in addition, a viscosity of the refrigerant is much smaller than that of lubricating oil, and the clearance leakage speed is high. Therefore, a solution in the prior art will have the following harmful effects: the leakage of the refrigerant from the sealed cavity to a gas inlet of the variable-capacity cylinder through a pin side clearance will be significantly in-

creased, thereby resulting in a decrease in volumetric efficiency of the variable-capacity cylinder and a decrease in performance; in addition, the clearance size of different compressors cannot be completely consistent during mass production, which will lead to significant fluctuations in compressor refrigeration/heating capacity and is not conducive to controlling a quality stability of a compressor and an air-conditioning product.

Summary

[0004] In view of this, in order to at least partially solve the above-mentioned technical problems, the present invention provides a sliding vane control structure for a variable-capacity cylinder, capable of ensuring a seal effect, a variable-capacity cylinder with the sliding vane control structure, and a variable-capacity compressor.

[0005] According to a first aspect of the present invention, a sliding vane control structure for a variable-capacity cylinder is provided. The sliding vane control structure comprises:

a pin, provided on a lower side of a sliding vane, the pin having a first position capable of stopping the sliding vane and a second position capable of being separated from the sliding vane,
a low-pressure passage is provided under the pin; and
a surface seal structure is provided between the pin and the low-pressure passage, and when the pin is at the second position, a surface seal is formed at a lower end of the pin.

[0006] Preferably, the pin is provided in a pin hole, the pin hole is a step hole, an inner diameter of a portion, close to the lower end, of the pin hole is smaller than an inner diameter of a portion of an upper side, and thus a step surface extending inward in a radial direction is formed at a portion, close to the lower end, of the pin hole.

[0007] Preferably, a seal gasket is provided on the step surface, the lower end of the pin can be tightly pressed against an upper surface of the seal gasket, and the surface seal is formed between the lower end of the pin and the upper surface of the seal gasket.

[0008] Preferably, a through hole is formed in a middle of the seal gasket.

[0009] Preferably, a seal division plate is provided on a lower side of the pin, a lower end of the pin abuts against an upper surface of the seal division plate, and the surface seal is formed between the lower end of the pin and the upper surface of the seal division plate.

[0010] Preferably, a groove is provided at a lower part of the pin, and a first through hole is provided at a position, corresponding to the groove, on the seal division plate.

[0011] Preferably, a maximum size of the first through hole in a horizontal plane is smaller than a maximum outer diameter of the pin.

[0012] Preferably, a maximum size of the first through

hole in a horizontal plane is smaller than the maximum size of the groove in a horizontal plane.

[0013] Preferably, a second through hole is provided on the seal division plate, the second through hole enabling the low-pressure passage to communicate with a gas inlet of a variable-capacity cylinder.

[0014] According to a second aspect of the present invention, a variable-capacity cylinder is provided. The variable-capacity cylinder is provided with a sliding vane control structure in the present application.

[0015] According to a third aspect of the present invention, a variable-capacity compressor is provided. The variable-capacity compressor is provided with a variable-capacity cylinder in the present application.

[0016] In the present application, since the surface seal structure is provided between the pin and the low-pressure passage, a seal effect of the surface seal is much better than that of a clearance seal, thereby greatly reducing a leakage of a refrigerant. Consequently, an efficiency of the compressor is increased when the variable-capacity cylinder is in a working mode, and a performance of the compressor is optimized. Moreover, due to the provision of the surface seal structure in the present application, the seal effect is good. Thus, a processing precision requirement of the pin hole may be reduced, and a processing cost and assembly cost of the pin hole are reduced, thereby stabilizing a production quality of the compressor.

Brief Description of the Drawings

[0017] The above and other objects, features and advantages of the present invention will become more apparent from the following description of the embodiments of the present invention with reference to the accompanying drawings in which:

Fig. 1 is a structural schematic diagram of a variable-capacity cylinder in a variable-capacity compressor under a normal working mode in the prior art;

Fig. 2 is a structural schematic diagram of the variable-capacity cylinder in the variable-capacity compressor under an unloading mode in the prior art;

Fig. 3 is a sectional partial enlarged view of a section A-A in Fig. 1;

Fig. 4 is a structural schematic diagram (corresponding to a portion as shown in Fig. 3) of a preferred embodiment of the present invention; and

Fig. 5 is a structural schematic diagram (corresponding to a portion as shown in Fig. 3) of another preferred embodiment of the present invention.

