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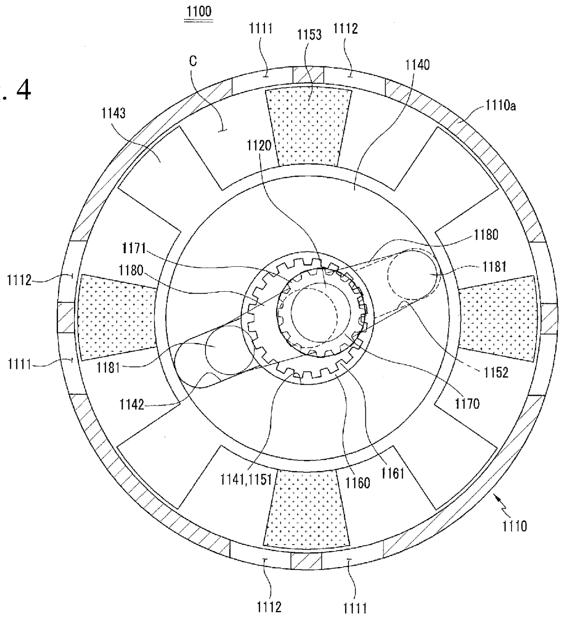
(54) ROTATIONAL CLAP SUCTION/PRESSURE DEVICE

(57) The present invention relates to a simple and straightforward positive displacement suction/pressure device (rotational clap suction/pressure device) for utilizing in general industrial flow machines, such as various positive displacement pumps, vacuum pumps, compressors, flow meters, and rotary internal combustion engines. The object of the present invention using a double non-uniform rotation is to provide a simple and durable mechanical device having improved efficiency, by replacing the existing linear contact between various types of rotors or between a rotor and a housing, which is a problem in existing positive displacement flow machines and rotary internal combustion engines, with a whole surface.

Fig. 4



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Description

TECHNICAL FIELD

[0001] The present invention relates to a positive displacement suction/pressure device that is utilized in overall industrial fluid machines such as various positive displacement peristaltic pumps, vacuum pumps, gas compressors, positive displacement air blowers, gas and liquid flow meters, or rotary internal combustion engines, and more particularly, to a positive displacement suction/pressure device (hereinafter, referred to as a "rotational clap suction/pressure device") in which two rotational piston blades are rotated in the same direction as if a person clap his hands so that a change in volume between the blades is used for suctioning a fluid.

BACKGROUND ART

[0002] Recently, a vane pump and a gear pump which have relatively simple structures and a piston and plunger type pump and a screw pump which are relatively complicated and have relatively large scales are widely used as positive displacement liquid transfer pumps.
[0003] In general vacuum pumps, a vane pump, a piston type pump, and a water seal type (a centrifugal type) pump are being widely used. Also, in general air compressors, refrigerant compressors, and specific gas compressors, piston or plunger type, screw type, and vane type compressors are being widely used as positive displacement compressors, and turbo type compressors are used as centrifugal type compressors.
[0004] Also, gear type flow meters, piston type flow meters, and diaphragm type flow meters are widely used as positive displacement flow meters. Here, they have advantageous or disadvantageous features different from each other in aspects of pressure loss and measurement accuracy.
[0005] A Wankel rotary engine is representatively used as a rotational rotary engine at the present. The Wankel rotary engine is very restrictively used in some sports cars.

DISCLOSURE OF THE INVENTION

TECHNICAL PROBLEM

[0006] An objection of the prevent invention provides a rotational clap suction/pressure device in which problems such as abrasion and deterioration of durability and efficiency due to line contact between various rotors or between the rotors and a housing cylinder (or a casing), which is generated in various positive displacement fluid transfer compressor, a flow meter, a rotational rotary engine, and the like, and two rotational pistons non-uniformly rotated in the same direction are combined with each other to change a volume, thereby transfer and compressing a fluid, wherein a housing and the rotational pistons completely surface-contact each other to significantly reduce abrasion and improve durability and efficiency.
[0007] The present invention also provides an accurate rotational clap suction/pressure device which maintains advantages of a vane pump and gear pump and overcomes disadvantages of the vane pump and gear pump as a dual non-uniform rotational positive displacement suction/discharge device having a firm and simple structure by overcoming disadvantages such as low power transmission efficiency due to leakage of a fluid because of a limited suction cycle that is a fault of the vane pump, abrasion of a vane that is unavoidable in structure, limitation of a suction cycle in the gear pump, leakage of a fluid due to difficulty in sealing in structure of a gear.
[0008] Various vacuum pumps that are used at the present should have a very complicated structure and improved processing accuracy so as to increase a degree of vacuum. The present invention also provides a rotational clap suction/pressure device that replaces the above-described vacuum pumps to realize a high degree of vacuum with a simplified structure and small size.
[0009] The present invention also provides a rotational clap suction/pressure device for realizing various small-sized and lightweight gas compressors to perform a function of a piston-type high-pressure positive displacement compressor having a simplified structure such as a vane type compressor.
[0010] The present invention also provides a rotational clap suction/pressure device having advantages such as the simplified structure and sealing maintenance in flow meter properties and replacing the gear type flow meter, the piston type flow meter, and the diaphragm type flow meter which are widely used as the existing positive displacement flow meter to reduce a loss of a pressure and improve measuring accuracy.
[0011] The present invention also provides a rotational clap suction/pressure device that can be applied to an internal combustion engine. In a Wankel rotary engine that is a representative rotary internal combustion engine, a rotational piston and a circular cylinder line-contact each other, and thus the Wankel rotary engine may not be further developed due to the unavoidable disadvantage. The above-described line contact may be very weak in abrasion even though

