



(12) **Patent Application Publication**
Hsu

(43) **Pub. Date:** **Sep. 30, 2004**

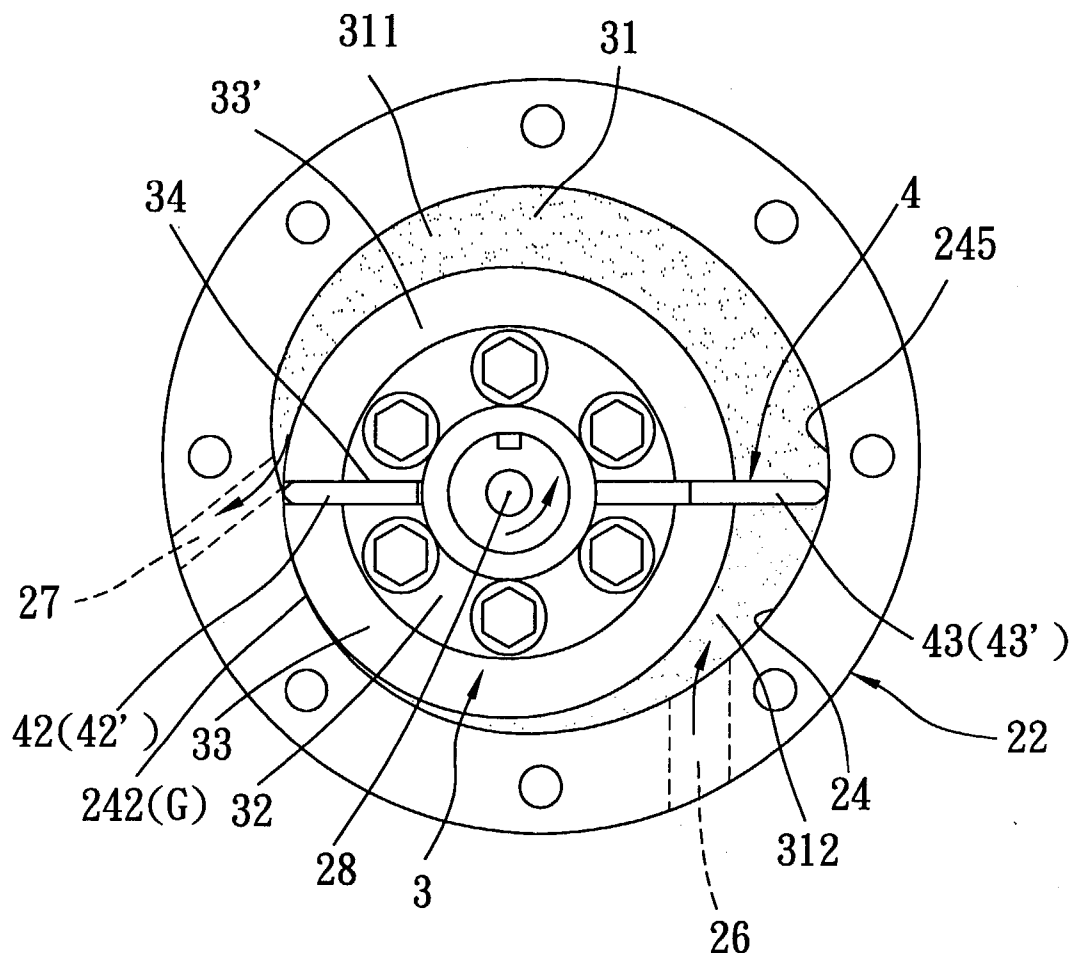
Publication Classification

(52) U.S. Cl. 418/255

(57) **ABSTRACT**

A rotary compressor includes a cylinder formed with an inlet and an outlet, a rotor disposed eccentrically and rotatably in the cylinder and formed with a sliding space that extends in a radial direction through the rotating axis of the rotor, and a sliding vane disposed slidingly in and spanning the sliding space. The cylinder cooperates with the rotor to define a chamber therebetween. The sliding vane divides the chamber into intake and discharging segments that are respectively in fluid communication with the inlet and the outlet.

