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(54) **SCREW COMPRESSOR**

(57) A screw compressor (100) is provided. The screw compressor (100) includes a housing (1), at least one compression screw rotor (2), and a volume adjustment assembly (3). The volume adjustment assembly (3) includes a guide track (31) and an adjusting member (32) that is disposed in the guide track (31). The guide track (31) includes a first accommodating groove (311) and a second accommodating groove (312). The adjusting member (32) includes a first end portion (321), a second end portion (322), a guide portion (323), and a discharge port (324). The first end portion (321) and the first accommodating groove (311) jointly define a first enclosed chamber (S1). The second end portion (322) and the second accommodating groove (312) jointly define a second enclosed chamber (S2). The guide portion (323) has a first gas channel (3232) that is in spatial communication with the first enclosed chamber (S1). The discharge port (324) has a second gas channel (3243) that is in spatial communication with the second enclosed chamber (S2). Accordingly, the adjusting member (32) can adjust a gas pressure of the screw compressor (100) while gas enters the first enclosed chamber (S1) and the second enclosed chamber (S2) through the first gas channel (3232) and the second gas channel (3243), respectively.

chamber (S1). The second end portion (322) and the second accommodating groove (312) jointly define a second enclosed chamber (S2). The guide portion (323) has a first gas channel (3232) that is in spatial communication with the first enclosed chamber (S1). The discharge port (324) has a second gas channel (3243) that is in spatial communication with the second enclosed chamber (S2). Accordingly, the adjusting member (32) can adjust a gas pressure of the screw compressor (100) while gas enters the first enclosed chamber (S1) and the second enclosed chamber (S2) through the first gas channel (3232) and the second gas channel (3243), respectively.

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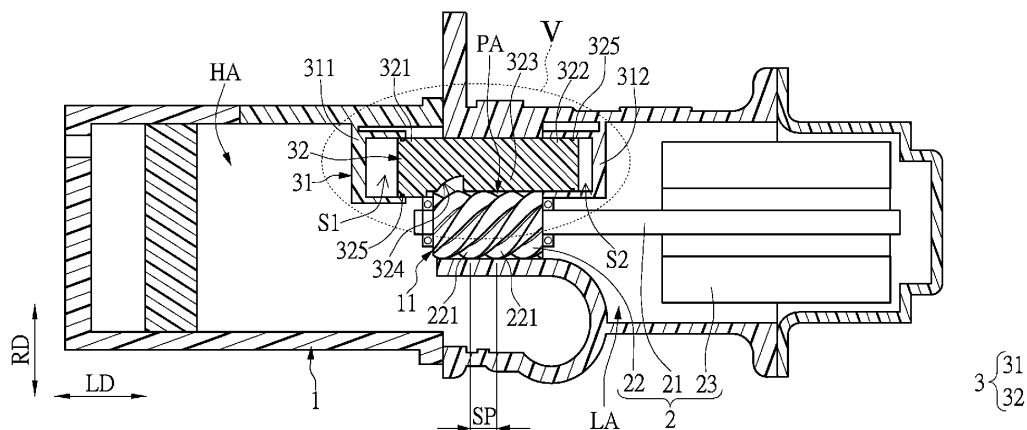


FIG. 4

Description

[0001] This application claims the benefit of priority to Taiwan Patent Application No. 109134148, filed on September 30, 2020.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to a compressor, and more particularly to a screw compressor that is configured to adjust a gas pressure by a volume adjustment.

BACKGROUND OF THE DISCLOSURE

[0003] Conventional screw compressors are able to compress gas through a screw that is located in a compression area thereof. In order to ensure that a gas pressure generated by the compressed gas does not affect power of the conventional screw compressors, the conventional screw compressors are configured to have a gas pressure adjustment component installed in the compression area. The gas pressure adjustment component includes a sensor and an electronic control valve, the sensor can sense a pressure value of the gas that is compressed, and the electronic control valve can exhaust a part of the gas by opening and closing according to the pressure value. Accordingly, the conventional screw compressors can achieve an effect of controlling the pressure through the gas pressure adjustment component.

[0004] However, the sensor and the electronic control valve of the conventional screw compressors not only are expensive, but also have a short service life due to being placed in a high-pressure environment for a long time. In other words, the conventional screw compressors still have room for improvement.

SUMMARY OF THE DISCLOSURE

[0005] In response to the above-referenced technical inadequacies, the present disclosure provides a screw compressor to effectively improve on issues associated with conventional screw compressors.

[0006] In one aspect, the present disclosure provides a screw compressor. The screw compressor includes a housing, at least one compression screw rotor, and a volume adjustment assembly. The at least one compression screw rotor is disposed in the housing, and includes at least one helical lobe portion having a plurality of spiral teeth. The volume adjustment assembly is disposed in the housing, and a part of the volume adjustment assembly corresponds in position to the at least one compression screw rotor. The volume adjustment assembly includes a guide track and an adjusting member. The guide track includes a first accommodating groove and a second accommodating groove that is opposite to the first accommodating groove. The adjusting member is disposed in the guide track, and is configured to slide along

the guide track. The adjusting member has a longitudinal direction, and includes a first end portion, a second end portion, a guide portion, and a discharge port. The first end portion is disposed in the first accommodating groove, and the first end portion and the first accommodating groove jointly define a first enclosed chamber. The second end portion is disposed in the second accommodating groove, and the second end portion and the second accommodating groove jointly define a second enclosed chamber. The guide portion is located between the first end portion and the second end portion, and the discharge port is disposed on the guide portion and adjacent to the first end portion. The guide portion has a first gas channel that is in spatial communication with the first enclosed chamber. A gas inlet of the first gas channel is located between the second end portion and the discharge port, and is spaced apart from an edge of the discharge port by a predetermined distance. The discharge port has a second gas channel that is in spatial communication with the second enclosed chamber.

[0007] Therefore, in the screw compressor provided by the present disclosure, by virtue of "a high-pressure gas being introduced into the second enclosed chamber through the second gas channel" and "a medium-pressure gas being introduced into the first enclosed chamber through the first gas channel", the adjusting member can be pushed to slide along the guide track by a gas pressure in the first enclosed chamber and a gas pressure in the second enclosed chamber, so as to achieve an effect of adjusting the gas pressure by changing a position of the discharge port.

[0008] These and other aspects of the present disclosure will become apparent from the following description of the embodiment taken in conjunction with the following drawings and their captions, although variations and modifications therein may be affected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The described embodiments may be better understood by reference to the following description and the accompanying drawings, in which:

FIG. 1 is a schematic perspective view of a screw compressor according to a first embodiment of the present disclosure;

FIG. 2 is a partly exploded view of the screw compressor according to the first embodiment of the present disclosure;

FIG. 3 is a cross-sectional view taken along line III-III of FIG. 2;

FIG. 4 is a schematic cross-sectional view of the screw compressor according to the first embodiment of the present disclosure;

FIG. 5 is a partially enlarged view of section V of FIG. 4;

FIG. 6 is another schematic cross-sectional view of the screw compressor according to the first embodiment of the present disclosure;

FIG. 7 is a schematic cross-sectional view of the screw compressor according to a second embodiment of the present disclosure;

FIG. 8 is another schematic cross-sectional view of the screw compressor according to the second embodiment of the present disclosure;

FIG. 9 is a schematic cross-sectional view of the screw compressor according to a third embodiment of the present disclosure; and

FIG. 10 is a schematic cross-sectional view of the screw compressor according to a fourth embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0010] The present disclosure is more particularly described in the following examples that are intended as illustrative only since numerous modifications and variations therein will be apparent to those skilled in the art. Like numbers in the drawings indicate like components throughout the views. As used in the description herein and throughout the claims that follow, unless the context clearly dictates otherwise, the meaning of "a", "an", and "the" includes plural reference, and the meaning of "in" includes "in" and "on". Titles or subtitles can be used herein for the convenience of a reader, which shall have no influence on the scope of the present disclosure.

[0011] The terms used herein generally have their ordinary meanings in the art. In the case of conflict, the present document, including any definitions given herein, will prevail. The same thing can be expressed in more than one way. Alternative language and synonyms can be used for any term(s) discussed herein, and no special significance is to be placed upon whether a term is elaborated or discussed herein. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this specification including examples of any terms is illustrative only, and in no way limits the scope and meaning of the present disclosure or of any exemplified term. Likewise, the present disclosure is not limited to various embodiments given herein. Numbering terms such as "first", "second" or "third" can be used to describe various components, signals or the like, which are for distinguishing one component/signal from another one only, and are not intended to, nor should be construed to impose any substantive limitations on the components, signals or the like.

[First Embodiment]

[0012] Referring to FIG. 1 to FIG. 6, a first embodiment of the present disclosure provides a screw compressor 100. As shown in FIG. 1 and FIG. 4, the screw compressor 100 includes a housing 1, at least one compression

screw rotor 2, and a volume adjustment assembly 3. The volume adjustment assembly 3 and the at least one compression screw rotor 2 are disposed in the housing 1, the at least one compression screw rotor 2 can compress gas located in the housing 1, and the volume adjustment assembly 3 can adjust a pressure of the gas by changing a volume thereof. In other words, any compressor that does not compress the gas by a screw and does not adjust the pressure by a volume change is not the screw compressor 100 of the present embodiment. The following description describes the structure and connection relation of each component of the screw compressor 100.

