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(54) **Volume regulating structure for rotary helical screw compressors**

(57) A volume regulating structure for a rotary helical screw compressor includes a housing, a male-female rotor pair, a slide valve, and an extending support. The housing is provided, inside, with a rotor chamber and a slide valve chamber which are opening at the discharge surface of the housing. The extending support is fixed on

the discharge surface of the housing, and that an inner profile of the extending support is aligned with two lower-half arcs of an opening profile of the slide valve chamber. Accordingly, part of the slide valve moved out of the housing can be supported by the extending support so as to reduce shocking of the slide valve effectively.

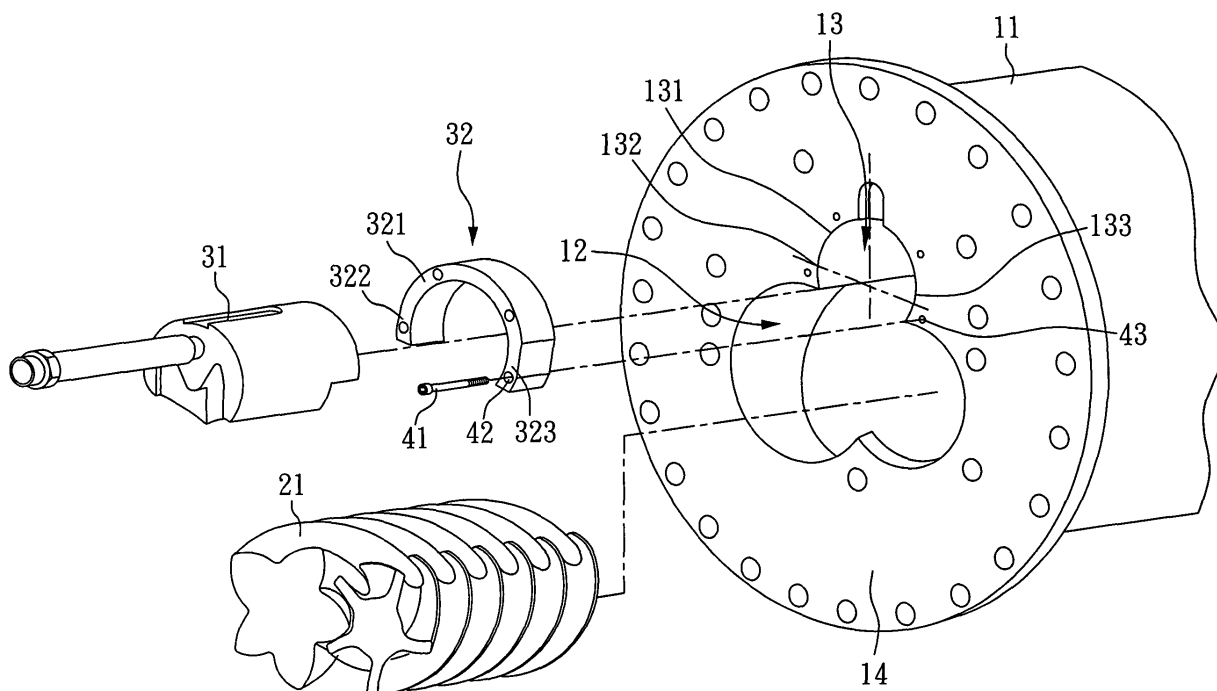


FIG. 4

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a volume regulating structure for compressors and, more particularly, to a volume regulating structure for rotary helical screw compressors.

2. Description of Related Art

[0002] Nowadays, rotary helical screw compressors have been widely used for air conditioning and refrigeration systems, for which a compression effect can be achieved by rotating a male-female rotor pair such that a sealed space between the rotors is gradually converged and under compression. In a conventional rotary helical screw compressor, a volume regulating device is provided for altering refrigeration capacity.