Detailed Description of the Embodiments

[0018] Various embodiments of the present invention will be described below in more detail with reference to the accompanying drawings. In each drawing, identical elements are denoted by identical or similar reference

signs. For the sake of clarity, various portions of the drawings are not drawn to scale.

[0019] It should be noted that the terms "upper", "lower", "front", "rear", "left", "right" and the like are used herein for the purpose of illustration only and are not intended to limit the structure of the present invention.

[0020] As shown in Fig. 1 to Fig. 3, a pump assembly of a variable-capacity compressor comprises a crankshaft 1, and an upper bearing 4 connected to the crankshaft 1, a lower bearing 5, a cover plate 7, and a first cylinder 2 and a second cylinder 3 sandwiched between the upper bearing 4 and the lower bearing 5. The first cylinder 2 and the second cylinder 3 are separated by a division plate 6, wherein the second cylinder 3 is a variable-capacity cylinder. The upper bearing 4, the first cylinder 2, the division plate 6, the second cylinder 3, the lower bearing 5 and the cover plate 7 are sequentially mounted in an axial direction of a compressor crankshaft 1. A first sliding vane groove is provided in the first cylinder 2, a first sliding vane 10 is provided in the first sliding vane groove, and the first sliding vane 10 is pressed toward a first rolling piston 8 under an action of a spring force of a spring provided on a back of the first sliding vane 10, and the first sliding vane 10 is in contact with an outer surface of the first rolling piston 8, thereby separating an interior of the first cylinder 2 into an intake chamber and a compression chamber. A second sliding vane groove is provided in the second cylinder 3, a second sliding vane is provided in the second sliding vane groove, a sealed cavity 18 is formed on a back of a second sliding vane 11 (one side on a right of the second sliding vane 11 in Fig. 1), a pressure switching pipe 12 is provided on the sealed cavity 18, the pressure switching pipe 12 may be connected with an external gas source (not shown in the figure), and preferably, the external gas source may be high-pressure/low-pressure gas from a gas outlet/suction port of the compressor. The pressure switching pipe 12 may be connected with the external gas source via a control valve. For example, preferably, a magnetic valve, a three-way valve or the like may be used as the control valve to control switching of the high/low-pressure gas introduced into the pressure switching pipe 12, so as to allow high-pressure or low-pressure gas to be introduced into the pressure switching pipe 12. When the high-pressure gas is introduced into the pressure switching pipe 12, the second sliding vane 11 can be pressed against a second rolling piston 9 under a pressure action of the introduced gas, and the second sliding vane 11 is in contact with an outer surface of the second rolling piston 9, so as to separate an interior of the second cylinder 3 into an intake chamber and a compression chamber, wherein the first rolling piston 8 and the second rolling piston 9 are fixedly mounted on an eccentric portion of the compressor crankshaft 1 and are eccentrically rotated in the cylinder by the compressor crankshaft 1, so as to compress refrigerant gas entering a cylinder cavity.

[0021] A pin hole 17 is provided in the lower bearing

5. Preferably, an axis of the pin hole 17 is parallel to an axis of the compressor crankshaft 1. An upper end of the pin hole 17 communicates with the sealed cavity 18. A low-pressure passage 15 (see Fig. 3) communicating with a second cylinder air intake 16 is provided below the pin hole 17. A part of the low-pressure passage 15 is preferably provided on the cover plate 7. A pin 13 is provided in the pin hole 17, the pin 13 is movable up and down in the pin hole 17. A biasing member 14 is provided on a lower side of the pin 13, wherein the biasing member may be a physical device such as a spring. The biasing member 14 provides an upward biasing force for the pin 13. Preferably, a groove 131 is provided on the lower side of the pin 13, and the biasing member 14 is provided between a top wall of the groove and the cover plate 7 below the pin 13. Correspondingly, a pin groove 111 (see Fig. 1) capable of matching with an upper end of the pin 13 is provided on a lower surface of the second sliding vane 11. When the pin 13 moves upward and the end protrudes from the lower bearing 5, the upper end of the pin 13 may extend into the pin groove 111 of the second sliding vane 11, so as to lock the second sliding vane 11 in a locking position (the pin 13 is at a first position at this time).