[0013] Referring to FIG. 4 to FIG. 6, the housing 1 has a high pressure area HA, a compression area PA, and a low pressure area LA. The low pressure area LA is an area for introducing the gas, the compression area PA is an area for compressing the gas, and the high pressure area HA is an area for exhausting the gas that is compressed. Specifically, the housing 1 has a gas compression chamber 11 defined as the compression area PA, and two sides of the gas compression chamber 11 are respectively defined as the high pressure area HA and the low pressure area LA.

[0014] Referring to FIG. 1, FIG. 2, and FIG. 4, the at least one compression screw rotor 2 is disposed in the compression area PA (i.e., the gas compression chamber 11). The at least one compression screw rotor 2 can introduce the gas located in the low pressure area LA into the compression area PA for compression, and can exhaust the gas located in the compression area PA from the high pressure area HA.

[0015] Specifically, the at least one compression screw rotor 2 in the present embodiment includes two rotating shafts 21, two helical lobe portions 22, and two drive units 23. The two helical lobe portions 22 are respectively fixed on the two rotating shafts 21, and each of the two helical lobe portions 22 has a plurality of spiral teeth 221. Any two adjacent ones of the spiral teeth 221 are spaced apart from each other by a predetermined pitch SP. The two drive units 23 can drive the two rotating shafts 21 to rotate, respectively, so that the two helical lobe portions 22 can compress the gas through the spiral teeth 221. It should be noted that since the manners in which the at least one compression screw rotor 2 can compress the gas are known to those skilled in the art, and are not the focus of the present disclosure, details thereof will not be described herein.

[0016] The volume adjustment assembly 3 is disposed between the compression area PA and the high pressure area HA, and a part of the volume adjustment assembly 3 corresponds in position to the at least one compression screw rotor 2. The volume adjustment assembly 3 includes a guide track 31 and an adjusting member 32.

[0017] Referring to FIG. 4 and FIG. 5, the guide track 31 is arranged in a side of the housing 1 that corresponds in position to the two helical lobe portions 22, and includes a first accommodating groove 311 and a second accommodating groove 312 that is opposite to and spaced apart

from the first accommodating groove 311. Furthermore, as shown in FIG. 5, in the present embodiment, the first accommodating groove 311 and the second accommodating groove 312 of the guide track 31 have two cross-sections perpendicular to a longitudinal direction LD, respectively. The two cross-sections are each in a circular shape and have a same center, so that an imaginary connecting line CL between a midpoint C1 of the first accommodating groove 311 and a midpoint C2 of the second accommodating groove 312 is parallel to any one of the two rotating shafts 21. However, the present disclosure is not limited thereto. For example, according to practical requirements, the two cross-sections of the first accommodating groove 311 and the second accommodating groove 312 of the guide track 31 in other embodiments (as shown in FIG. 7, FIG. 8, and FIG. 9) are each designed to have a circular shape, and the centers thereof do not overlap with each other along the longitudinal direction LD. That is, the first accommodating groove 311 is eccentric to the second accommodating groove 312.

[0018] The adjusting member 32 is disposed in the guide track 31, and can slide along the guide track 31. Specifically, the adjusting member 32 in the present embodiment is substantially in a cylindrical shape and has the longitudinal direction LD. When the adjusting member 32 is disposed in the guide track 31, the longitudinal direction LD of the adjusting member 32 is parallel to the imaginary connecting line CL and a long axis direction of the at least one compression screw rotor 2. Furthermore, a length of the adjusting member 32 along the longitudinal direction LD is preferably 1.01 to 5 times a length of any one of the two helical lobe portions 22 along the longitudinal direction LD. In other words, the length of the adjusting member 32 must be greater than the length of each of the two helical lobe portions 22, but is not greater than 5 times the length of each of the two helical lobe portions 22.

[0019] Furthermore, the adjusting member 32 includes a first end portion 321, a second end portion 322, a guide portion 323, a discharge port 324, and two gastight members 325. The first end portion 321, the guide portion 323, the discharge port 324, and the second end portion 322 of the adjusting member 32 are integrally formed as a single one-piece structure.

[0020] Referring to FIG. 2, FIG. 4, and FIG. 5, the first end portion 321 is disposed in the first accommodating groove 311, and the first end portion 321 and the first accommodating groove 311 jointly define a first enclosed chamber S1. Specifically, the first end portion 321 in the present embodiment has a cross-section that is perpendicular to the longitudinal direction LD and is in a circular shape, and the first accommodating groove 311 corresponds in shape to the first end portion 321. That is to say, the first accommodating groove 311 also has a cross-section that is perpendicular to the longitudinal direction LD and is in a circular shape, so that a gastight relationship can be formed between the first end portion 321 and the first accommodating groove 311. Further-

more, one of the two gastight members 325 is disposed on an outer edge of the first end portion 321, so as to effectively achieve a gastight effect between the first accommodating groove 311 and the first end portion 321.

[0021] The second end portion 322 is disposed in the second accommodating groove 312, and the second end portion 322 and the second accommodating groove 312 jointly define a second enclosed chamber S2. Specifically, the second end portion 322 in the present embodiment has a cross-section perpendicular to the longitudinal direction LD and is in a circular shape, and the cross-section of the second end portion 322 and the cross-section of the first end portion 321 have a same center, but the present disclosure is not limited thereto.

[0022] Referring to FIG. 7, FIG. 8, and FIG. 9, the cross-sections of the first end portion 321 and the second end portion 322 in other embodiments may not have the same center, so that a center of the cross-section of the first end portion 321 is eccentric to a center of the cross-section of the second end portion 322.

[0023] Furthermore, the second accommodating groove 312 corresponds in shape to the second end portion 322, and the second accommodating groove 312 also has a cross-section that is perpendicular to the longitudinal direction LD and is in a circular shape, so that a gastight relationship can be formed between the second end portion 322 and the second accommodating groove 312. Moreover, another one of the two gastight members 325 is disposed on an outer edge of the second end portion 322, so as to effectively achieve a gastight effect between the second accommodating groove 312 and the second end portion 322.

[0024] It should be noted that, each of the cross-sections of the first end portion 321 and the second end portion 322 in the present embodiment is in the circular shape. However, in certain embodiments of the present disclosure (not shown), each of the cross-sections of the first end portion 321 and the second end portion 322 may be in an oval shape or a polygonal shape. Furthermore, the shapes of the first accommodating groove 311 and the second accommodating groove 312 of the guide track 31 are also changed in accordance with the shapes of the first end portion 321 and the second end portion 322, so that the first enclosed chamber S1 and the second enclosed chamber S2 can each maintain the gastight effect. Moreover, the two gastight members 325 can be omitted according to practical requirements.

[0025] In addition, because cross-sections of the first end portion 321, and the second end portion 322 are perpendicular to the longitudinal direction LD, an area of the cross-section of the first end portion 321 is greater than an area of the cross-section of the second end portion 322, and a value of the area of the cross-section of the first end portion 321 divided by the area of the cross-section of the second end portion 322 is within a range from 1.01 to 5. In other words, when the first enclosed chamber S1 and the second enclosed chamber S2 have a same length along the longitudinal direction LD, a vol-

ume of the first enclosed chamber S1 will be greater than a volume of the second enclosed chamber S2.

[0026] Referring to FIG. 2, FIG. 3, and FIG. 4, the guide portion 323 is located between the first end portion 321 and the second end portion 322, and can move along the at least one compression screw rotor 2. In detail, the guide portion 323 has a V-shaped structure and has two arc grooves 3231, the two helical lobe portions 22 are respectively located in the two arc grooves 3231 of the guide portion 323, and the guide portion 323 can move along the two helical lobe portions 22 through an inner edge of the two arc grooves 3231.

[0027] It is worth mentioning that the guide portion 323 has a first gas channel 3232 that is in spatial communication with the first enclosed chamber S1. A gas inlet IN of the first gas channel 3232 is located between the second end portion 322 and the discharge port 324, and is spaced apart from an edge of the discharge port 324 by a predetermined distance PD. A value of the predetermined distance PD divided by the predetermined pitch SP is within a range from 1.01 to 3.

[0028] Furthermore, referring to FIG. 5, the first gas channel 3232 includes a first segment 3232A and a second segment 3232B. The first segment 3232A is arranged along the longitudinal direction LD of the adjusting member 32 and is in spatial communication with the first enclosed chamber S1. The second segment 3232B is arranged along a radial direction RD of the adjusting member 32 that is perpendicular to the longitudinal direction LD, and is in spatial communication with the first segment 3232A and the compression area PA. The second segment 3232B has the gas inlet IN, and the gas inlet IN and an inner edge of the discharge port 324 are spaced apart from each other by the predetermined distance PD, so as to prevent the gas near the gas inlet IN from directly leaking into the discharge port 324. Furthermore, the first segment 3232A and the second segment 3232B are arranged to be perpendicular to each other, which can also ensure that the gas in the compression area PA can be effectively and directly introduced into the first enclosed chamber S1.

[0029] Moreover, the discharge port 324 has a second gas channel 3243 that is in spatial communication with the second enclosed chamber S2, and the second gas channel 3243 is arranged along the longitudinal direction LD of the adjusting member 32, so as to ensure that the gas in the discharge port 324 can be effectively and directly introduced into the second enclosed chamber S2.