strong materials are developed, as wall as be disadvantageous in sealing to deteriorate combustion efficiency, thereby occurring critical defects in aspect of durability. Thus, in spite that the Wankel rotary engine has high volume efficiency, low noises, low vibration, and a structure that is capable of being applied to simple peripheral devices, which causes high combustion efficiency that is an advantage of the rotational rotary engine, the Wankel rotary engine have not been developed. The present invention also provide a rotational clap suction/pressure device using a complete rotational rotary engine as an internal combustion engine, wherein the rotational clap suction/pressure device is a dual non-uniform rotational positive displacement suction/discharge device having a simplified and firm structure and in which a blade of a rotational piston and a cylindrical housing completely surface-contact each other.

[0012] The prevent invention may be variously applied to a positive displacement rotation fluid machinery, which is required for overall industries, such as accurate fixed displacement pumps, hydraulic oil pumps, and the like to provide a rotational clap suction/pressure device having a more simplified structure, thereby replacing existing machineries.

[0013] Another object of the present invention provides a rotational clap suction/pressure device in which power transmission elements for operating rotational pistons are disposed within a gear box outside a cylindrical housing to endure a high-temperature high-pressure environment in the fluid.

[0014] Further another object of the present invention provides a rotational clap suction/pressure device in which two rotation pins are combined with each other from a crank arm integrated with a crankshaft to operate one rotational piston, thereby significantly increasing coupling strength of the crank arm, dispersing rotation force into the rotation pins, and thus improving power transmission efficiency and mechanical strength.

TECHNICAL SOLUTION

[0015] According to an aspect of the present invention, there is provided a rotational clap suction/pressure device including: a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and a housing side plate is disposed on each of both sides of the housing cylinder; a crankshaft passing through a central portion of the housing side plate, the crankshaft being rotatably supported by the cylindrical housing; a crankpin extending from a central portion of the crankshaft; a first rotational piston rotatably disposed within the cylindrical housing, the first rotational piston having a shaft driving hole in a central portion thereof, a slot (a long hole) in a center thereof, and a plurality of blades on an outer circumference thereof; a second rotational piston rotatably disposed in the cylindrical housing to face the first rotational piston, the second rotational piston having a shaft driving hole in a central portion thereof, a slot in a center thereof, and a plurality of blades on an outer circumference thereof; a gear ring fixedly disposed along an inner circumferential surface of the housing side plate, the gear ring including a fixed internal gear on an inner circumferential surface thereof; a connection tube coupled to an outer circumferential surface of the crankpin and slidably rotated together with the crankpin, the connection tube including a planetary external gear corresponding to the fixed internal gear on an outer circumferential surface thereof; a connecting rod extending from the outer circumferential surface of the connection tube; and a rotation pin disposed on an end of the connecting rod, the rotation pin being inserted into the slots of the first and second rotational pistons, wherein, when the crankpin is rotated in a clockwise direction by rotation of the crankshaft, the planetary external gear is engaged (tooth engagement) with the fixed internal gear while being rotated, and the first and second rotational pistons are non-uniformly rotated in the same direction, i.e., in a counterclockwise direction through the connection tube, the connecting rod, and the rotation pin to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

[0016] When the number of blades of each of the first and second rotational pistons is N, a gear ratio between the fixed internal gear and the planetary gear may be N:N-1.

[0017] All or portions of the plurality of suction and discharge holes defined in the housing cylinder may be replaced with suction and discharge holes defined with the same number as the plurality of suction and discharge holes in the housing rear plate instead of the housing cylinder.