[0003] FIGs. 1 and 2 are a perspective view and a cross-sectional view of a conventional volume regulating structure for a rotary helical screw compressor, wherein a male-female rotor pair has been removed from FIG. 2. The conventional volume regulating structure for a rotary helical screw compressor comprises a housing 1, a rotor chamber 2 having a slide valve chamber 3 provided above the rotor chamber 2, and a slide valve 4 received in the slide valve chamber 3. The slide valve chamber 3 is opening at the discharge surface 5 of the housing 1, where the discharge surface 5 is flat around the opening of the slide valve chamber 3. By moving the slide valve 4, a gas-compressed space defined by the male-female rotor pair 6, the housing 1 and the slide valve 4 will be altered correspondingly. As shown in FIG. 2, when the slide valve 4 is moved to a position defined by a dotted line, the compressor has a maximum volume, and so a maximum gas-compressed space; however, when the slide valve is moved to a position defined by a solid line, the compressor has a minimum volume.

[0004] The conventional volume regulating structure for a rotary helical screw compressor has a potential problem, namely, when the slide valve 4 moves away from the slide valve chamber 3 and out of the housing 1, or moving from the position defined by the dotted line to the position defined by the solid line, the slide valve 4 will be subjected to a radial force against the male-female rotor pair 6 due to a pressure difference and a pressure change. Besides, the surface of the slide valve chamber 3 and of the slide valve 4 contacting with each other will be worn out easily due to getting shorter of the slide valve chamber 3 in support of the slide valve 4. Even worse, the slide valve 4 is brought into contact with the male-female rotor pair 6, causing problems of reduction in performance, abnormal vibration and noise.

SUMMARY OF THE INVENTION

[0005] An object of the present invention is to provide a volume regulating structure for a rotary helical screw compressor, where the compressor comprises a housing, a male-female rotor pair, a slide valve, and an extending support. The housing is provided, inside, with a rotor chamber and a slide valve chamber which are opening at the discharge surface of the housing. An opening profile of the slide valve chamber consists of an upper-half arc and two lower-half arcs.

[0006] The male-female rotor pair and the slide valve are arranged, respectively, in the rotor chamber and the slide valve chamber of the housing, and that the slide valve is slidable. The extending support is fixed on the discharge surface of the housing, and that an inner profile of the extending support is aligned with the two lower-half arcs of the opening profile of the slide valve chamber.

[0007] With the help of the structural design of the present invention, part of the slide valve moved out of the housing can be supported by the extending support so as to minimize the radial movement of the slide valve and to maintain the stability of the slide valve in the housing.

[0008] The extending support may include two arc sections and a medium section, and that an inner profile, formed together by the two arc sections and the medium section, has the same dimension as the opening profile of the slide valve chamber. The extending support may be a component separated from the housing and, through a locking means, be secured on the discharge surface of the housing. The locking means may be a bolt. Alternatively, the extending support may be integrally made in one piece with the housing.

[0009] The discharge surface of the housing may be provided with an inner threaded hole, and that the extending support is, correspondingly, provided with a through hole. The locking means passes through the through hole and is screwed into the inner threaded hole.

[0010] Other objects, advantages, and novel features of the present invention will become more apparent from the following detailed descriptions when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a perspective view of a conventional volume regulating structure for a rotary helical screw compressor;

FIG. 2 is a cross-sectional view of the conventional volume regulating structure for a rotary helical screw compressor, wherein a male-female rotor pair has been removed;

FIG. 3 is a perspective view of a volume regulating structure for a rotary helical screw compressor according to the present invention;

FIG. 4 is an exploded view of the volume regulating structure for a rotary helical screw compressor according to the present invention; and
 FIG. 5 is a cross-sectional view of the volume regulating structure for a rotary helical screw compressor according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] Referring to FIG. 3, a perspective view of a volume regulating structure for a rotary helical screw compressor according to the present invention, the volume regulating structure comprises a housing 11, a male-female rotor pair 21 and a slide valve 31 both arranged in the housing 11, and an extending support 32 fixed on an discharge surface 14 of the housing 11, where the extending support 32 envelops periphery of the slide valve 31.

[0013] Referring to FIG. 4, an exploded view of the volume regulating structure for a rotary helical screw compressor according to the present invention, the housing 11 is provided, inside, with a rotor chamber 12 and a slide valve chamber 13 which are communicated with each other and which are opening at the discharge surface 14 of the housing 11. An opening profile of the slide valve chamber 13 consists of an upper-half arc 131 and two lower-half arcs 132, 133 extending from the upper-half arc 131, respectively. The upper-half arc 131 refers to a semi-circular profile which is consistent with the structural profile of a known slide valve.