[0030] In addition, a projection path defined by orthogonally projecting the first segment 3232A of the first gas channel 3232 along the longitudinal direction LD does not overlap with a projection path defined by orthogonally projecting the second gas channel 3243 along the longitudinal direction LD. In other words, a first projection region defined by orthogonally projecting the second gas channel 3243 on the second end portion 322 can be located in a second projection region defined by orthogonally projecting the discharge port 324 on the second end

portion 322. A third projection region defined by orthogonally projecting the first segment 3232A of the first gas channel 3232 on the second end portion 322 can be located in a fourth projection region defined by orthogonally projecting the guide portion 323 on the second end portion 322, and does not overlap with the second projection region.

[0031] In addition, in a cross-section of the adjusting member 32 that is perpendicular to the longitudinal direction LD (as shown in FIG. 9), the first segment 3232A of the first gas channel 3232 and the second gas channel 3243 can be designed to be skewed to each other according to practical requirements. Naturally, one of the first segment 3232A of the first gas channel 3232 and the second gas channel 3243 can also be designed to be skewed, and a part of the projection path defined by orthogonally projecting the first segment 3232A of the first gas channel 3232 along the longitudinal direction LD overlaps with a part of the projection path defined by orthogonally projecting the second gas channel 3243 along the longitudinal direction LD.

[0032] It should be noted that in the present embodiment, a quantity of each of the helical lobe portions 22, the rotating shafts 21, and the drive units 23 of the at least one compression screw rotor 2 is two, and the guide portion 323 is designed to have a V-shaped structure according to the quantity of the helical lobe portions 22, but the present disclosure is not limited thereto. For example, in certain embodiments of the present disclosure (not shown), the quantity of each of the helical lobe portions 22, the rotating shafts 21, and the drive units 23 of the at least one compression screw rotor 2 may be one, and the guide portion 323 may be designed to have a semicircular shape or any other shape that can cooperate with that of the helical lobe portions 22.

[0033] In order to enable those skilled in the art to better understand the present disclosure, an example of the screw compressor 100 in an actual operation state will be given below, so as to illustrate how to achieve automatic volume adjustment. However, the present disclosure is not limited to the following description.

[0034] Referring to FIG. 5 and FIG. 6, the two rotating shafts 21 are respectively driven by the two drive units 23, so that the two helical lobe portions 22 produce a screw motion. Through the screw motion, the two helical lobe portions 22 introduce a low-pressure gas in the low pressure area LA into the gas compression chamber 11 (i.e., the compression area PA) for compression. Accordingly, a gas pressure distribution in the gas compression chamber 11 gradually increases from the low pressure area LA toward the high pressure area HA.

[0035] In other word, after the low-pressure gas that is uncompressed enters the gas compression chamber 11, the low-pressure gas is gradually compressed into a medium-pressure gas MP through the screw motion of the two helical lobe portions 22. In the gas compression chamber 11, the medium-pressure gas MP located in the discharge port 324 reaches a highest pressure, which is

defined as a high-pressure gas HP. The high-pressure gas HP can be released to the high pressure area HA and be discharged from the housing 1.

[0036] Furthermore, a gas pressure at the discharge port 324 of the adjusting member 32 is the same as a pressure of the high-pressure gas HP, and a gas pressure at the guide portion 323 corresponds to a pressure of the medium-pressure gas MP. The medium-pressure gas MP enters the first enclosed chamber S1 through the first gas channel 3232, and the high-pressure gas HP enters the second enclosed chamber S2 through the second gas channel 3243. That is to say, the pressure of the second enclosed chamber S2 will be greater than that of the first enclosed chamber S1.

[0037] In other words, referring to FIG. 5 and FIG. 6, the high-pressure gas HP located in the second enclosed chamber S2 generates a thrust force F2 toward the first enclosed chamber S1 at the second end portion 322 of the adjusting member 32, and the medium-pressure gas MP located in the first enclosed chamber S1 generates a thrust force F1 toward the second enclosed chamber S2 at the first end portion 321 of the adjusting member 32. Because the area of the cross-section of the first end portion 321 is greater than the area of the cross-section of the second end portion 322, and the pressure of the medium-pressure gas MP in the first enclosed chamber S1 is less than the pressure of the high-pressure gas HP in the second enclosed chamber S2, the thrust force F1 and the thrust force F2 that is opposite to the thrust force F1 continue to push both ends of the adjusting member 32, and move the adjusting member 32. In this way, a balanced state in which the thrust force F1 is equal to the thrust force F2 can be achieved. Accordingly, the screw compressor 100 can achieve the effect of automatically adjusting the gas pressure.

[0038] Referring to FIG. 5, when the thrust force F1 is greater than the thrust force F2, the adjusting member 32 will move toward the second enclosed chamber S2 until the thrust force F1 is equal to the thrust force F2. Accordingly, the adjusting member 32 stops moving, and the purpose of automatically adjusting the gas pressure is achieved. Referring to FIG. 6, when the thrust force F2 is greater than the thrust force F1, the adjusting member 32 will move toward the first enclosed chamber S1 until the thrust force F2 is equal to the thrust force F1. Accordingly, the adjusting member 32 stops moving, and the purpose of automatically adjusting the gas pressure is achieved.

[0039] It is worth mentioning that, since the second gas channel 3243 of the adjusting member 32 is opened in the discharge port 324, a component force located in the inner edge of the discharge port 324 is almost canceled. Therefore, as long as the thrust force F1 and the thrust force F2 at the two ends of the adjusting member 32 are balanced, the adjusting member 32 can be moved to an appropriate position, thereby allowing a balance mechanism of the adjusting member 32 to have a more enhanced sensitivity.

[Second Embodiment]

[0040] Referring to FIG. 7 and FIG. 8, a second embodiment of the present disclosure is provided. The present embodiment is similar to the first embodiment, and the similarities therebetween will not be repeated herein. The differences of the present embodiment from the first embodiment are mainly as follows.

[0041] A side of the adjusting member 32 facing the at least one compression screw rotor 2 has a first protrusion portion 326 adjacent to the first end portion 321 and a second protrusion portion 327 that is adjacent to the second end portion 322. In other words, the first protrusion portion 326 and the second protrusion portion 327 are located on two sides of the guide portion 323. The first protrusion portion 326 and the second protrusion portion 327 respectively abut against an inner wall of the first accommodating groove 311 and an inner wall of the second accommodating groove 312, so as to effectively achieve a gastight effect between the first accommodating groove 311 and the first end portion 321 and a gastight effect between the second accommodating groove 312 and the second end portion 322.

[0042] In addition, when the first protrusion portion 326 and the second protrusion portion 327 respectively abut against the inner walls of the first accommodating groove 311 and the second accommodating groove 312, a value of a distance between the first protrusion portion 326 and the second protrusion portion 327 along the longitudinal direction LD divided by a length of any one of the two helical lobe portions 22 along the longitudinal direction LD can be within a range from 1.25 to 4.75, so as to prevent the adjusting member 32 from being damaged due to contacting the two helical lobe portions 22 during the movement.

[0043] Furthermore, referring to FIG. 7, when the second end portion 322 of the adjusting member 32 contacts a bottom surface of the second accommodating groove 312, the first protrusion portion 326 and the second protrusion portion 327 do not contact the two helical lobe portions 22. Referring to FIG. 8, when the first end portion 321 of the adjusting member 32 contacts a bottom surface of the first accommodating groove 311, the first protrusion portion 326 and the second protrusion portion 327 also do not contact the two helical lobe portions 22.

[0044] Moreover, along a direction perpendicular to the longitudinal direction LD, the first protrusion portion 326 has a side surface, and the second protrusion portion 327 has a side surface facing the side surface of the first protrusion portion 326. An area of the side surface of the first protrusion portion 326 is greater than an area of the side surface of the second protrusion portion 327, and a value of the area of the side surface of the first protrusion portion 326 divided by the area of the side surface of the second protrusion portion 327 is within a range from 1.01 to 3.5. Referring to FIG. 10, a side of the adjusting member 32 away from the at least one compression screw rotor 2 has a fourth protrusion portion 329 adjacent to

the second end portion 322, and the fourth protrusion portion 329 can abut against an end surface of the second accommodating groove 312, so that a moving (travel) distance of the adjusting member 32 is restricted, but the present disclosure is not limited thereto. As shown in FIG. 7, the fourth protrusion portion 329 can be designed not to abut against the end surface of the second accommodating groove 312, so as to be adapted to different shapes of the second end portion 322 and the second accommodating groove 312 during manufacturing and assembling processes.

[0045] In addition, referring to FIG. 5 and FIG. 6, the adjusting member 32 can be designed to have only a third protrusion portion 328 according to practical requirements. Specifically, a side of the adjusting member 32 facing the at least one compression screw rotor 2 has a third protrusion portion 328 adjacent to the first end portion 321 or the second end portion 322, and the third protrusion portion 328 can abut against the inner wall of the first accommodating groove 311 or the inner wall of the second accommodating groove 312, so as to effectively achieve the gastight effect between the first accommodating groove 311 and the first end portion 321, or the gastight effect between the second accommodating groove 312 and the second end portion 322.

[Third Embodiment]

[0046] Referring to FIG. 9, a third embodiment of the present disclosure is provided. The present embodiment is similar to the first embodiment, and the similarities therebetween the present embodiment and the first embodiment will not be repeated herein. The differences of the present embodiment from the first embodiment are mainly as follows.