[0018] A portion of the plurality of pairs of suction and discharge holes may include an ignition plug according to the number of the blade of the rotation piston.

[0019] A structure for engaging the fixed internal gear with the planetary external gear may be provided on only one of both sides of the fixed internal gear and the planetary external gear, and the other one of the fixed internal gear and the planetary external gear may have a structure for guiding a circular contact.

[0020] A slidably movable contact conversion ring may be disposed on the slot, and the rotation pin may be coupled to the contact conversion ring.

[0021] The crankpin may be bisectionally divided into two parts each having a semicircular shape in a middle sectional, and ends of the divided parts may be respectively inserted into both sides of the connection tube and then be engaged with and coupled to each other.

[0022] The crankpin may be bisectionally divided into two parts, and ends of the divided parts may be respectively fitted into inner tubes defined in both sides of the connection tube of which a middle portion is blocked.

[0023] The connecting rods symmetrically extends from a central portion of the outer circumferential surface of the connection tube and the rotation pins respectively disposed on ends of the connecting rods are bent in directions facing each other.

[0024] The connecting rods symmetrically extends from a central portion of the outer circumferential surface of the connection tube with a predetermined distance there between and the rotation pins respectively disposed on ends of the connecting rods are bent in directions facing each other.

[0025] A plurality of rotational clap suction/pressure devices may be connected to one same crankshaft in series.

[0026] According to another aspect of the present invention, there is provided a rotational clap suction/pressure device including: a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and a housing front plate and a housing rear plate are disposed on each of both sides of the housing cylinder; a first rotational piston rotatably disposed in a space part within the cylindrical housing, the first rotational piston including a solid shaft extending toward a driving part at a central portion thereof and a plurality of blades on an outer circumference thereof; a second rotational piston 6161 rotatably disposed in the space part to face the first rotational piston, the second rotational piston including a hollow shaft extending toward the driving part at a central portion thereof and a plurality of blades on an outer circumference thereof; a first rotational piston driving gear coupled to the solid shaft of the first rotational piston; a second rotational piston driving gear coupled to the hollow shaft of the second rotational piston; a first power transmission gear engaged with the first rotational piston driving gear; a second power transmission gear engaged with the second rotational piston driving gear; a first power transmission shaft and a first driving eccentric gear which are coupled to the first power transmission gear; a second power transmission shaft and a second driving eccentric gear which are coupled to the second power transmission gear; a main shaft eccentric gear engaged with the first and second driving eccentric gears; and a main shaft coupled to the main shaft eccentric gear, wherein, when the first and second driving eccentric gears are non-uniformly rotated opposite to each other in a counterclockwise direction by rotation of the main shaft in a clockwise direction, the first power transmission gear rotates the first rotational piston driving gear and the first rotational piston at a decelerated rate in the clockwise direction, and the second power transmission gear rotates the second rotational piston driving gear and the second rotational piston at a decelerated rate in the clockwise direction to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

[0027] When a gear ratio of each of between the first rotational piston driving gear and the second rotational piston driving gear and between the first power transmission gear and the second power transmission gear may be N:1, the number of each of the first and second rotational pistons may be N.

[0028] All or portions of the plurality of suction and discharge holes defined in the housing cylinder may be replaced with suction and discharge holes defined with the same number as the plurality of suction and discharge holes in the housing rear plate instead of the housing cylinder.

[0029] A portion of the plurality of pairs of suction and discharge holes may include an ignition plug according to the number of the blade of the rotation piston.

[0030] One ignition plug may be provided in one suction/pressure chamber, or at least two ignition plugs may be provided in the suction/pressure chamber when the suction/pressure chamber is longitudinally provided.

[0031] Each of the blades of the first and second rotational pistons may have a linear shape inclined at a predetermined angle with respect to the housing front and rear plates or a curved shape.

[0032] A plurality of rotational clap suction/pressure devices may be combined with each other and connected to one shaft.