(22) Filed: **Mar. 25, 2003**



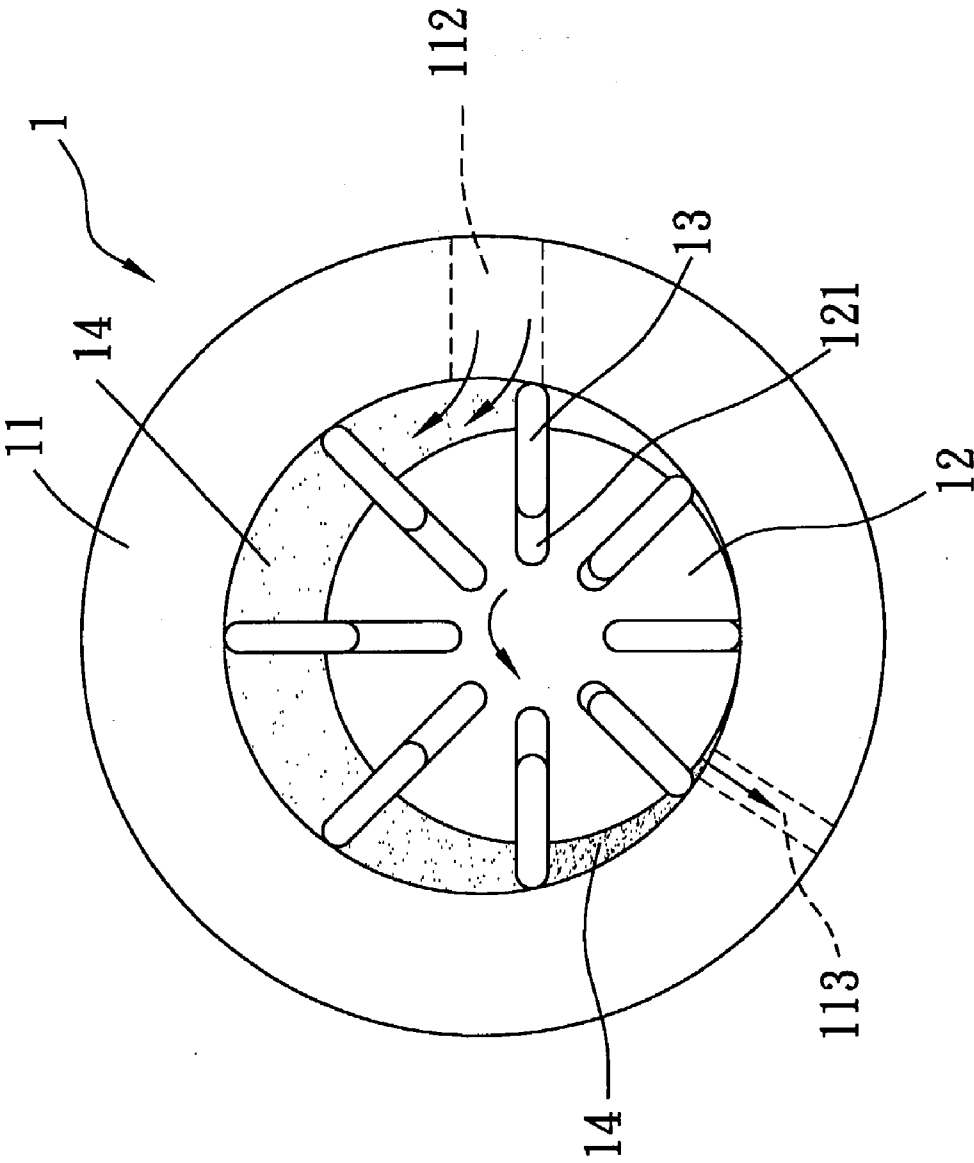


FIG. 1
PRIOR ART

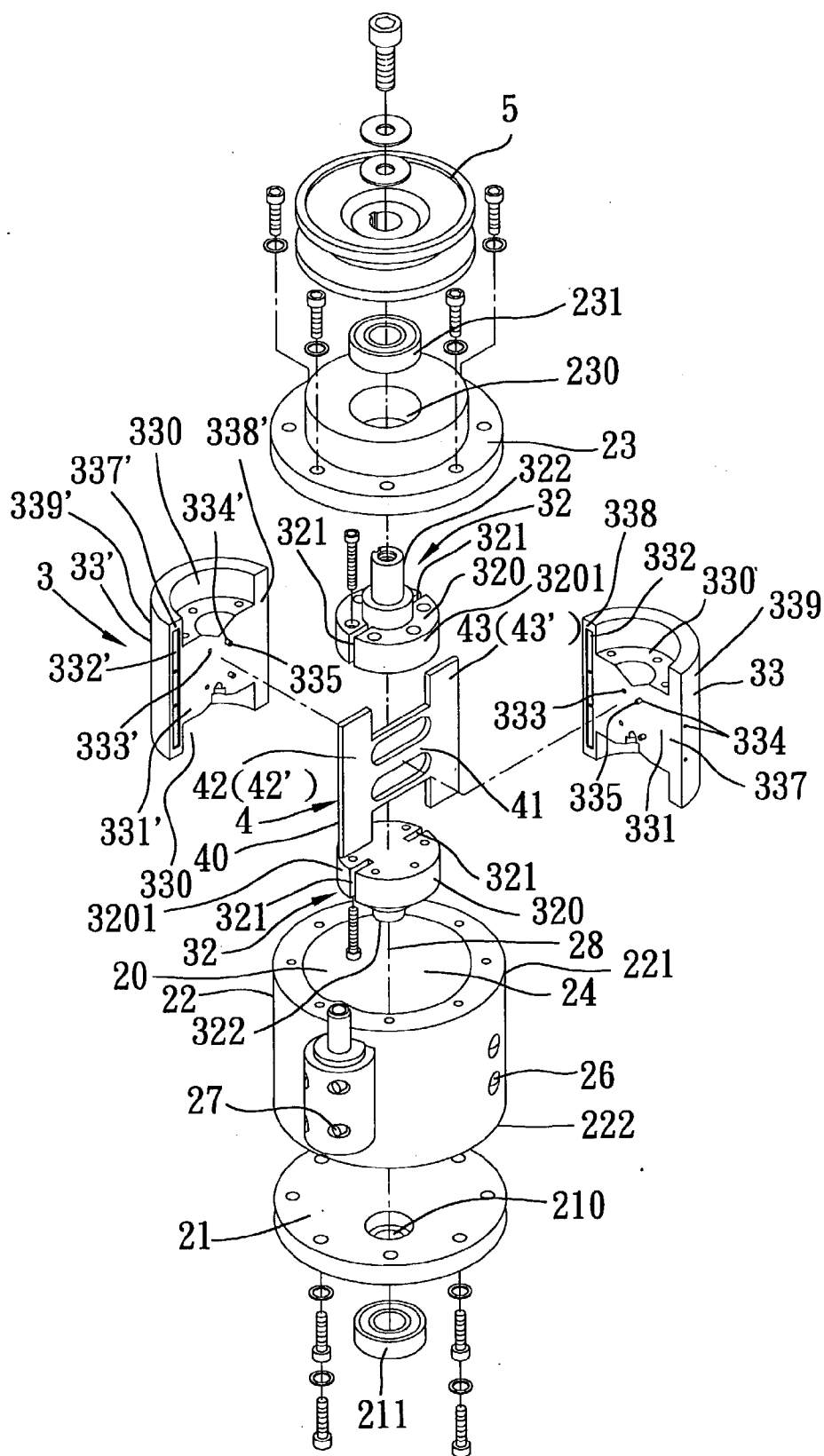


FIG. 2

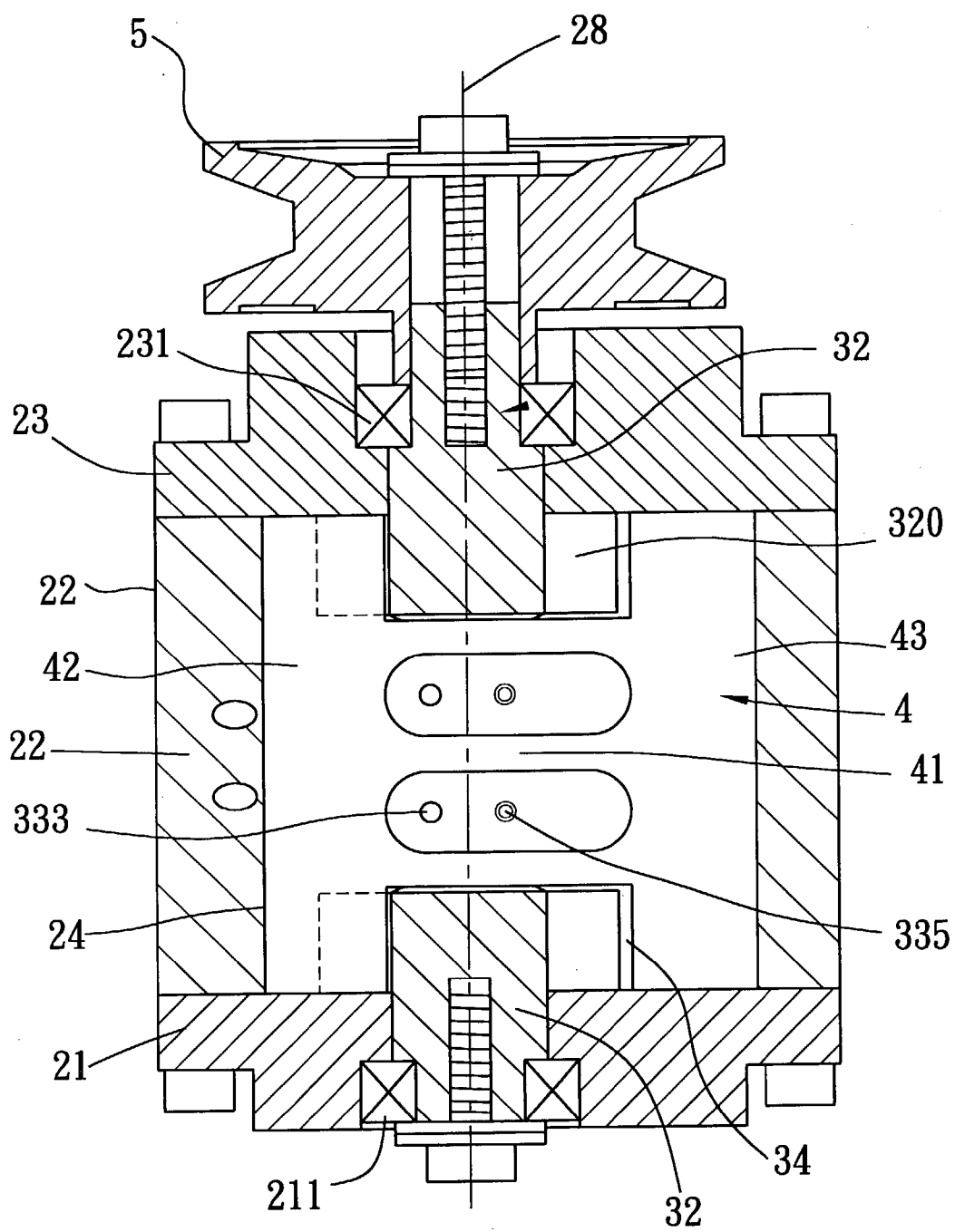