[0047] The first segment 3232A of the first gas channel 3232 and the second gas channel 3243 in the present embodiment are not parallel to the longitudinal direction LD. Specifically, in a cross-section of the adjusting member 32 along the longitudinal direction LD, the first segment 3232A and the second segment 3232B of the first gas channel 3232 have an angle θ there-between, and the angle θ is less than 90 degrees. Moreover, the second gas channel 3243 and an end surface of the second end portion 322 have an angle θ there-between, and the angle θ is also less than 90 degrees, but the present disclosure is not limited thereto.

[0048] For example, in certain embodiments of the present disclosure (not shown), the angle θ between the first segment 3232A and the second segment 3232B of the first gas channel 3232, and the angle θ between the second gas channel 3243 and the end surface of the second end portion 322 can be greater than 90 degrees, or the second segment 3232B of the first gas channel 3232 can be not parallel to the radial direction RD.

[Fourth Embodiment]

[0049] Referring to FIG. 10, a fourth embodiment of the present disclosure is provided. The present embodiment is similar to the first embodiment, and the similarities therebetween the present embodiment and the first embodiment will not be repeated herein. The differences of the present embodiment from the first embodiment are mainly as follows.

[0050] A side surface of the guide portion 323 of the adjusting member 32 facing the at least one compression screw rotor 2 in the present embodiment does not have any protrusion portion. Cross-sections of the first end portion 321, the guide portion 323, and the second end portion 322 perpendicular to the longitudinal direction LD are each in a circular shape and have the same center. Moreover, an area of the cross-section of the first end portion 321 perpendicular to the longitudinal direction LD is equal to an area of the guide portion 323 perpendicular to the longitudinal direction LD, and the area of the guide portion 323 perpendicular to the longitudinal direction LD is greater than an area of the cross-section of the second end portion 322 perpendicular to the longitudinal direction LD, so that the second end portion 322 and the guide portion 323 jointly form a stepped shape and have the fourth protrusion portion 329. The fourth protrusion portion 329 can abut against the end surface of the second accommodating groove 312, so that the moving (travel) distance of the adjusting member 32 can be restricted.

[Beneficial Effects of the Embodiments]

[0051] In conclusion, in the screw compressor 100 provided by the present disclosure, by virtue of "the high-pressure gas HP being introduced into the second enclosed chamber S2 through the second gas channel 3243" and "the medium-pressure gas MP being introduced into the first enclosed chamber S1 through the first gas channel 3232", the adjusting member 32 can be pushed to slide along the guide track 31 by the gas pressure in the first enclosed chamber S1 and the gas pressure in the second enclosed chamber S2, so as to achieve the effect of automatically adjusting the gas pressure by changing a position of the discharge port 324.

[0052] The foregoing description of the exemplary embodiments of the disclosure has been presented only for the purposes of illustration and description and is not intended to be exhaustive or to limit the disclosure to the precise forms disclosed. Many modifications and variations are possible in light of the above teaching.

[0053] The embodiments were chosen and described in order to explain the principles of the disclosure and their practical application so as to enable others skilled in the art to utilize the disclosure and various embodiments and with various modifications as are suited to the particular use contemplated. Alternative embodiments will become apparent to those skilled in the art to which the present disclosure pertains without departing from its

spirit and scope.

Claims

1. A screw compressor (100), **characterized by** comprising:

a housing (1);
at least one compression screw rotor (2) disposed in the housing (1), and including at least one helical lobe portion (22) that has a plurality of spiral teeth (221); and
a volume adjustment assembly (3) disposed in the housing (1), a part of the volume adjustment assembly (3) corresponding in position to the at least one compression screw rotor (2), wherein the volume adjustment assembly (3) includes:

a guide track (31) including a first accommodating groove (311) and a second accommodating groove (312) that is opposite to the first accommodating groove (311); and

an adjusting member (32) disposed in the guide track (31) and configured to slide along the guide track (31), wherein the adjusting member (32) has a longitudinal direction (LD) and includes:

a first end portion (321) disposed in the first accommodating groove (311), wherein the first end portion (321) and the first accommodating groove (311) jointly define a first enclosed chamber (S1);

a second end portion (322) disposed in the second accommodating groove (312), wherein the second end portion (322) and the second accommodating groove (312) jointly define a second enclosed chamber (S2); and

a guide portion (323) and a discharge port (324), wherein the guide portion (323) is located between the first end portion (321) and the second end portion (322), and the discharge port (324) is disposed on the guide portion (323) and adjacent to the first end portion (321), wherein the guide portion (323) has a first gas channel (3232) that is in spatial communication with the first enclosed chamber (S1), wherein a gas inlet (IN) of the first gas channel (3232) is located between the second end portion (322) and the discharge port (324), and is spaced apart from an edge of the discharge port (324) by a predeter-

mined distance (PD), and wherein the discharge port (324) has a second gas channel (3243) that is in spatial communication with the second enclosed chamber (S2).

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2. The screw compressor (100) according to claim 1, **characterised in that** any two adjacent ones of the spiral teeth (221) of the at least one helical lobe portion (22) are spaced apart from each other by a predetermined pitch (SP), and a value of the predetermined distance (PD) divided by the predetermined pitch (SP) is within a range from 1.01 to 3.

3. The screw compressor (100) according to claim 1 or claim 2, **characterised in that** each of the first end portion (321) and the second end portion (322) has a cross-section perpendicular to the longitudinal direction (LD); wherein an area of the cross-section of the first end portion (321) is greater than an area of the cross-section of the second end portion (322).

4. The screw compressor (100) according to claim 3, **characterised in that** a value of the area of the cross-section of the first end portion (321) divided by the area of the cross-section of the second end portion (322) is within a range from 1.01 to 5.

5. The screw compressor (100) according to any of the preceding claims, **characterised in that** the first end portion (321) and the second end portion (322) have two cross-sections perpendicular to the longitudinal direction (LD), respectively; wherein the two cross-sections are each in a circular shape and have a same center.

6. The screw compressor (100) according to any of the preceding claims, **characterised in that** each of the first end portion (321) and the second end portion (322) has a cross-section that is perpendicular to the longitudinal direction (LD) and is in a circular shape; wherein a center of the cross-section of the first end portion (321) is eccentric to a center of the cross-section of the second end portion (322).

7. The screw compressor (100) according to any of the preceding claims, **characterised in that** a length of the adjusting member (32) is 1.01 to 5 times a length of the at least one helical lobe portion (22).

8. The screw compressor (100) according to any of the preceding claims, **characterised in that** the second gas channel (3243) is arranged along the longitudinal direction (LD) of the adjusting member (32); wherein the first gas channel (3232) includes a first segment (3232A) and a second segment (3232B), the first segment (3232A) is arranged along the longitudinal direction (LD) of the adjusting member (32),

and the second segment (3232B) is arranged along a radial direction (RD) of the adjusting member (32) that is perpendicular to the longitudinal direction (LD).

9. The screw compressor (100) according to claim 8, **characterised in that** a projection path defined by orthogonally projecting the first segment (3232A) of the first gas channel (3232) along the longitudinal direction (LD) does not overlap with a projection path defined by orthogonally projecting the second gas channel (3243) along the longitudinal direction (LD).
10. The screw compressor (100) according to any of the preceding claims, **characterised in that** the first gas channel (3232) includes a first segment (3232A) and a second segment (3232B); wherein the second segment (3232B) extends from the gas inlet (IN) along a direction away from the at least one helical lobe portion (22), and the first segment (3232A) is in spatial communication with one end of the second segment (3232B) and the first enclosed chamber (S1).
11. The screw compressor (100) according to any of the preceding claims, **characterised in that** the adjusting member (32) further includes at least two gastight members (325) respectively disposed on an outer edge of the first end portion (321) and an outer edge of the second end portion (322).
12. The screw compressor (100) according to any of the preceding claims, **characterised in that** a side of the adjusting member (32) facing the at least one compression screw rotor (2) has a first protrusion portion (326) that is adjacent to the first end portion (321) and a second protrusion portion (327) that is adjacent to the second end portion (322).
13. The screw compressor (100) according to claim 12, **characterised in that** a value of a distance between the first protrusion portion (326) and the second protrusion portion (327) divided by a length of the at least one helical lobe portion (22) is within a range from 1.25 to 4.75.
14. The screw compressor (100) according to claim 12, **characterised in that** the first protrusion portion (326) has a side surface, the second protrusion portion (327) has a side surface facing the side surface of the first protrusion portion (326), an area of the side surface of the first protrusion portion (326) is greater than an area of the side surface of the second protrusion portion (327), and a value of the area of the side surface of the first protrusion portion (326) divided by the area of the side surface of the second protrusion portion (327) is within a range from 1.01 to 3.5.