[0033] According to another aspect of the present invention, there is provided a rotational clap suction/pressure device including: a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and housing side plates are disposed on each of both sides of the housing cylinder; a fixing gear respectively extending from a central portion of each of the housing side plates, the fixing gear being integrated with each of the housing side plate; a first rotational piston rotatably disposed in a space part within the cylindrical housing, the first rotational piston including a crankshaft driving hole in a central portion thereof, a slot hole in a middle portion thereof, and a plurality of blades on an outer circumference thereof; a second rotational piston rotatably disposed in the space part to face the first rotational piston, the second rotational piston including a crankshaft driving hole in a central portion thereof, a slot hole in a middle portion thereof, and a plurality of blades on an outer circumference thereof; a crankshaft passing through central portions of the housing side plates, the crankshaft being rotatably supported by the cylindrical housing; a crank arm integrated with a central portion of the crankshaft; a crankpin integrated with the crank arm; a planetary gear inserted into and rotatably coupled to the crankpin, the planetary gear being circumscribed and engaged with the fixing gear; and a rotation pin extending and integrated with the planetary gear, the rotation pin being inserted into the slot hole of each of the rotational pistons, wherein, when the planetary gear is circumscribed on the fixed gear and rotated by the rotation of the crank shaft in a clockwise direction, the rotation pin is rotated in a epicycloid curve shape to non-uniformly oppositely rotate the first and second rotational pistons in the clockwise direction to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

[0034] When a gear ratio between the fixed gear and the planetary gear is N:1, the number of each of the first and second rotational pistons may be N.

[0035] The fixed gear may have an oval shape, and the planetary gear may be eccentric.

[0036] The plurality of suction and discharge holes defined in the housing cylinder may be replaced with suction and discharge holes defined with the same number as the plurality of suction and discharge holes in the housing rear plate instead of the housing cylinder.

[0037] A portion of the plurality of pairs of suction and discharge holes may include an ignition plug according to the number of the blade of the rotation piston.

[0038] Each of the blades of the first and second rotational pistons may have a linear shape inclined at a predetermined angle with respect to the housing side plate or a curved shape.

[0039] A slidably movable contact conversion ring may be disposed on the slot hole, and the rotation pin may be coupled to the contact conversion ring.

[0040] A roller instead of the contact conversion ring may be disposed on the slot hole, and the rotation pin may be coupled to the roller.

[0041] The crank arm may be separated into two crank arms for respectively operating the first and second rotational pistons at a predetermined distance on the crankshaft.

[0042] A plurality of rotational clap suction/pressure devices may be connected to one same crankshaft in series.

ADVANTAGEOUS EFFECTS

[0043] As described above, according to the present invention, the power transmission elements for operating the pistons may be disposed within a gear box outside the cylindrical housing to improve the mechanical strength of the rotational pistons and to superiorly cope with the high-temperature high-pressure environment in the fluid.

[0044] Also, according to the present invention, the crank arm may be integrated with the crankshaft, but not integrated with the cylinder, to increase the coupling strength of the crank arm. Also, the one rotational piston may be dispersed into the two rotation pins to operate, thereby improving the power transmission efficiency and the mechanical strength.

[0045] Also, according to the present invention, the non-uniformly rotated two rotational pistons may be combined with each other to change the volume of the chamber, thereby suctioning and compressing the fluid. In addition, the housing and the rotational pistons may completely surface-contact each other to significantly reduce the abrasion and improve the durability and efficiency.

[0046] Also, in the typical vacuum pump, although the vane pump, piston type pump, and water seal type (a centrifugal type) pump are widely used as the vacuum pump, the pump should be more complicated and increased in processing accuracy so as to increase a degree of vacuum. However, according to the present invention, the various pumps may be replaced to effectively realize the degree of vacuum with a more simplified structure and small size.

[0047] Also, according to the present invention, various gas compressors may be small-sized and lightweight to perform a function of a high-pressure positive displacement compressor by using a compressor having a simplified structure such as the vane type compressor. Thus, the present invention may provide a new positive displacement blower having a significant small size and simplified structure as a blower which is capable of replacing the representative positive displacement roots blower to generate the same amount and pressure of wind.

[0048] Also, the present invention has advantages such as the simplified structure and sealing maintenance in flow meter properties. Thus, the flow meter according to the present invention may replace the gear type flow meter, the piston type flow meter, and the diaphragm type flow meter which are widely used as the existing positive displacement flow meter to provide a small-sized structure in which a loss of a pressure is reduced, and measuring accuracy is improved.

[0049] Also, the present may provide the small-sized rotary engine having a function of the internal combustion engine. Here, since a suction vale and an exhaust valve are not required, a cam shaft and a timing belt which are valve operation components may be omitted. In addition, since the blade is easily processed to adjust a compression ratio, the rotary engine according to the present invention may be used for various engines such as spark ignition engines, compression ignition engines, semi-diesel engines, environment-friendly fuel engines, and hydrogen fueled engines.

BRIEF DESCRIPTION OF THE DRAWINGS

[0050]

FIG. 1 is a perspective view illustrating a coupled state of a rotational clap suction/pressure device according to a first embodiment of the present invention.