FIG. 3

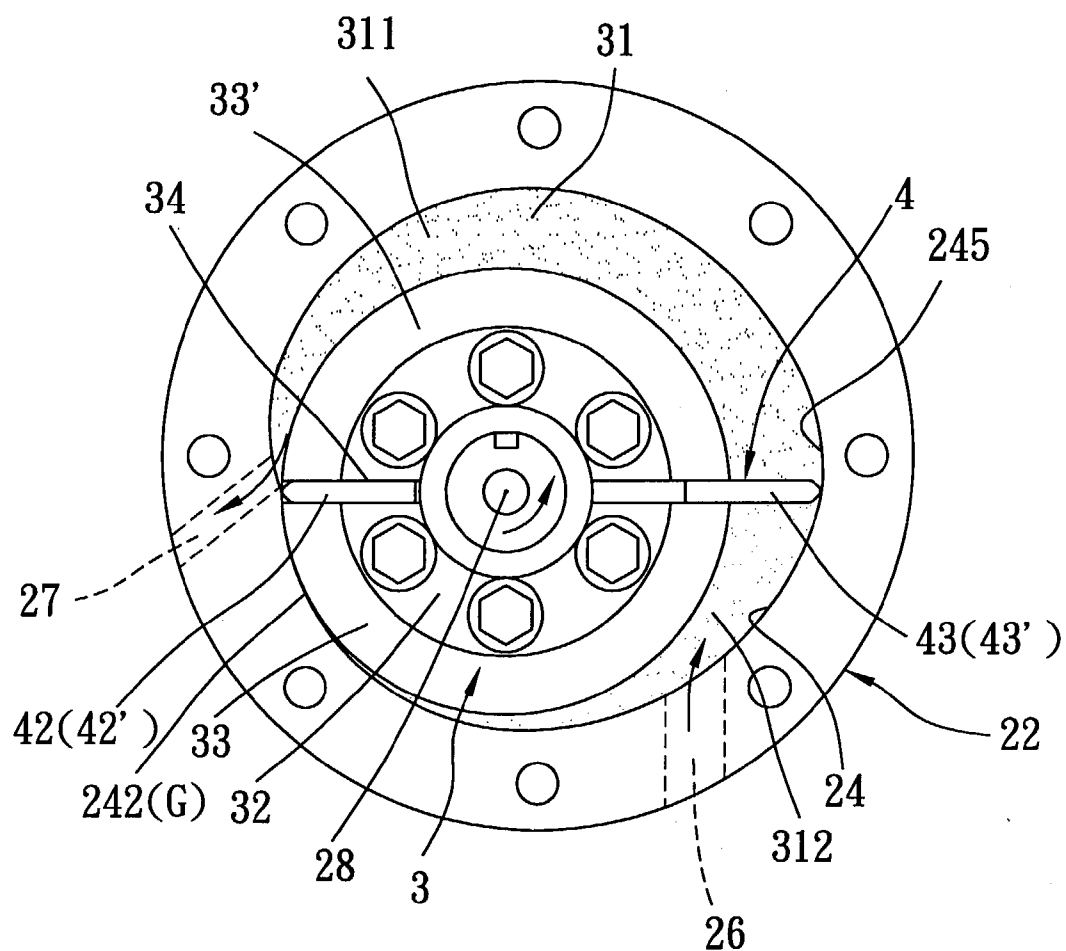


FIG. 4

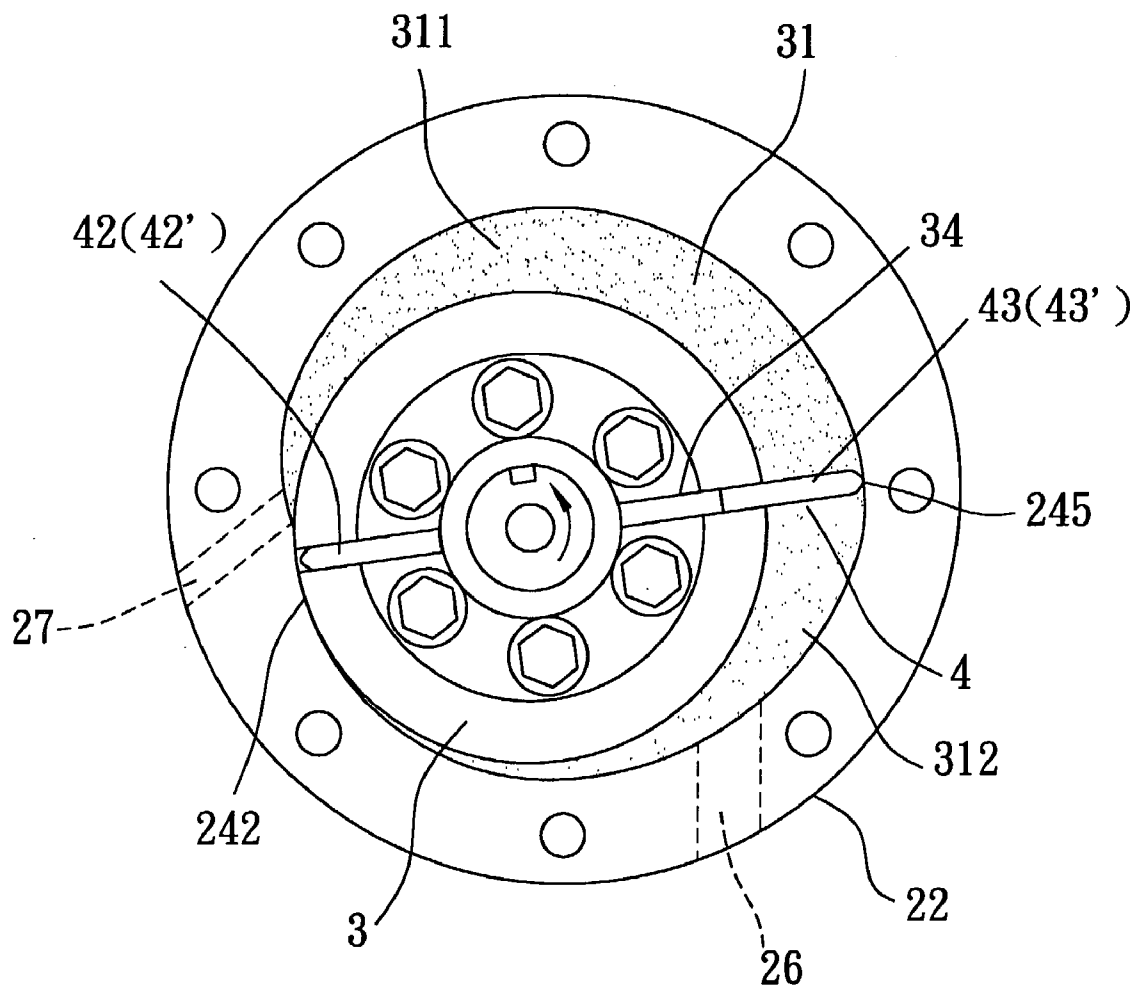


FIG. 5

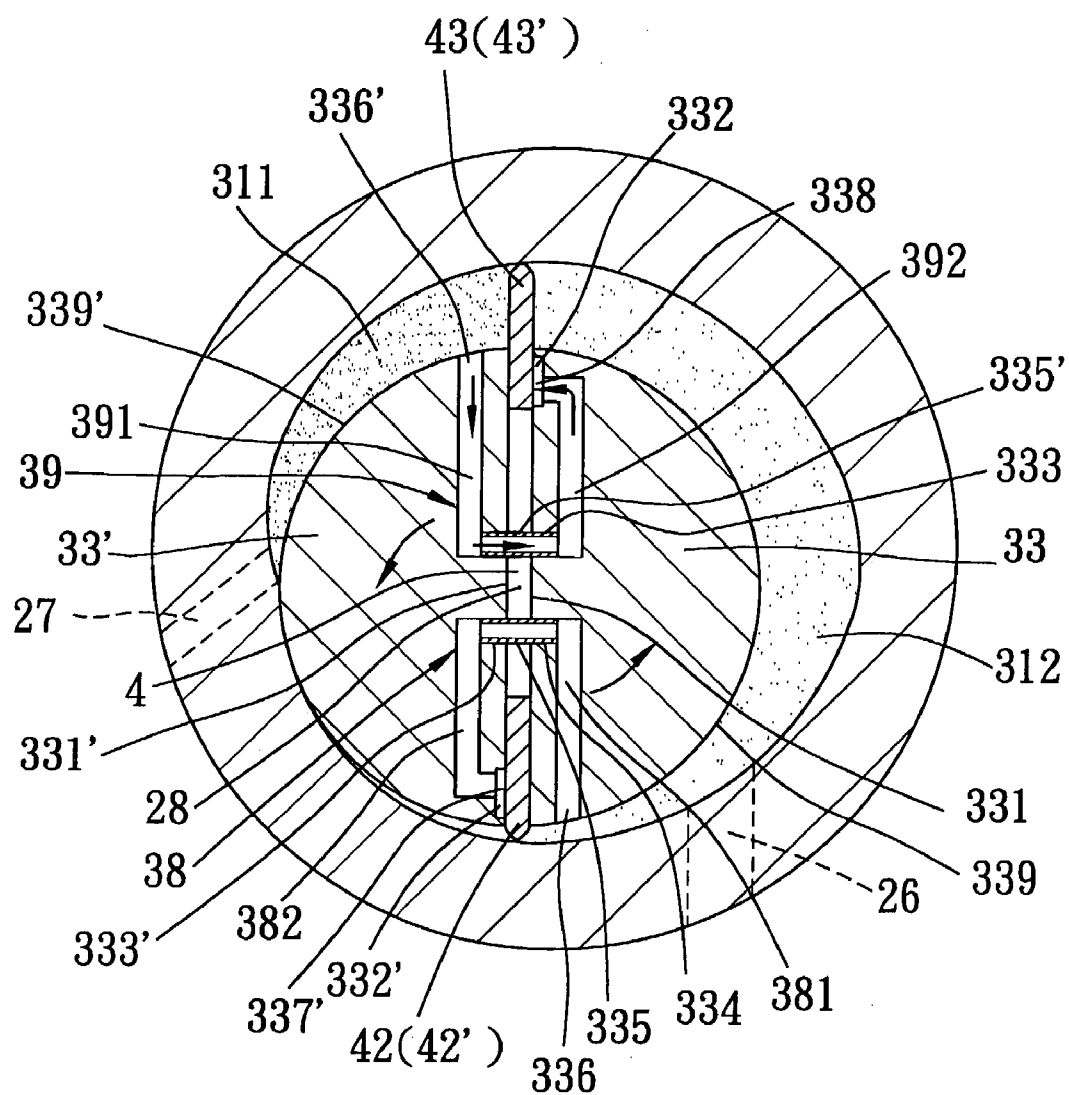