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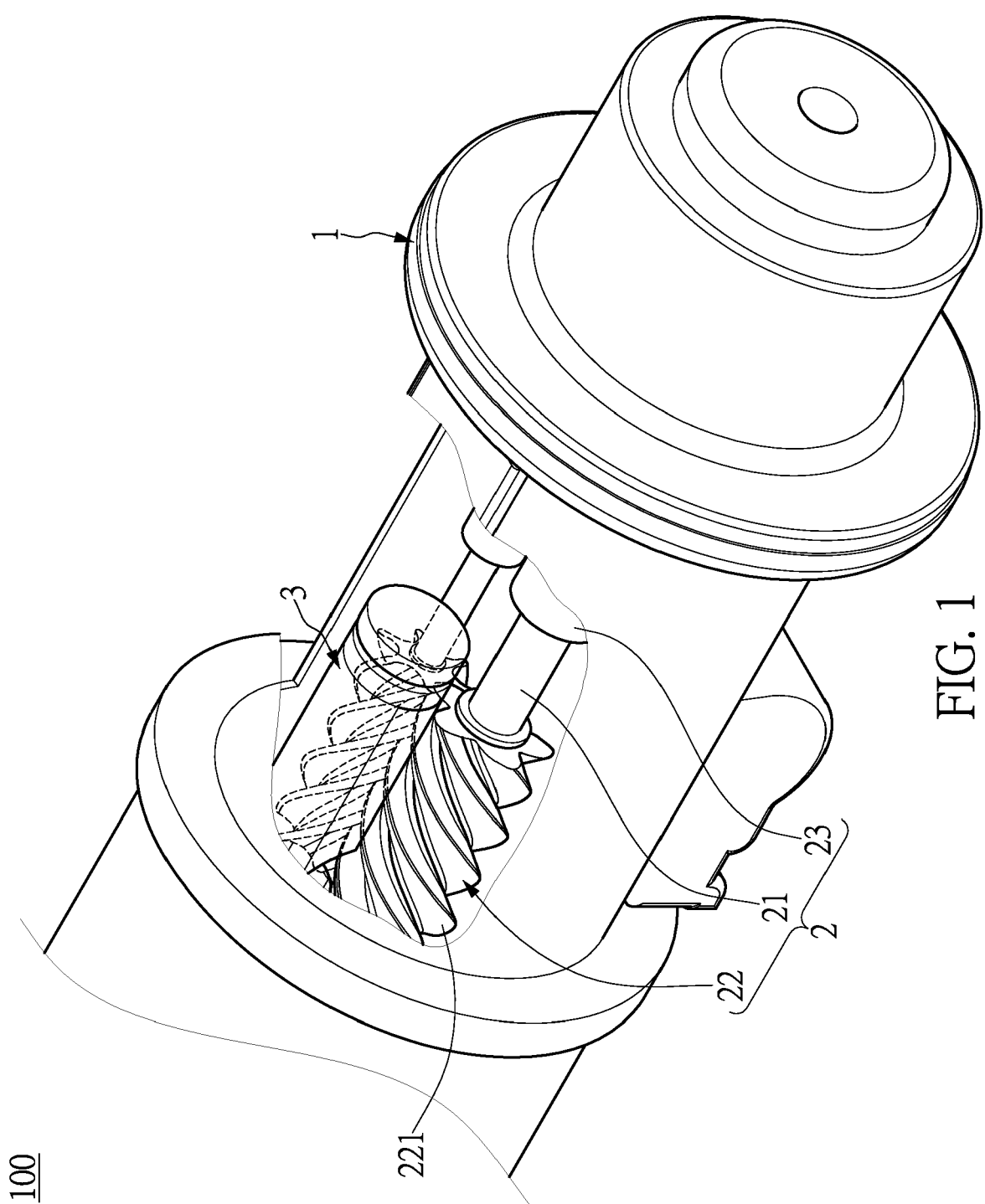
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15. The screw compressor (100) according to any of the preceding claims, **characterised in that** a side of the adjusting member (32) facing the at least one compression screw rotor (2) has a third protrusion portion (328) that is adjacent to the first end portion (321) or the second end portion (322).
16. The screw compressor (100) according to any of the preceding claims, **characterised in that** a side of the adjusting member (32) away from the at least one compression screw rotor (2) has a fourth protrusion portion (329) adjacent to the second end portion (322).
17. The screw compressor (100) according to any of the preceding claims, **characterised in that** the first accommodating groove (311) and the second accommodating groove (312) of the guide track (31) have two cross-sections perpendicular to the longitudinal direction (LD), respectively; wherein the two cross-sections are each in a circular shape and have a same center.
18. The screw compressor (100) according to any of the preceding claims, **characterised in that** the first accommodating groove (311) and the second accommodating groove (312) of the guide track (31) have two cross-sections perpendicular to the longitudinal direction (LD), respectively; wherein the two cross-sections are each in a circular shape, and centers of the two cross-sections do not overlap with each other.
19. The screw compressor (100) according to any of the preceding claims, **characterised in that** the first end portion (321), the guide portion (323), and the second end portion (322) of the adjusting member (32) are integrally formed as a single one-piece structure.
20. The screw compressor (100) according to any of the preceding claims, **characterised in that** each of the first end portion (321) and the second end portion (322) has a cross-section that is perpendicular to the longitudinal direction (LD) and is in a circular shape, an oval shape, or a polygonal shape.