[0022] When a high-pressure gas is introduced into the pressure switching pipe 12, the pin 13 overcomes a pre-force of the biasing member 14 and a gas pressure of the low-pressure passage under the action of the high-pressure gas, so that the pin 13 moves downward and leaves the pin groove 111 on the second sliding vane 11, so that the pin 13 is at an unlocked position (the pin 13 is at a second position at this time) that makes the second sliding vane 11 unconstrained, the second sliding vane 11 is pressed against the second rolling piston 9 under the action of the high-pressure gas on the back thereof, and a head of the second sliding vane 11 is in contact with the outer surface of the second rolling piston 9, so that a normal compression process of the second cylinder 3 (variable-capacity cylinder) is implemented.

[0023] When a low pressure is applied to the pressure switching pipe 12, a head (upper end) and a tail (lower end) of the pin 13 are pressure-balanced, and the pin 13 moves upward to approach the second sliding vane 11 under the pre-force of the biasing member 14. When the second sliding vane 11 runs to a position, the pin groove 111 is opposite to the head of the pin 13, the head of the pin 13 is inserted into the pin groove 111 of the second sliding vane 11, so as to lock the second sliding vane 11. At this time, the second sliding vane 11 is separated from the second rolling piston 9, so that the second cylinder 3 cannot work normally, thereby unloading the second cylinder 3 (variable-capacity cylinder).

[0024] The existing structures as shown in Fig. 1 to Fig. 3 have certain defects. When high-pressure gas is introduced into the pressure switching pipe 12, as shown in Fig. 3, high-pressure refrigerant gas in the sealed cavity 18 will discharge refrigeration oil in the sealed cavity 18. In order to ensure that the pin 13 is slidably up and

down in the pin hole 17, there must be a certain clearance between the pin 13 and the pin hole 17. In the case where the refrigeration oil is discharged, the clearance seal of lubricating oil cannot be achieved, so that the high-pressure refrigerant gas will leak outward in a direction indicated by an arrow in Fig. 3 along a clearance between an outer wall of the pin 13 and an inner wall of the pin hole 17. The high-pressure refrigerant gas enters the air intake 16 of the second cylinder 3 via the clearance between the outer wall of the pin 13 and the inner wall of the pin hole 17 and the low-pressure passage 15 below the pin 13, the expansion of the high-pressure refrigerant gas causes actual reduction of the amount of gas circulation in the second cylinder 3 and repeated compression of the leaked gas, which not only reduces a cooling capacity, but also consumes additional power, thereby reducing the performance of the existing variable-capacity compressor during dual-cylinder operation.

[0025] The present invention is an improvement on the basis of the variable-capacity compressor described in the related art, in which the variable-capacity compressor sliding vane control structure according to the present invention is provided, that is to say, the sliding vane control structure in the present invention is applied to the variable-capacity compressor having the above-mentioned construction and components. The sliding vane control structure for the variable-capacity compressor in the present invention will be described in detail below in order to avoid excessive repetition. The same parts as those described above will not be repeated.

[0026] As shown in Fig. 4, in a preferred embodiment of the present invention, a second cylinder 103 of the variable-capacity compressor is provided above a lower bearing 105, and a cover plate 107 is provided below the lower bearing 105. A pin hole 117 formed in a stepped shape is provided in the lower bearing 105. An inner diameter of a portion, close to a lower end, of the pin hole 117 is smaller than an inner diameter of a portion of an upper side, and thus a step surface extending inward in a radial direction is formed at a portion, close to the lower end, of the pin hole 117. The step surface is provided with a seal gasket 109. The seal gasket 109 is preferably but not limited to a metal seal gasket or a rubber seal gasket. The seal gasket 109 is an annular seal gasket and is provided with a through hole in a center. A pin 113 provided with a groove 1131 on a lower side is provided in the pin hole 17, and a lower end surface of the pin 113 abuts against an upper surface of the seal gasket 109 on the step surface. The groove 1131 of the pin 113 is provided with a biasing member 114 passing through a through hole on the seal gasket 109 and contacting the cover plate 107. The biasing member 114 is preferably a spring for providing an upward biasing force for the pin 113. The lower end of the pin 113 communicates with a low-pressure passage 115 on the cover plate 107, and further communicates with an air intake 116 of the second air cylinder 103. The seal gasket 109 is made of metal or rubber.