FIG. 6

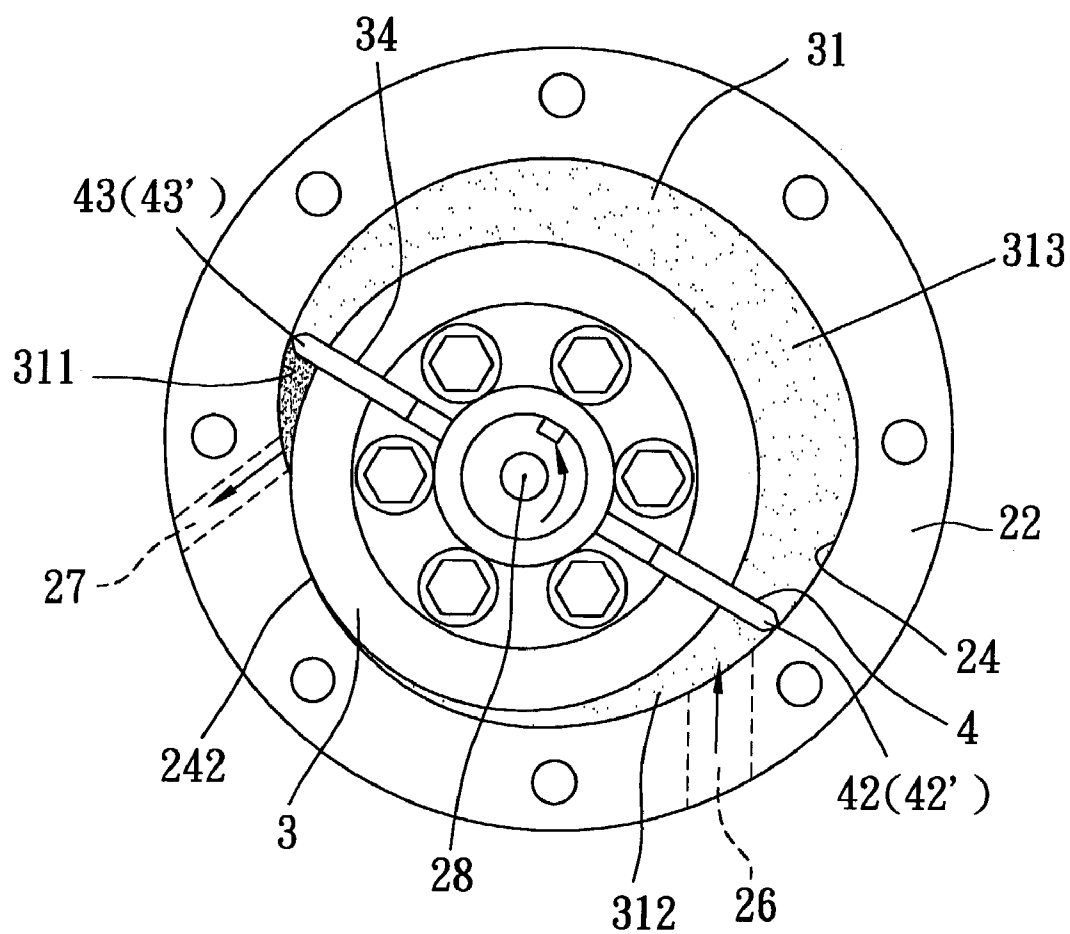


FIG. 7

ROTARY COMPRESSOR HAVING A ROTOR WITH A SLIDING VANE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates to a rotary compressor, more particularly to a rotary compressor having a rotor with a sliding vane that extends radially through the rotating axis of the rotor.