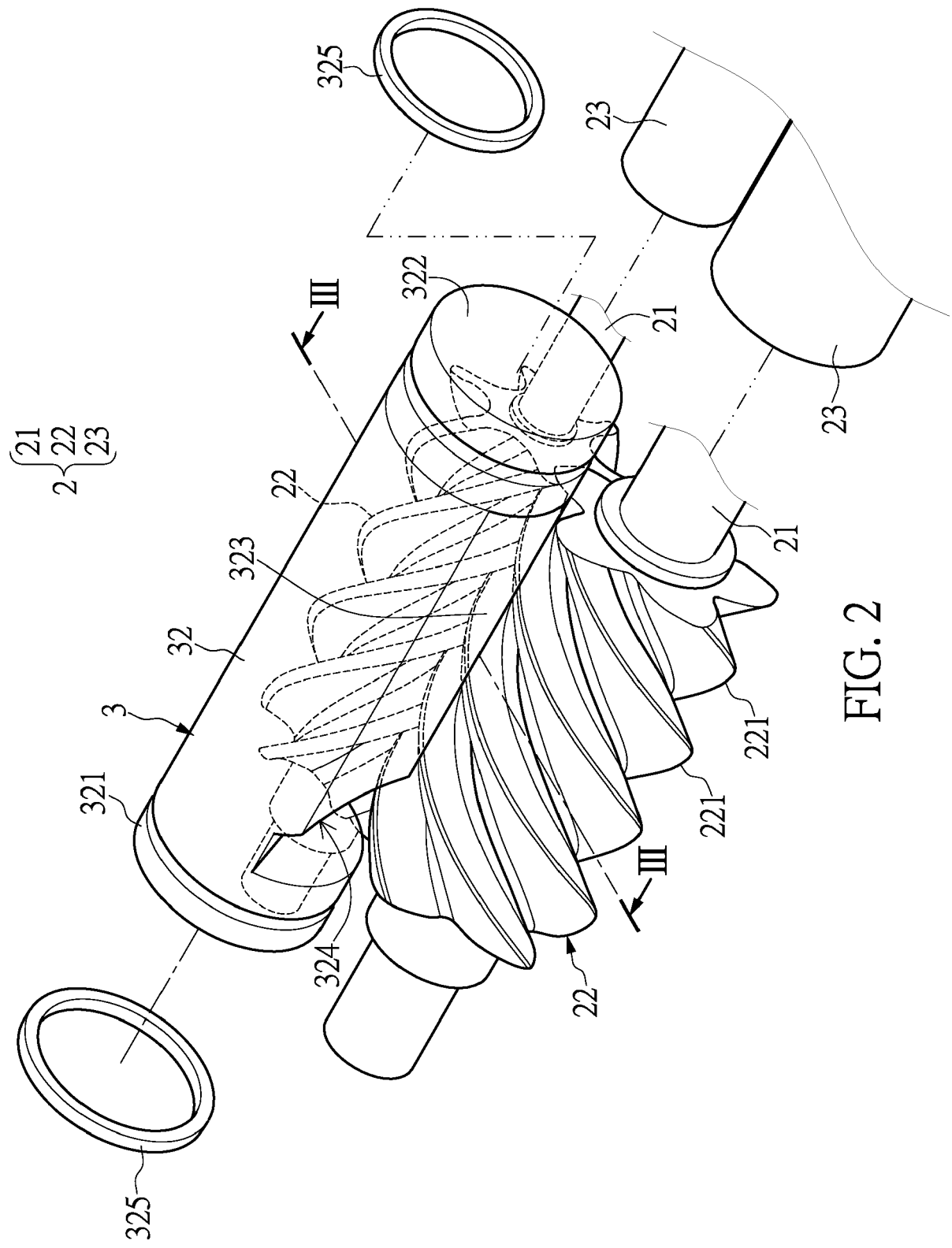


FIG. 2

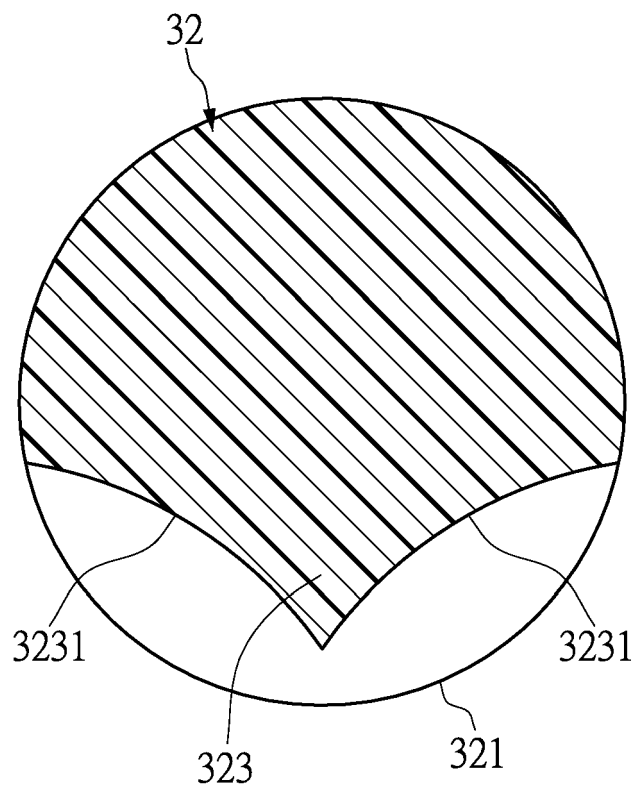


FIG. 3

100

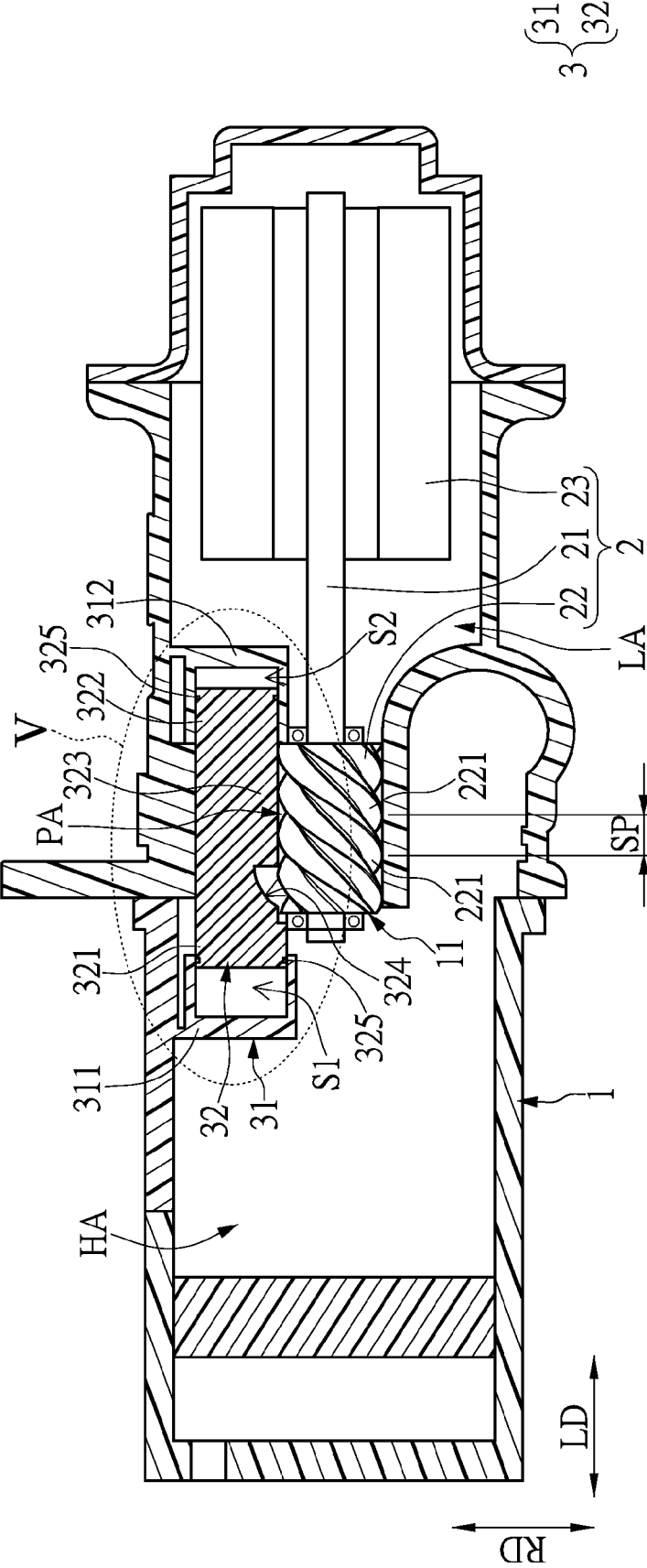


FIG. 4