[0027] When the second cylinder 103 of the variable-capacity compressor in the above embodiment of the present invention works normally, a high-pressure refrigerant gas is introduced into a sealed cavity (not shown in the drawings) above the pin 113. Under the action of the high-pressure refrigerant gas, the pin 113 overcomes the pre-force of the biasing member 114 and the gas pressure in the low-pressure passage, and the pin 113 moves downward in the pin hole 117 to the second position, so that the pin 113 is separated from the sliding vane of the second cylinder 103, while the lower end of the pin 113 is tightly pressed against an upper surface of the seal gasket 109, and a surface seal is formed at the lower end of the pin 113. At this time, the second cylinder 103 performs normal compression operation. The high-pressure refrigerant gas will flow downward along a clearance between the pin 113 and the pin hole 117, but because the lower end of the pin 113 is tightly pressed against the seal gasket 109, a surface seal structure is formed between the pin 113 and a step surface of the pin hole 117, so that a surface seal is formed between the clearance between the pin 113 and the pin hole 117 and the low-pressure passage 115 on the lower side of the pin 113. The seal performance of the surface seal structure is much better than that of a clearance seal between the pin 113 and the pin hole 117, so that the leakage amount of a refrigerant is greatly reduced, thereby effectively improving the performance of the compressor.

[0028] As shown in Fig. 5, in another preferred embodiment of the present invention, a second cylinder 203 of the variable-capacity compressor is provided above a lower bearing 205, and a seal division plate 218 and a cover plate 207 are sequentially provided below the lower bearing 205, wherein a pin hole 217 is provided in the lower bearing 205, and a pin 213 having a groove 2131 is provided in the pin hole 217. A biasing member 214, such as a spring, capable of generating a pre-force is provided between a top wall of the groove 2131 of the pin 213 and the seal division plate 218 below the pin 213. A first through hole 219 is provided at a position, corresponding to the groove 2131 in the pin hole 17, on the seal division plate 218. Preferably, a maximum size of the through hole 219 in a horizontal plane is smaller than an outer diameter of the pin 213, so that a lower end of the pin 213 abuts against an upper surface of the seal division plate 218. More preferably, the maximum size of the through hole 219 in the horizontal plane is smaller than a maximum size of the groove 2131 in the horizontal plane, so that a bottom of the biasing member 214 abuts against the upper surface of the seal division plate 218. When the through hole 219 is a circular hole, its maximum size is its diameter. A low-pressure passage 215 communicating with a second cylinder air intake 216 is provided on the cover plate 207. Preferably, in order to make the low-pressure passage 215 communicate with the air intake 216 of the second cylinder 203, a second through hole 220 is provided on the seal division plate 218. The

low-pressure passage 215, the first through hole 219 and the second through hole 220 are not provided in a unique manner and may have various structural forms as long as the lower side of the pin 213 can communicate with the air intake 216 of the second cylinder 203. Preferably, the seal division plate 218 is machined or stamped modeling.

[0029] During normal operation of the second cylinder 203 of the variable-capacity compressor in the above embodiment of the present invention, a high-pressure refrigerant gas is introduced into a sealed cavity (not shown) above the pin 213. Under the action of the high-pressure refrigerant gas, the pin 213 overcomes the pre-force of the biasing member and the gas pressure in the low-pressure passage, so that the pin 213 moves downward in the pin hole 17 to the second position, thereby making the pin 213 separated from a sliding vane of the second cylinder 203, and the second cylinder 203 performs normal compression operation at this time. The high-pressure refrigerant gas will flow down along the clearance between the pin 213 and the pin hole 217, but due to a surface contact between a bottom end surface of the pin 213 and the seal division plate 218, a surface seal is formed at the lower end of the pin 213. Under the action of a pressure difference between the two ends, the lower end of the pin 213 is tightly pressed against the upper end surface of the seal division plate 218, so that a surface seal is formed between the lower end of the pin 213 and the upper end surface of the seal division plate 218. The seal performance of the seal structure is much better than that of the clearance seal between the pin 213 and the pin hole 217, so that the leakage amount of a refrigerant is greatly reduced, thereby improving the performance of the compressor.

[0030] In the present application, since a surface seal structure is provided between a pin and a low-pressure passage, the seal effect of the surface seal is much better than that of the clearance seal, thereby greatly reducing the leakage of a refrigerant. Consequently, the efficiency of a compressor is increased when a variable-capacity cylinder is in a working mode, and the performance of the compressor is optimized. Moreover, due to the provision of the surface seal structure in the present application, the seal effect is good. Thus, the processing precision requirement of a pin hole may be reduced, and the processing cost and assembly cost of the pin hole are reduced, thereby stabilizing the production quality of a compressor.