[0003] 2. Description of the Related Art

[0004] FIG. 1 illustrates a conventional sliding-vane type rotary compressor 1 that includes a cylinder 11 formed with an inlet 112 and an outlet 113, and a rotor 12 disposed eccentrically and rotatably in the cylinder 11 and formed with a plurality of angularly spaced apart slots 121. The cylinder 11 and the rotor 12 cooperatively define a chamber 14 therebetween. A plurality of vanes 13 are respectively and slidably received in the slots 121 so as to divide the chamber 14 into a plurality of independent sub-chambers. Each sub-chamber receives fluid from the inlet 112 upon passing by the inlet 112. The fluid in each sub-chamber is gradually compressed when the sub-chamber approaches to the outlet 113, and is discharged at the outlet 113 to an external container (not shown). A pressure-regulating valve (not shown) is connected to the container for controlling the pressure in the container.

[0005] The aforesaid conventional rotary compressor 1 is disadvantageous in that friction among the vanes 13 and an inner wall of the cylinder 11 is relatively large during rotation of the rotor 12, which results in high temperature of the rotary compressor 1, which has an adverse effect on the performance of the rotary compressor 1, and which can result in a shorter service life for the rotary compressor 1.

SUMMARY OF THE INVENTION

[0006] Therefore, the object of the present invention is to provide a rotary compressor that can overcome the aforementioned drawback of the prior art.

[0007] According to the present invention, there is provided a rotary compressor that comprises: a cylinder having an inner wall that defines an inner space therein, and formed with an inlet that is in fluid communication with the inner space, and an outlet which is spaced apart from the inlet and which is in fluid communication with the inner space; a rotor mounted rotatably in the inner space and defining a sliding space, the rotor and the inner wall of the cylinder cooperatively defining a chamber therebetween, the rotor being rotatable about an axis in a rotating direction, the chamber being in fluid communication with the inlet and the outlet, the sliding space being in spatial communication with the chamber, extending through the axis in a radial direction relative to the axis, and having two opposite ends opposite to each other in the radial direction, the rotor being eccentrically disposed in the inner space and being in close proximity to a portion of the inner wall at a position between the inlet and the outlet; and a sliding vane mounted slidably in the sliding space, extending in the radial direction, and having two opposite ends that are opposite to each other in the radial direction and that extend oppositely to the inner wall of the cylinder so as to divide the chamber into at least a discharging segment that is in fluid communication with

the outlet and that extends in the rotating direction from one of the opposite ends of the sliding vane to the outlet, and an intake segment that is in fluid communication with the inlet and that is isolated from the discharging segment, the sliding vane being slidable in the sliding space in the radial direction upon rotation of the rotor in such a manner that said one of the opposite ends of the sliding vane abuts slidably against the inner wall of the cylinder, thereby preventing back flow of fluid from the discharging segment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] In drawings which illustrate an embodiment of the invention,

[0009] FIG. 1 is a schematic top view of a conventional rotary compressor;

[0010] FIG. 2 is an exploded perspective view of a rotary compressor embodying the present invention;

[0011] FIG. 3 is a sectional side view of the rotary compressor of FIG. 2;

[0012] FIG. 4 is a top view of the rotary compressor of FIG. 2, which illustrates rotation of a sliding vane to a first position;

[0013] FIG. 5 is a top view of the rotary compressor of FIG. 2, which illustrates rotation of the sliding vane to a second position;

[0014] FIG. 6 is a sectional top view of the rotary compressor of FIG. 2, which illustrates rotation of the sliding vane to a third position; and

[0015] FIG. 7 is a top view of the rotary compressor of FIG. 2, which illustrates rotation of the sliding vane to a fourth position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] FIGS. 2 to 7 illustrate the preferred embodiment of a rotary compressor according to the present invention. The rotary compressor includes: a cylinder 22 having an inner wall 24 that defines an inner space 20 therein, and formed with an inlet 26 that is in fluid communication with the inner space 20, and an outlet 27 which is angularly spaced apart from the inlet 26 and which is in fluid communication with the inner space 20; a rotor 3 mounted rotatably in the inner space 20 and defining a sliding space 34, the rotor 3 and the inner wall 24 of the cylinder 22 cooperatively defining a chamber 31 therebetween, the rotor 3 being rotatable about an axis 28 in a rotating direction, the chamber 31 being in fluid communication with the inlet 26 and the outlet 27, the sliding space 34 being in spatial communication with the chamber 31, extending through the axis 28 in a radial direction relative to the axis 28, and having two opposite ends opposite to each other in the radial direction, the rotor 3 being eccentrically disposed in the inner space 20 and being in close proximity to a portion 242 of the inner wall 24 at a position between the inlet 26 and the outlet 27 and adjacent to the outlet 27 such that the rotor 3 and the portion 242 of the inner wall 24 cooperatively define a clearance (G) therebetween and that the clearance (G) converges and is substantially closed at the portion 242 of the inner wall 24; and a sliding vane 4 mounted slidably in the sliding space 34, extending in the radial direction, and having two oppo-

site ends **42**, **43** that are opposite to each other in the radial direction and that extend oppositely to the inner wall **24** of the cylinder **22** so as to divide the chamber **31** into at least a discharging segment **311** that is in fluid communication with the outlet **27** and that extends in the rotating direction from one of the opposite ends **42**, **43** of the sliding vane **4** to the outlet **27**, and an intake segment **312** that is in fluid communication with the inlet **26** and that is isolated from the discharging segment **311**, the sliding vane **4** being slidable in the sliding space **34** in the radial direction upon rotation of the rotor **3** in such a manner that said one of the opposite ends **42**, **43** of the sliding vane **4** abuts slidably against the inner wall **24** of the cylinder **22**, thereby preventing back flow of fluid from the discharging segment **311**. A middle segment **313** is formed between the discharging segment **311** and the intake segment **312** (see FIG. 7) immediately after one of the opposite ends **42**, **43** of the sliding vane **4** passes by the inlet **26**, and becomes the next discharging segment when moved to communicate with the outlet **27**.