[0014] The male-female rotor pair 21 is received in the rotor chamber 12 of the housing 11, while the slide valve 31 is slidably received in the slide valve chamber 13 of the housing 11. When the rotary helical screw compressor is under operation, the male-female rotor pair 21, the housing 11 and the slide valve 31 will envelop, together, and define a compression space, i.e. a space occupied by a to-be compressed gas whose volume will be reduced when pressure is increased.

[0015] The extending support 32 is fixed on the discharge surface 14 of the housing 11, and includes two arc sections 322, 323 and a medium section 321. An inner profile formed by the two arc sections 322, 323 and the medium section 321 is aligned with the two lower-half arcs 132, 133 and the upper-half arc 131 forming the opening profile of the slide valve chamber 13. In other words, the inner profile of the extending support 32 has the same dimension as the opening profile of the slide valve chamber 13. In the present embodiment, the two arc sections 322, 323 and the medium section 321 are integrally made in one piece.

[0016] The discharge surface 14 of the housing 11 is provided with a plurality of inner threaded holes 43, and that the extending support 32 is, correspondingly, provided with a plurality of through holes 42. There are also provided with a corresponding number of locking means 41 (only one is shown) which pass through the through

holes 42 and screwed into the inner threaded holes 43, so that the extending support 32 can be secured on the discharge surface 14 of the housing 11. In the present embodiment, the locking means 41 refer to bolts.

[0017] References are made to FIGs. 4 and 5, wherein the latter is a cross-sectional view of the volume regulating structure where the male-female rotor pair 6 has been removed. The following is a description on features of the volume regulating structure for a rotary helical screw according to the present invention. When moving a piston means (not shown), which connects the slide valve 31, rightward, the slide valve 31 will occupy most space of the slide valve chamber 13, so that the compressor has a maximum compression volume (as shown by the dotted line). At this moment, the slide valve 31 is supported by wall of the slide valve chamber 13.

[0018] When the compressor is intended to be regulated to a minimum compression volume, the piston means will be moved leftward such that the slide valve 31 will mostly be moved out of the slide valve chamber 13 and the housing 11. At this moment, a small part of the slide valve 31 is supported by the wall of the slide valve chamber 13, while most part of the slide valve 31 moved out of the housing 11 is supported by the two arc sections 322, 323 of the extending support 32 so as to greatly improve the shocking situation of the slide valve 31. In addition, the medium section 321 of the extending support 32 serves to restrict upward tremble of the slide valve 31. This will effectively reduce the tendency of trembling for the slide valve 31.

[0019] Given the above, the present invention uses the extending support 32 at the discharge surface 14 of the housing 11 to properly support the slide valve 31 when it moves outward of the housing 11 for reducing the compression volume, and that the shocking situation existing in the prior art due to suspension of the slide valve can thus be avoided.

[0020] Although the present invention has been explained in relation to its preferred embodiments, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the invention as hereinafter claimed.

Claims

1. A volume regulating structure for a rotary helical screw compressor, comprising:

- a housing, being provided, inside, with a rotor chamber and a slide valve chamber which are opening at the discharge surface of the housing, wherein an opening profile of the slide valve chamber consists of an upper-half arc and two lower-half arcs;
- a male-female rotor pair, being arranged in the rotor chamber of the housing; and
- a slide valve, being arranged in the slide valve

chamber of the housing;

characterized in that:

the volume regulating structure further comprises an extending support fixed on the discharge surface of the housing, and an inner profile of the extending support is aligned with the two lower-half arcs of the opening profile of the slide valve chamber.

2. The volume regulating structure as claimed in claim 1, wherein the extending support includes two arc sections and a medium section, and an inner profile formed together by the two arc sections and the medium section has the same dimension as the opening profile of the slide valve chamber.
3. The volume regulating structure as claimed in claim 1, wherein the extending support is, through a locking means, secured on the discharge surface of the housing.
4. The volume regulating structure as claimed in claim 3, wherein the locking means is a bolt.
5. The volume regulating structure as claimed in claim 3, wherein the discharge surface of the housing is provided with an inner threaded hole, and the extending support is, correspondingly, provided with a through hole, such that the locking means passes through the through hole and is screwed into the inner threaded hole.