[0031] Unless otherwise defined, technical and scientific terms used herein have the same meaning as commonly understood by those skilled in the art of the present invention. The term used herein is for the purpose of describing particular embodiments only and is not intended to limit the present invention. Terms such as "components" appearing herein may represent either a single part or a combination of multiple parts. Terms such as "mount" and "dispose" appearing herein may mean either that one component is directly attached to another com-

ponent, or that one component is attached to another component through an intermediate member. The features described in one embodiment herein may be applied to another embodiment singly or in combination with other features unless the feature is not applicable or otherwise described in the other embodiment.

[0032] The present invention has been described by way of the above embodiments, but it should be understood that the above embodiments are for purposes of illustration and description only and are not intended to limit the present invention to the scope of the described embodiments. Those skilled in the art may understand that many variations and modifications may be made according to the teachings of the present invention, and these variations and modifications fall within the scope as claimed in the present invention.

Claims

1. A sliding vane control structure for a variable-capacity cylinder, the sliding vane control structure comprising:
 - a pin (113, 213), provided on a lower side of a sliding vane (11), the pin (113, 213) having a first position capable of stopping the sliding vane (11) and a second position capable of being separated from the sliding vane (11),
 - a low-pressure passage (115, 215) is provided under the pin,
 - wherein a surface seal structure is provided between the pin (113, 213) and the low-pressure passage (115, 215), and when the pin (113, 213) is at the second position, a surface seal is formed at a lower end of the pin (113, 213).
2. The sliding vane control structure as claimed in claim 1, wherein
 - the pin (113) is provided in a pin hole (117), the pin hole (117) is a step hole, an inner diameter of a portion, close to the lower end, of the pin hole (117) is smaller than an inner diameter of a portion of an upper side, and thus a step surface extending inward in a radial direction is formed at a portion, close to the lower end, of the pin hole (117).
3. The sliding vane control structure as claimed in claim 2, wherein a seal gasket (109) is provided on the step surface, the lower end of the pin (113) can be tightly pressed against an upper surface of the seal gasket (109), and the surface seal is formed between the lower end of the pin (113) and the upper surface of the seal gasket (109).
4. The sliding vane control structure as claimed in claim 3, wherein a through hole is formed in a middle of the seal gasket (109).
5. The sliding vane control structure as claimed in claim 1, wherein a seal division plate (218) is provided on a lower side of the pin (113), a lower end of the pin (213) abuts against an upper surface of the seal division plate (218), and the surface seal is formed between the lower end of the pin (213) and the upper surface of the seal division plate (218).
6. The sliding vane control structure as claimed in claim 5, wherein a groove (2131) is provided at a lower part of the pin (213), and a first through hole (219) is provided at a position, corresponding to the groove (2131), on the seal division plate (218).
7. The sliding vane control structure as claimed in claim 6, wherein a maximum size of the first through hole (219) in a horizontal plane is smaller than a maximum outer diameter of the pin (213).
8. The sliding vane control structure as claimed in claim 6, wherein a maximum size of the first through hole (219) in a horizontal plane is smaller than a maximum size of the groove (2131) in a horizontal plane.
9. The sliding vane control structure as claimed in claim 6, wherein a second through hole (220) is provided on the seal division plate (218), the second through hole (220) enabling the low-pressure passage (215) to communicate with a gas inlet (216) of a variable-capacity cylinder (203).
10. A variable-capacity cylinder, provided with a sliding vane control structure as claimed in any one of claims 1 to 9.
11. A variable-capacity compressor, provided with a variable-capacity cylinder as claimed in claim 10.