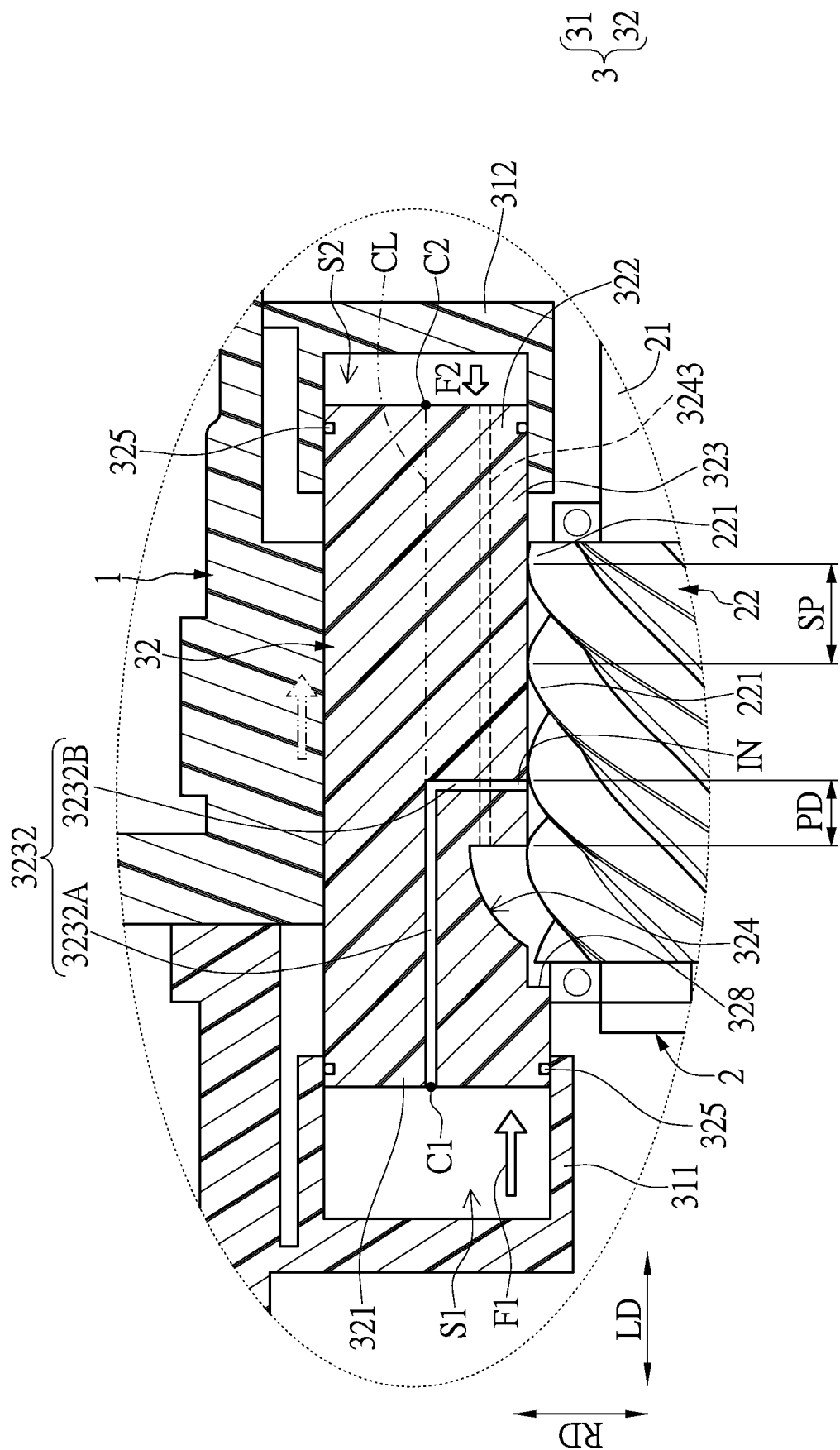


FIG. 5

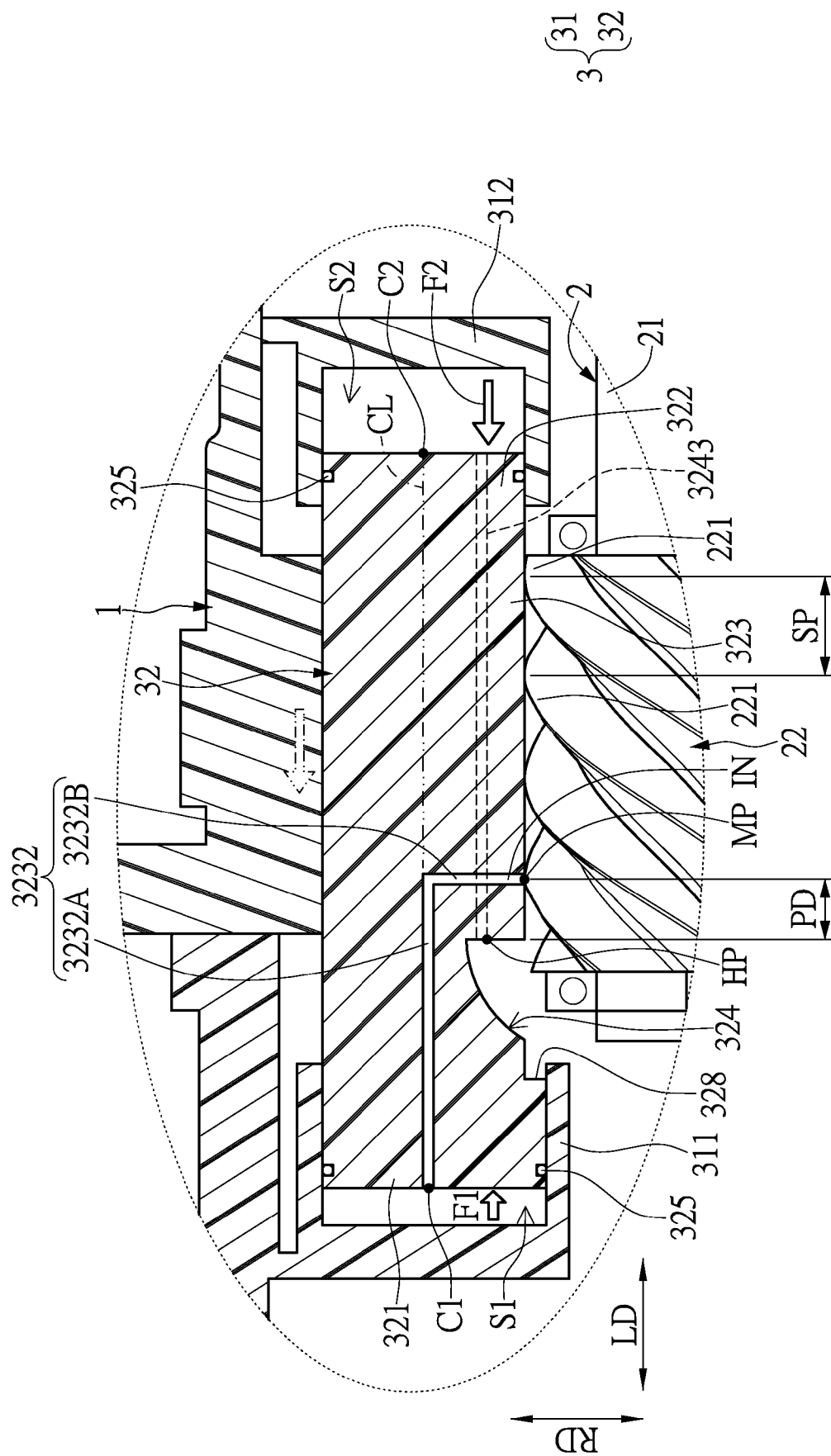


FIG. 6

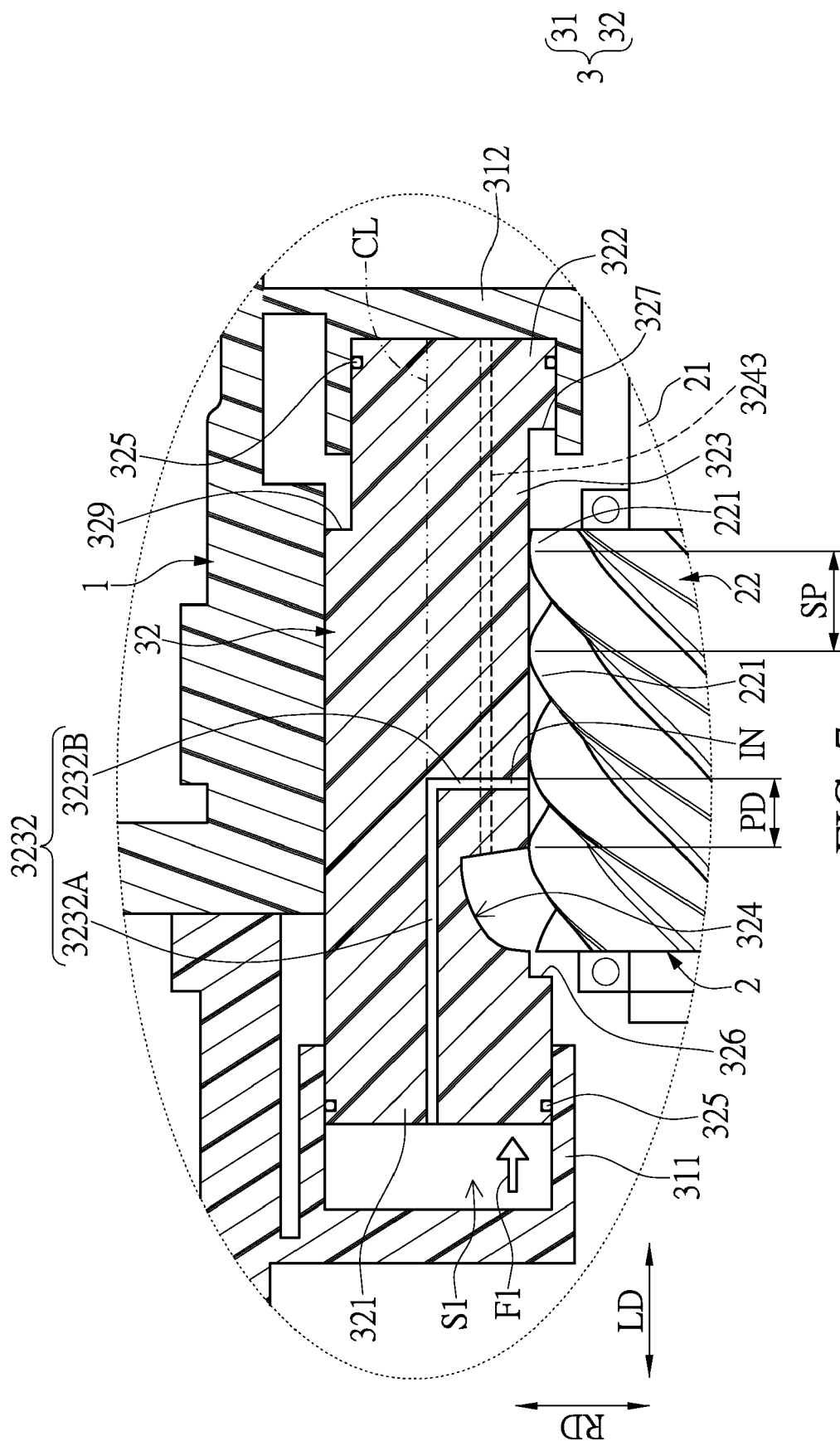
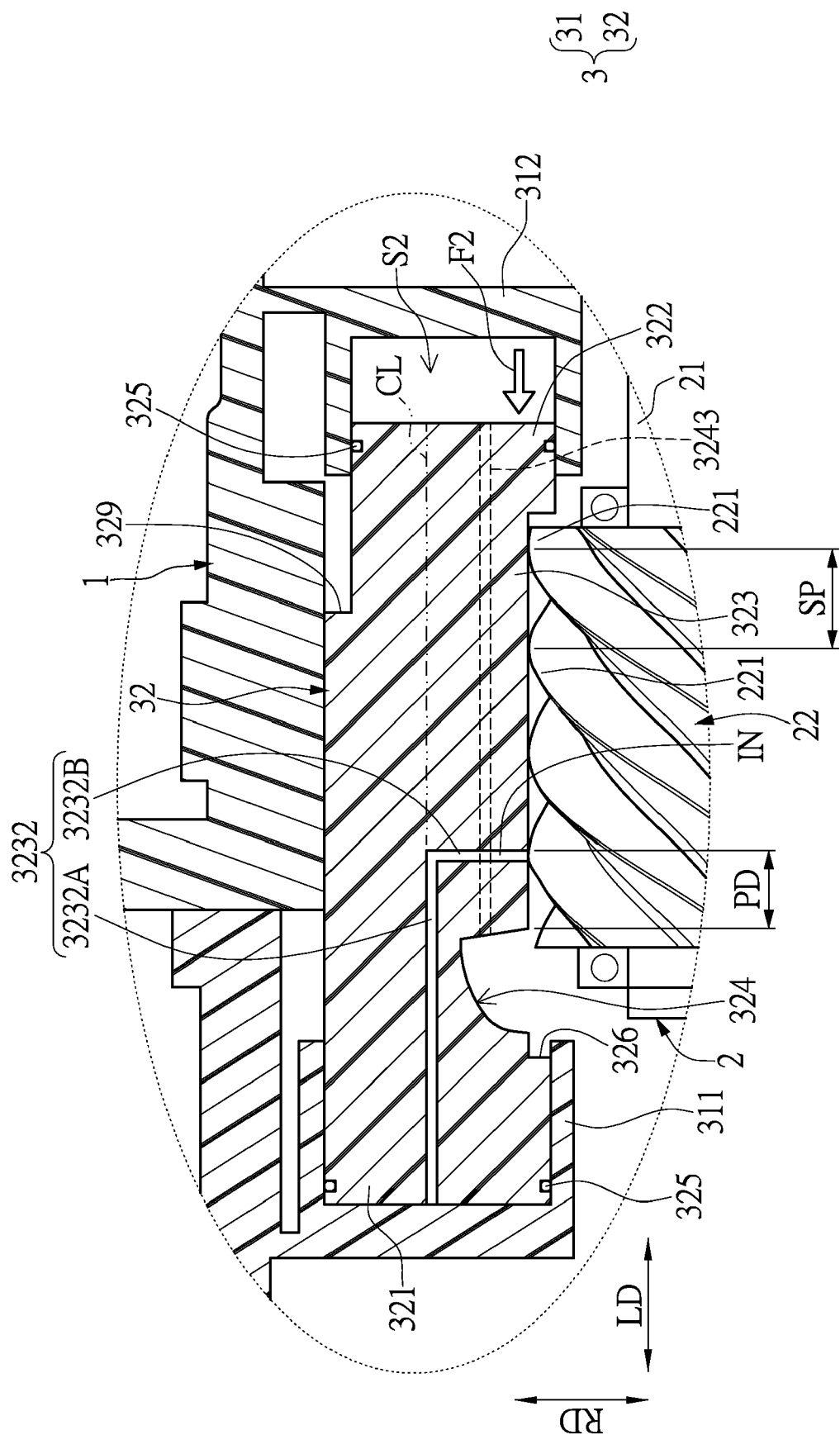