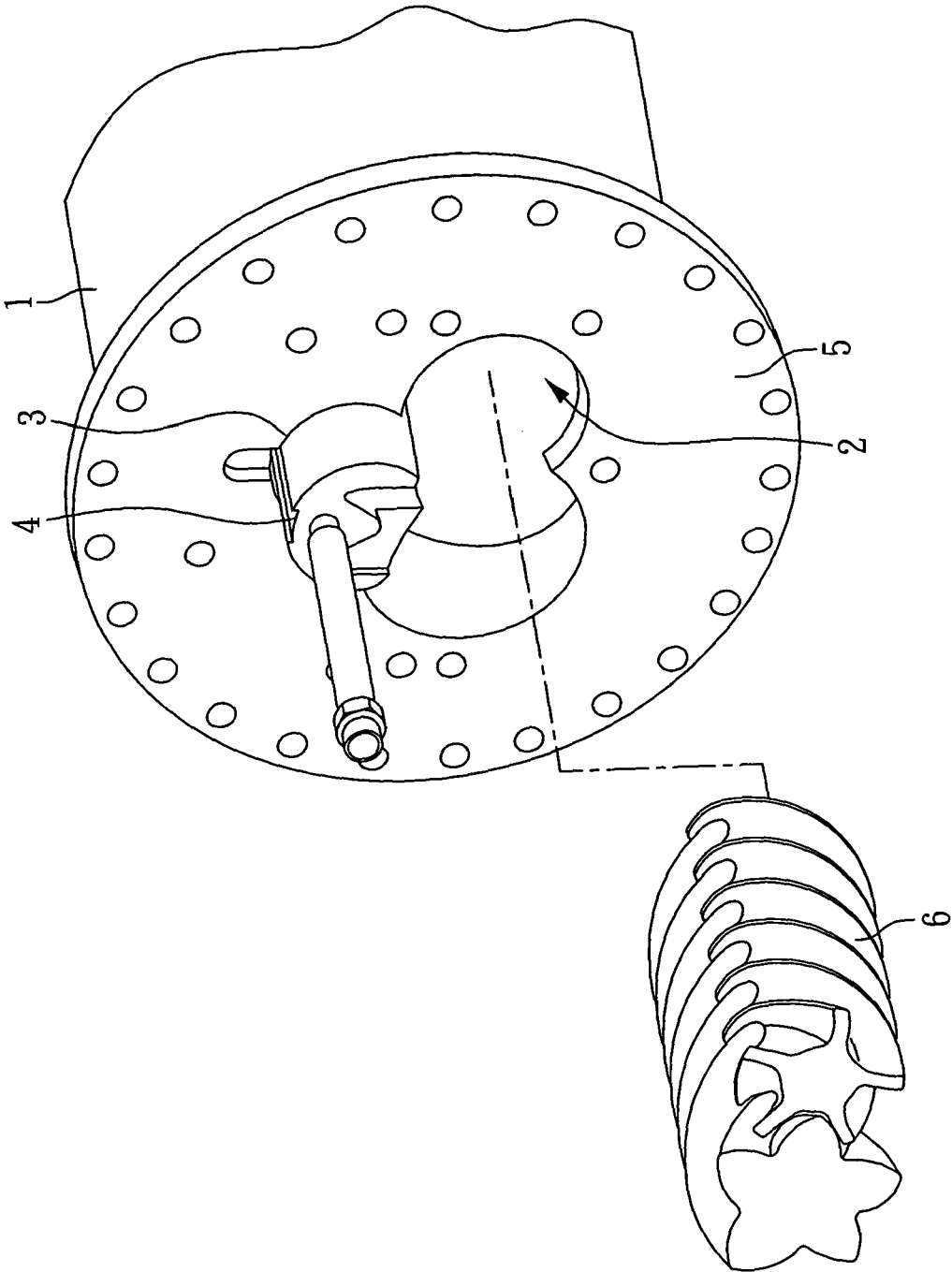
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