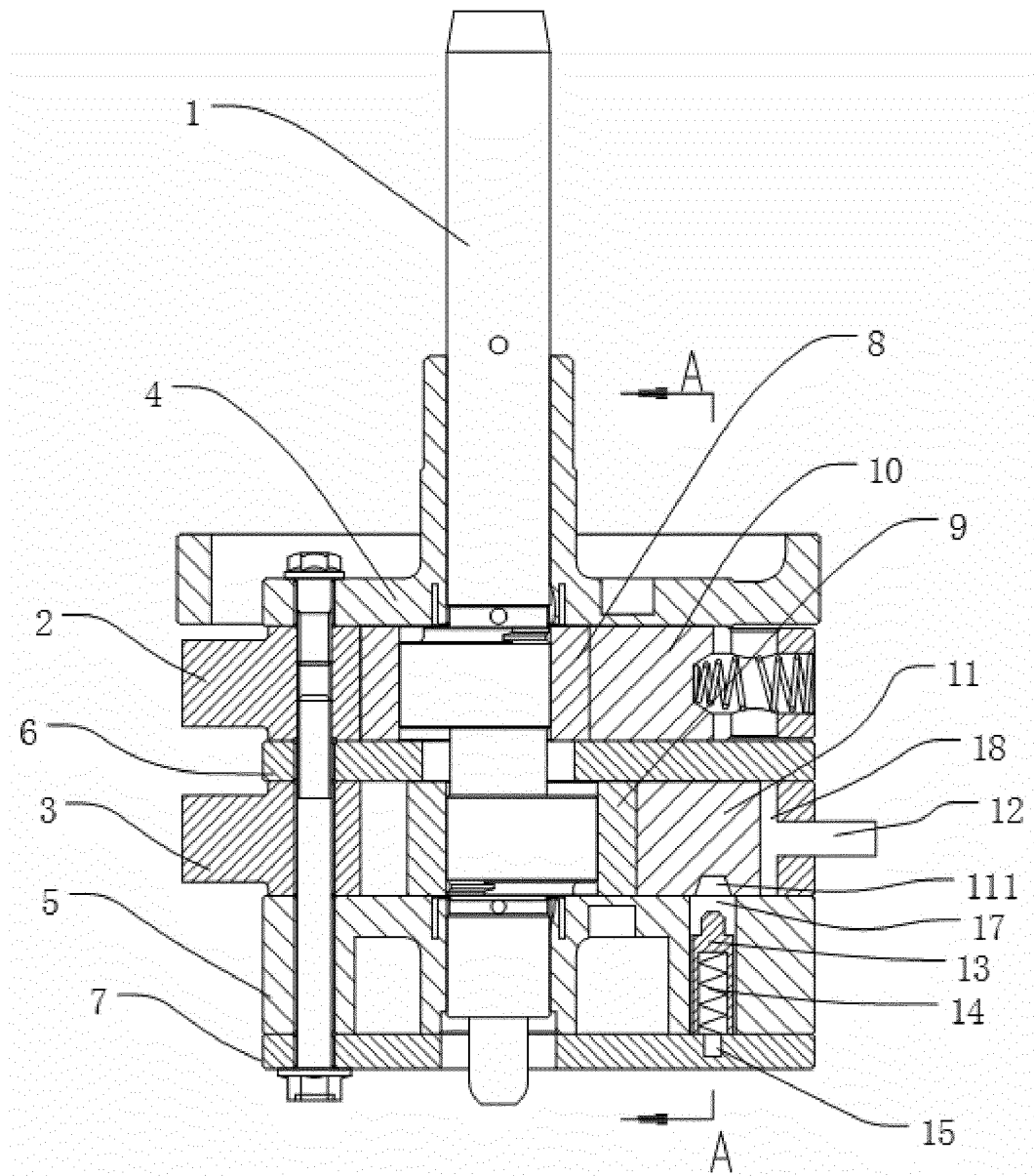


Fig. 1

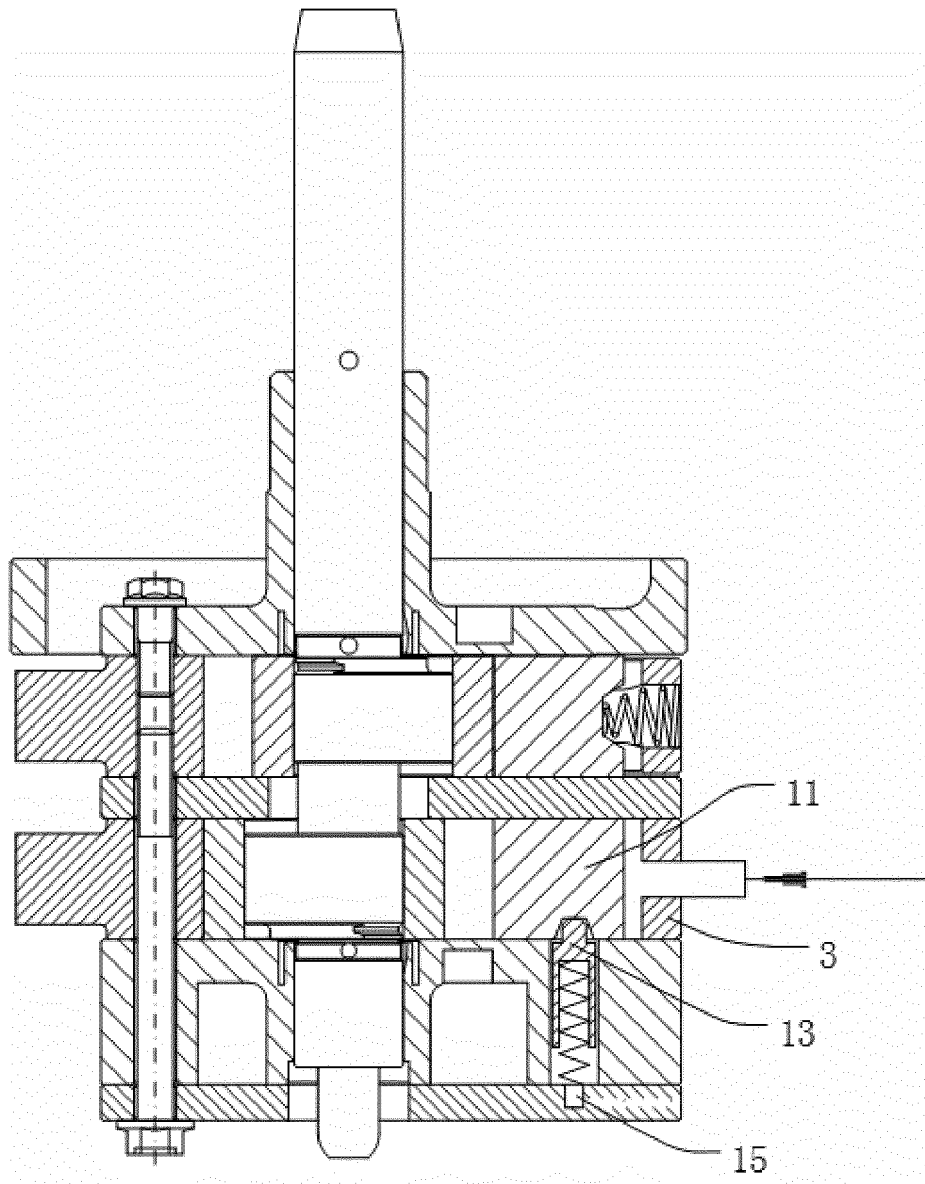


Fig. 2

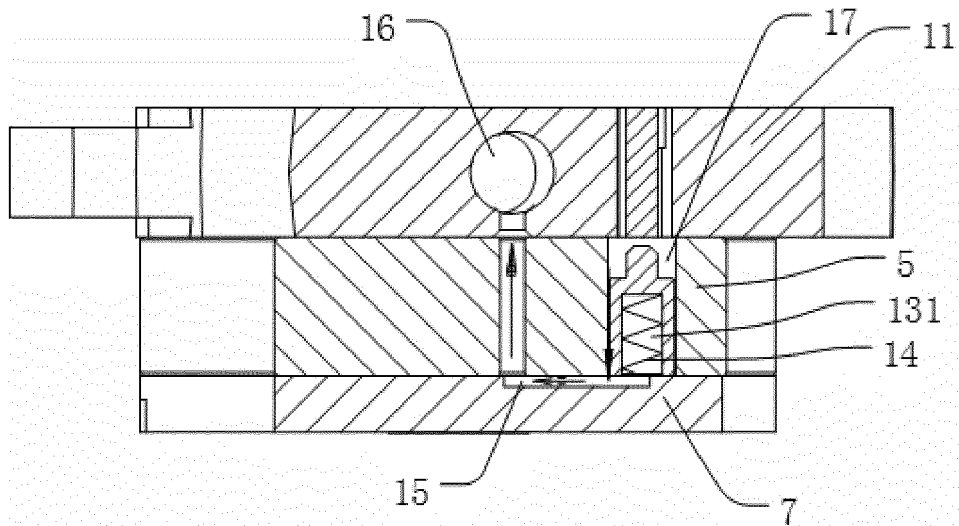


Fig. 3

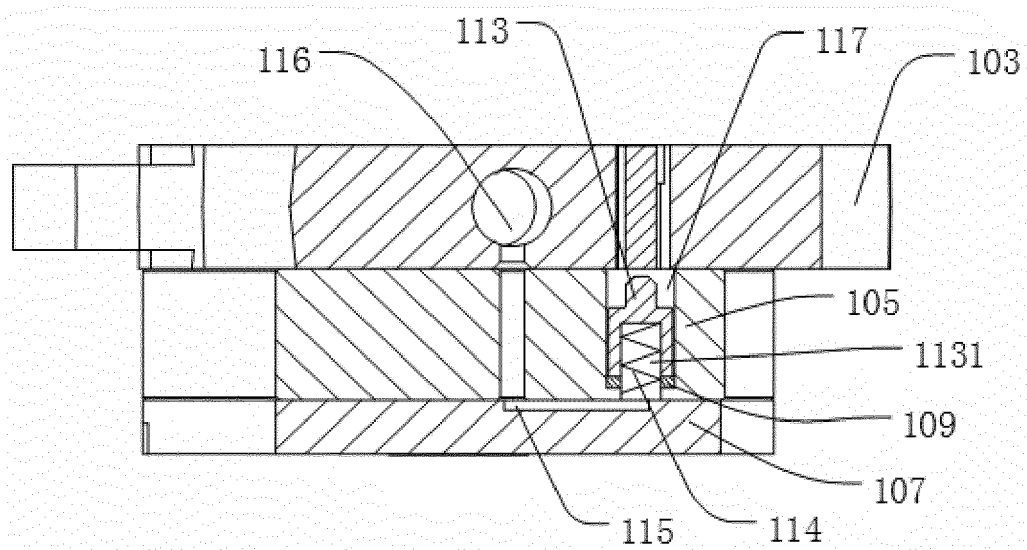


Fig. 4

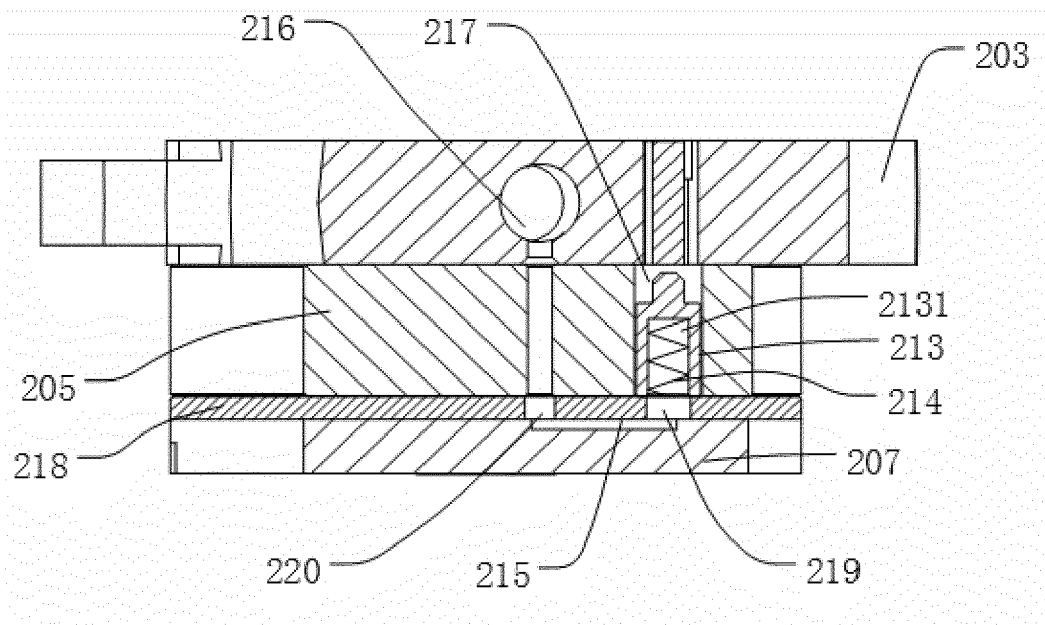


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/099111

A. CLASSIFICATION OF SUBJECT MATTER

F04C 18/356 (2006.01) i; F04C 28/06 (2006.01) i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, VEN, CNKI: compressor, vane, lock+, leak+, seal+, airproof+, capacity, variable

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 105464978 A (ZHUHAI GREE REFRIGERATION TECHNOLOGY CENTER OF ENERGY SAVING AND ENVIRONMENTAL PROTECTION CO., LTD.) 06 April 2016 (06.04.2016) claims 1-11	1-11
PX	CN 205446037 U (ZHUHAI GREE REFRIGERATION TECHNOLOGY CENTER OF ENERGY SAVING AND ENVIRONMENTAL PROTECTION CO., LTD.) 10 August 2016 (10.08.2016) claims 1-11	1-11
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT
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