FIG. 7



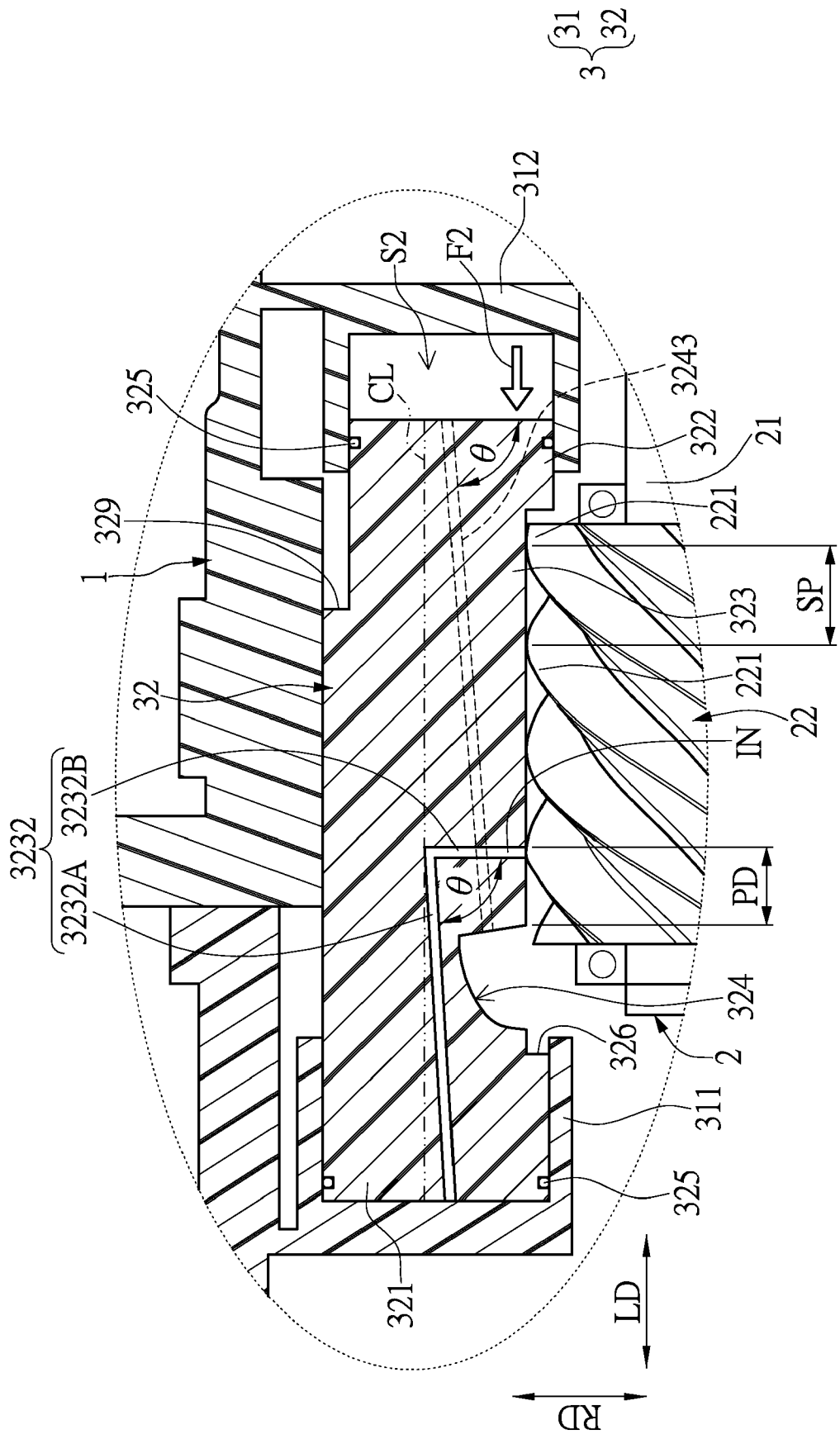


FIG. 9

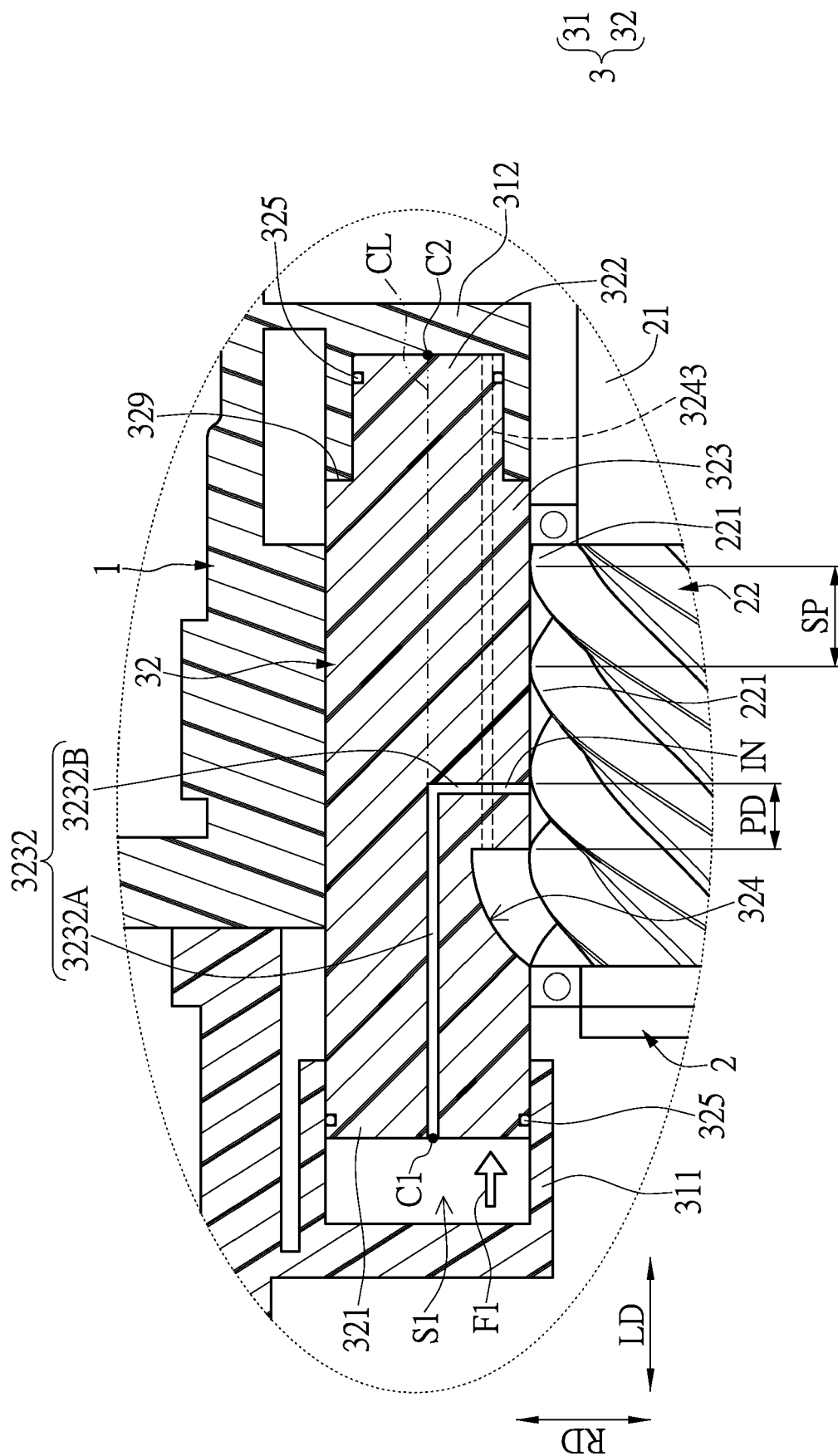


FIG. 10



EUROPEAN SEARCH REPORT

Application Number

EP 21 19 8150

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EPO FORM 1503 03.82 (P04C01)

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Y	* figure 5 * * paragraph [0045] - paragraph [0058] * -----	6, 18	
Y	JP 2011 080385 A (EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO LTD) 21 April 2011 (2011-04-21) * figure 1 * * paragraph [0018] - paragraph [0020] * -----	6, 18	
			TECHNICAL FIELDS SEARCHED (IPC)
			F04C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 February 2022	Examiner Durante, Andrea
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02-02-2022

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