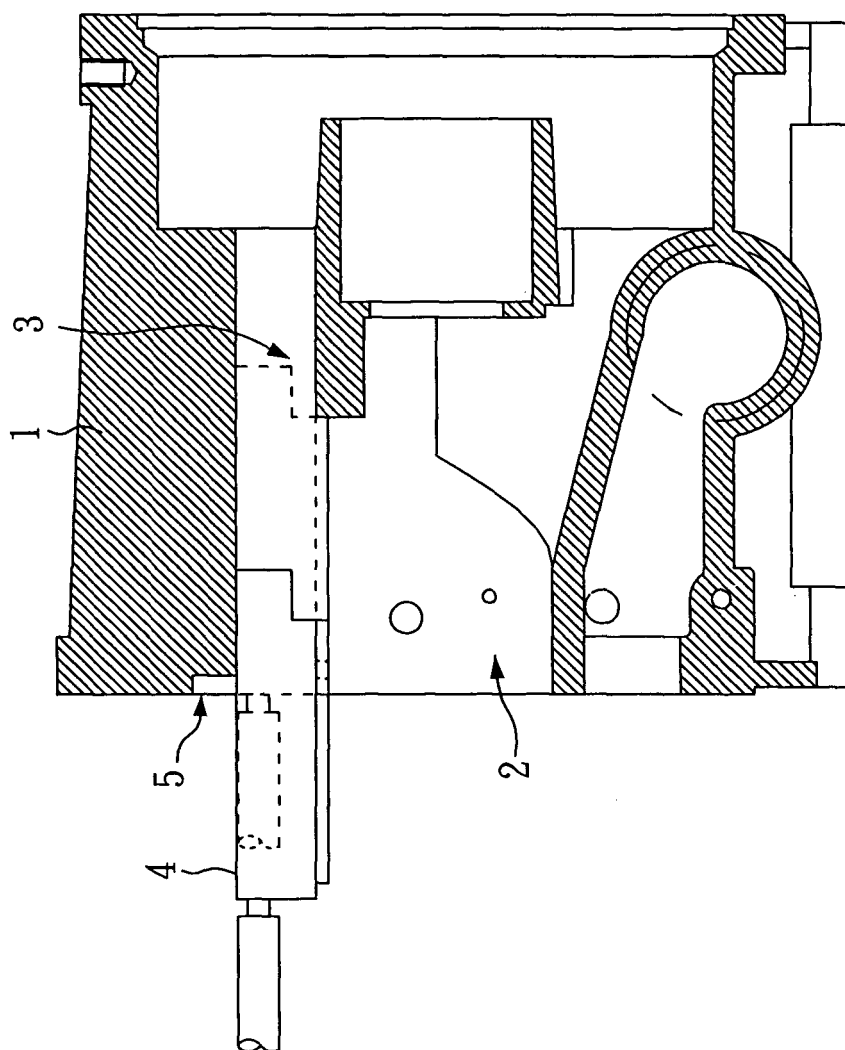