[0017] The sliding vane **4** is in the form of a plate that has an H-shaped portion **40** which includes parallel first and second leaves **42'**, **43'** and a middle rib **41** interconnecting the first and second leaves **42'**, **43'**. The first and second leaves **42'**, **43'** are opposite to each other in the radial direction, and respectively define the opposite ends **42**, **43** of the sliding vane **4**.

[0018] The cross-section of the chamber **31** gradually increases from a position proximate to the portion **242** of the inner wall **24** to an opposite position **245** diametrically opposite to the portion **242** of the inner wall **24**, and gradually decreases from the opposite position **245** to the outlet **27**.

[0019] The rotor **3** is cylindrical in shape, and includes first and second halves **33**, **33'** which cooperatively define the sliding space **34** therebetween. The cylinder **22** has opposite upper and lower open ends **221**, **222** and upper and lower sealing flanges **23**, **21** that are fixed sealingly and respectively to the upper and lower open ends **221**, **222** and that are respectively formed with central openings **230**, **210**. The first and second halves **33**, **33'** of the rotor **3** are indented in an axial direction relative to the rotor **3** to form opposite upper and lower recesses **330**. The rotary compressor further includes upper and lower bearings **231**, **211** that are respectively received in the central openings **230**, **210** in the upper and lower flanges **23**, **21**, and upper and lower journals **32** that respectively have upper and lower limiting flanges **320** which are respectively received in the upper and lower recesses **330** and which are secured to the rotor **3**, and upper and lower shafts **322** which extend respectively and outwardly of the cylinder **22** from the upper and lower limiting flanges **320** through the upper and lower bearings **231**, **211**. Each of the upper and lower limiting flanges **320** has a periphery edge **3201**, and a pair of opposite radial slits **321** that extend inwardly and radially from the periphery edge **3201**. The first and second leaves **42'**, **43'** of the sliding vane **4** have upper and lower ends that are respectively received in the slits **321** in the upper and lower limiting flanges **320**. A pulley **5** is connected to the upper shaft **322** of the upper journal **32** for driving the latter.

[0020] Each of the first and second halves **33** (**33'**) of the rotor **3** has opposite outer and inner surfaces **339** (**339'**), **331** (**331'**) extending angularly of the rotor **3**, and opposite first

and second ends **337** (**337'**), **338** (**338'**) opposite to each other in the radial direction. The first and second ends **337** (**337'**), **338** (**338'**) of each of the first and second halves **33** (**33'**) of the rotor **3** respectively confront the first and second leaves **42'**, **43'** of the sliding vane **4**. The rotor **3** further includes first and second tubular elements **335**, **335'**, and is formed with a first channel **38** (see FIG. 6) that is disposed adjacent to and that is associated with the first leaf **42'**, and a second channel **39** that is disposed adjacent to and that is associated with the second leaf **43'**. The first channel **38** has a first segment **381** that is formed in the first half **33** of the rotor **3**, and a second segment **382** that is formed in the second half **33'** of the rotor **3**. The first segment **381** of the first channel **38** has an inlet port **336** that is formed in the outer surface **339** of the first half **33** of the rotor **3**, and a first connecting port **334** that is formed in the inner surface **331** of the first half **33** of the rotor **3**. The second segment **382** of the first channel **38** has a second connecting port **333'** that is formed in the inner surface **331'** of the second half **33'** of the rotor **3** and that is connected to and that is in fluid communication with the first connecting port **334** through the first tubular element **335**, and an outlet port **332'** that is formed in the first end **337'** of the second half **33'** of the rotor **3** and that confronts the first leaf **42'** of the sliding vane **4**. The second channel **39** has a first segment **391** that is formed in the second half **33'** of the rotor **3**, and a second segment **392** that is formed in the first half **33** of the rotor **3**. The first segment **391** of the second channel **39** has an inlet port **336'** that is formed in the outer surface **339'** of the second half **33'** of the rotor **3**, and a first connecting port **334'** that is formed in the inner surface **331'** of the second half **33'** of the rotor **3**. The second segment **392** of the second channel **39** has a second connecting port **333** that is formed in the inner surface **331** of the first half **33** of the rotor **3** and that is connected to and that is in fluid communication with the first connecting port **334'** of the second channel **39** through the second tubular element **335'**, and an outlet port **332** that is formed in the second end **338** of the first half **33** of the rotor **3** and that confronts the second leaf **43'** of the sliding vane **4**. The inlet port **336** (**336'**) of the first segment **381** (**391**) of each of the first and second channels **38** (**39**) is disposed anteriorly of the respective one of the first and second leaves **42'**, **43'** in the rotating direction, while the outlet port **332** (**332'**) of the second segment **382** (**392**) of each of the first and second channels **38** (**39**) is disposed posteriorly of the respective one of the first and second leaves **42'**, **43'** in the rotating direction. During rotation of the rotor **3** in the cylinder **22**, compression of the fluid in the discharging segment **311** results in a force that pushes the respective one of the first and second leaves **42'**, **43'** (which is the second leaf **43'** when the rotor **3** rotates to the position shown in FIG. 6) in a direction opposite to the rotating direction, which, in turn, can result in an unbalanced sliding vane **4**. However, with the inclusion of the first and second channels **38**, **39**, the unbalanced problem can be eliminated. In the example shown in FIG. 6, the fluid enters into the second channel **39** through the inlet port **336'** and is discharged at the outlet port **332**, which results in a counter force that pushes the second leaf **43'** in the rotating direction, and which offsets the aforesaid force, thereby maintaining balance of the sliding vane **4** during rotation of the rotor **3**.