FIG. 2 (PRIOR ART)

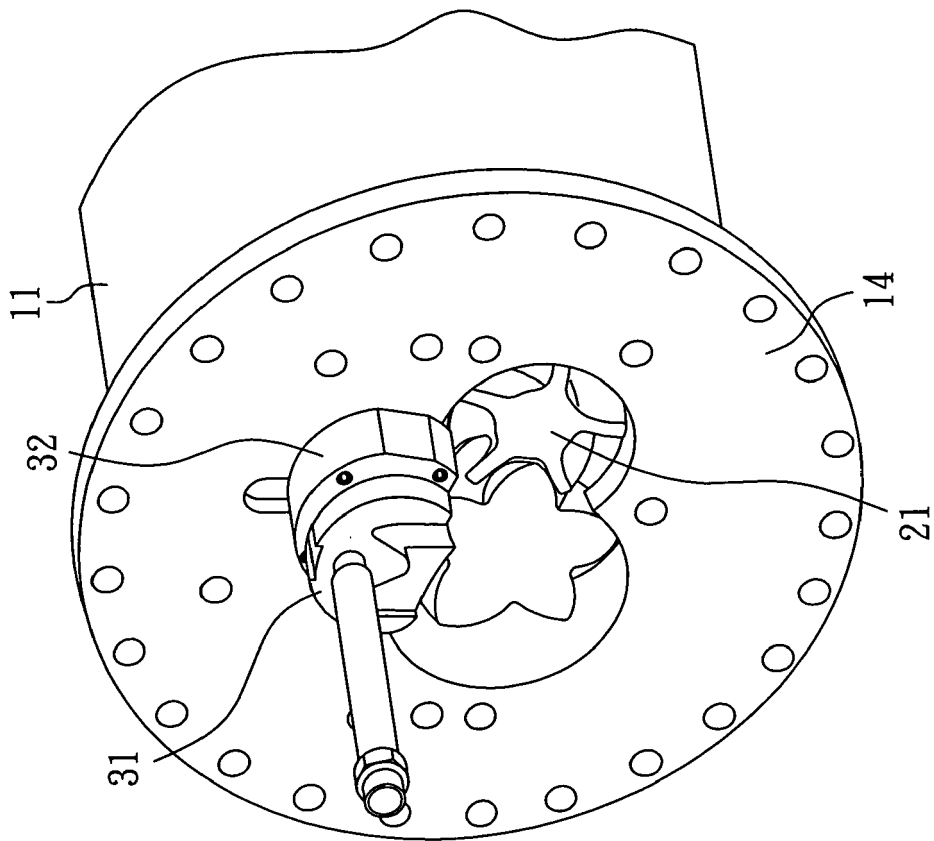


FIG. 3