[0021] As compared to the aforementioned conventional rotary compressor **1** only one of the first and second leaves **42'**, **43'** of the sliding vane **4** is in sliding contact with the

inner wall 24 of the cylinder 22, thereby significantly reducing the friction between the sliding vane 4 and the inner wall 24 of the cylinder 22 and wearing of the cylinder 22 as commonly encountered in the aforementioned conventional rotary compressor 1. Moreover, the weight of the sliding vane 4 is relatively light by virtue of its configuration so as to reduce the momentum of the sliding vane 4 when sliding in the sliding space 34.

[0022] The inner wall 24 of the cylinder 22 is divided into different segments which have different curvatures in such a manner that the sliding vane 4 can smoothly rotate from a first position shown in FIG. 7 through a second position shown in FIG. 4 (where the sliding vane 4 passed by the outlet 27 in the cylinder 22) to a third position (where the sliding vane 4 passes by the portion 242 of the inner wall 24 of the cylinder 22) shown in FIG. 5, and that the rotary compressor can be operated quietly.

[0023] With the invention thus explained, it is apparent that various modifications and variations can be made without departing from the spirit of the present invention. It is therefore intended that the invention be limited only as recited in the appended claims.

I claim:

1. A rotary compressor comprising:

a cylinder having an inner wall that defines an inner space therein, and formed with an inlet that is in fluid communication with said inner space, and an outlet which is spaced apart from said inlet and which is in fluid communication with said inner space;

a rotor mounted rotatably in said inner space and defining a sliding space, said rotor and said inner wall of said cylinder cooperatively defining a chamber therebetween, said rotor being rotatable about an axis in a rotating direction, said chamber being in fluid communication with said inlet and said outlet, said sliding space being in spatial communication with said chamber, extending through said axis in a radial direction relative to said axis, and having two opposite ends opposite to each other in said radial direction, said rotor being eccentrically disposed in said inner space and being in close proximity to a portion of said inner wall at a position between said inlet and said outlet; and

a sliding vane mounted slidably in said sliding space, extending in said radial direction, and having two opposite ends that are opposite to each other in said radial direction and that extend oppositely to said inner wall of said cylinder so as to divide said chamber into at least a discharging segment that is in fluid communication with said outlet and that extends in said rotating direction from one of said opposite ends of said sliding vane to said outlet, and an intake segment that is in fluid communication with said inlet and that is isolated from said discharging segment, said sliding vane being slidable in said sliding space in said radial direction upon rotation of said rotor in such a manner that said one of said opposite ends of said sliding vane abuts slidably against said inner wall of said cylinder, thereby preventing back flow of fluid from said discharging segment.

2. The rotary compressor of claim 1, wherein said sliding vane is in the form of a plate that has an H-shaped portion

which includes parallel first and second leaves and a middle rib interconnecting said first and second leaves, said first and second leaves being opposite to each other in said radial direction and respectively defining said opposite ends of said sliding vane.

3. The rotary compressor of claim 1, wherein the cross-section of said chamber gradually increases from a position proximate to said portion of said inner wall to an opposite position opposite to said portion of said inner wall, and gradually decreases from said opposite position to said outlet.

4. The rotary compressor of claim 3, wherein said rotor is cylindrical in shape, and includes first and second halves which cooperatively define said sliding space therebetween.

5. The rotary compressor of claim 4, wherein said cylinder has opposite upper and lower open ends and upper and lower sealing flanges that are fixed sealingly and respectively to said upper and lower open ends and that are respectively formed with central openings, said first and second halves of said rotor being indented in an axial direction relative to said rotor to form opposite upper and lower recesses, said rotary compressor further comprising upper and lower bearings that are respectively received in said central openings in said upper and lower flanges, and upper and lower journals that respectively have upper and lower limiting flanges which are respectively received in said upper and lower recesses and which are secured to said rotor, and upper and lower shafts which extend respectively and outwardly of said cylinder from said upper and lower limiting flanges through said upper and lower bearings, each of said upper and lower limiting flanges having a periphery edge, and a pair of opposite radial slits that extend inwardly and radially from said periphery edge, said first and second leaves having upper and lower ends that are respectively received in said slits in said upper and lower limiting flanges.

6. The rotary compressor of claim 4, wherein each of said first and second halves of said rotor has opposite outer and inner surfaces extending angularly of said rotor, and opposite first and second ends opposite to each other in said radial direction, said first and second ends of each of said first and second halves of said rotor respectively confronting said first and second leaves of said sliding vane, said rotor further including first and second tubular elements, and being formed with a first channel that is disposed adjacent to and that is associated with said first leaf, and a second channel that is disposed adjacent to and that is associated with said second leaf, said first channel having a first segment that is formed in said first half of said rotor, and a second segment that is formed in said second half of said rotor, said first segment of said first channel having an inlet port that is formed in said outer surface of said first half of said rotor, and a first connecting port that is formed in said inner surface of said first half of said rotor, said second segment of said first channel having a second connecting port that is formed in said inner surface of said second half of said rotor and that is connected to and that is in fluid communication with said first connecting port through said first tubular element, and an outlet port that is formed in said first end of said second half of said rotor and that confronts said first leaf of said sliding vane, said second channel having a first segment that is formed in said second half of said rotor, and a second segment that is formed in said first half of said rotor, said first segment of said second channel having an inlet port that is formed in said outer surface of said second

half of said rotor, and a first connecting port that is formed in said inner surface of said second half of said rotor, said second segment of said second channel having a second connecting port that is formed in said inner surface of said first half of said rotor and that is connected to and that is in fluid communication with said first connecting port of said second channel through said second tubular element, and an outlet port that is formed in said second end of said first half of said rotor and that confronts said second leaf of said

sliding vane, said inlet port of said first segment of each of said first and second channels being disposed anteriorly of the respective one of said first and second leaves in said rotating direction, said outlet port of said second segment of each of said first and second channels being disposed posteriorly of the respective one of said first and second leaves in said rotating direction.

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