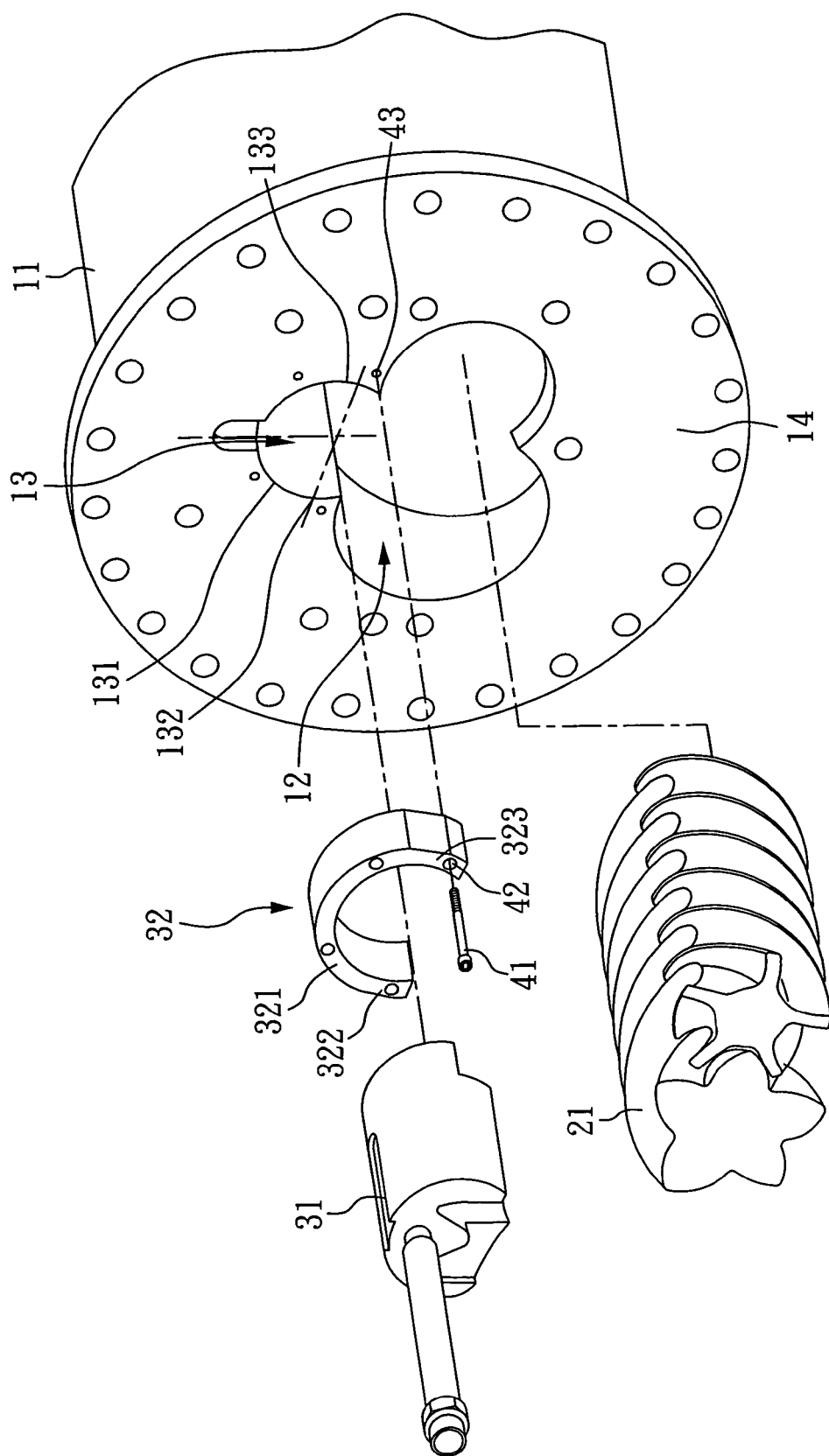


FIG. 4

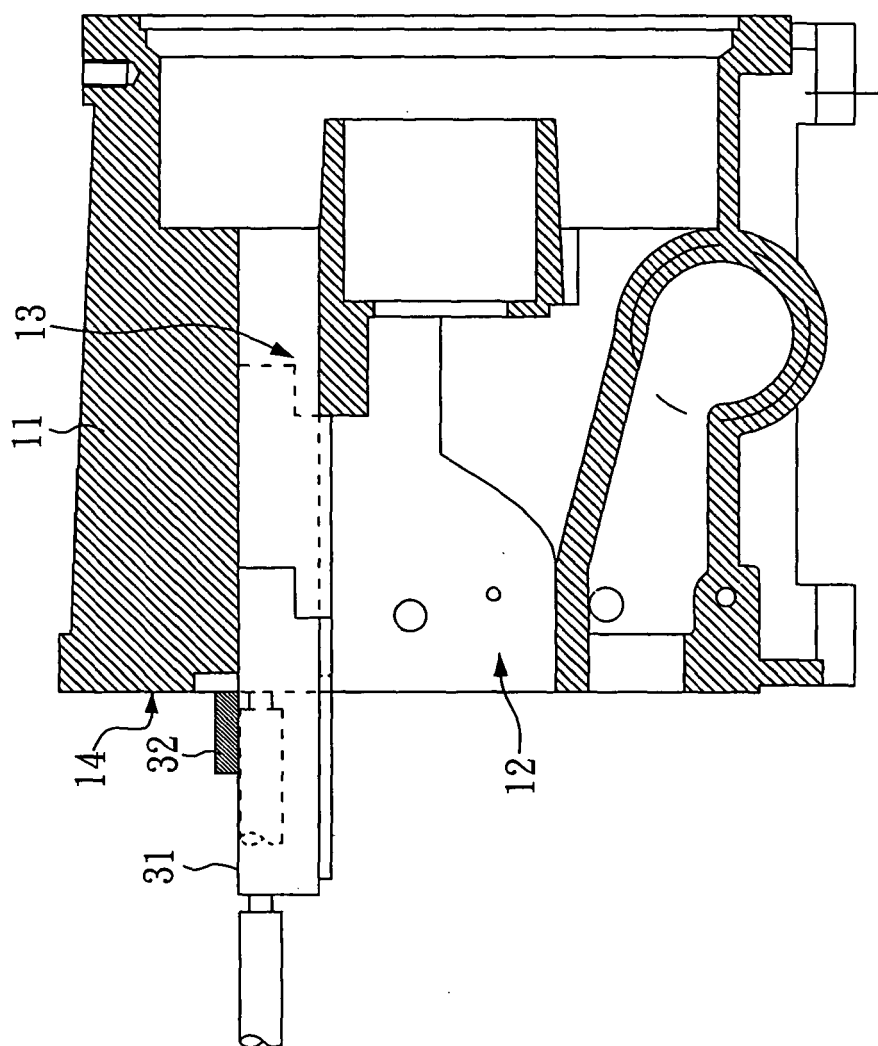


FIG. 5