FIG. 2	is an exploded perspective view of the rotational clap suction/pressure device according to the first embodiment of the present invention.
FIG. 3	is a cross-sectional view taken along line I-I of FIG. 1.
FIG. 4	is a cross-sectional view taken along line II-II of FIG. 1.
FIG. 5	is a front view of a first rotational piston and a second rotational piston in the rotation clap suction/pressure device according to the first embodiment of the present invention.
FIG. 6	is a view of a crankshaft and a crankpin in the rotational clap suction/pressure device according to the first embodiment of the present invention.
FIG. 7	is a view of a connection tube and a connecting rod in the rotational clap suction/pressure device according to the first embodiment of the present invention.
FIG. 8	is a view of a gear ring in the rotational clap suction/pressure device according to the first embodiment of the present invention.
FIGS. 9 A to 9E	are views for explaining a non-uniform operation of the rotational clap suction/pressure device according to the first embodiment of the present invention.
FIGS. 10 A to 10E	are views for explaining a non-uniform operation of a rotational clap suction/pressure device according to a second embodiment of the present invention.
FIGS. 11 A to 11E	are views for explaining a non-uniform operation of a rotational clap suction/pressure device according to a third embodiment of the present invention.
FIG. 12	is a cross-sectional view of another embodiment of the present invention.
FIGS. 13 and 14	are perspective and front views of a structure in which a contact conversion ring is installed in a slot.
FIG. 15	is a cross-sectional view illustrating a modified example of a crankpin.
FIG. 16	is a cross-sectional view illustrating modified examples of a connection tube and the crankpin.
FIG. 17	is a cross-sectional view illustrating a modified example of a connecting rod.
FIG. 18	is a view of a structure in which a plurality of rotational clap suction/pressure devices are connected to one crankshaft in series according to a modified example of the present invention.
FIG. 19	is a view for explaining a four-cycle operation structure of a rotary internal engine to which the first embodiment is reflected in a rotational clap suction/pressure device according to a fourth embodiment of the present invention.
FIG. 20	is a view for explaining a four-cycle operation structure of a rotary internal engine to which the third embodiment is reflected in a rotational clap suction/pressure device according to a fifth embodiment of the present invention.
FIG. 21	is a perspective view illustrating a coupled state of a rotational clap suction/pressure device according to a sixth embodiment of the present invention.
FIG. 22	is a perspective view illustrating an assembled state of a driving part according to the present invention.
FIG. 23	is an exploded perspective view according to the present invention.
FIG. 24	is a cross-sectional view taken along line A-A of FIG. 1.
FIG. 25	is a cross-sectional view taken along line B-B of FIG. 1.
FIG. 26	is a perspective view illustrating a modified example in which a discharge hole is formed in a side plate of a rear surface of a housing according to the present invention.
FIG. 27	is a perspective view illustrating a modified example of a rotational piston, a suction hole, and a discharge hole according to the present invention.
FIG. 28	is a view of a structure in which a plurality of rotational clap suction/pressure devices are combined and connected to each other through one shaft according to a modified example of the present invention.
FIGS. 29A to 29E	are views for explaining an non-uniform operation of a rotational clap suction/pressure device according to a sixth embodiment of the present invention.
FIG. 30	is a view for explaining a four-cycle operation structure of a rotary internal engine in a rotational clap suction/pressure device according to a seventh embodiment of the present invention.
FIG. 31	is a perspective view illustrating a coupled state of a rotational clap suction/pressure device according to an eighth embodiment of the present invention.
FIG. 32	is an exploded perspective view according to the present invention.
FIG. 33	is a perspective view illustrating an assembled state of a driving part according to the present invention.
FIG. 34	is a cross-sectional view taken along line A'-A' of FIG. 31.
FIG. 35	is a cross-sectional view taken along line B'-B' of FIG. 31.
FIG. 36	is a perspective view illustrating a modified example of an assembled state of a driving part of

which a fixing gear has an oval shape, and a planetary gear is provided with an eccentric gear according to the present invention.

FIG. 37 is a perspective view illustrating a modified example in which a discharge hole is formed in a side plate of a housing according to the present invention.

FIG. 38 is a perspective view illustrating a modified example of a rotational piston, a suction hole, and a discharge hole according to the present invention.

FIG. 39 is an exploded perspective view illustrating a modified example in which a contact conversion ring is installed in a slot hole of a rotational piston, and a rotation pin is coupled thereto according to the present invention.

FIG. 40 is an exploded perspective view illustrating a modified example in which a crank arm is divided into two crank arms according to the present invention.

FIG. 41 is a view of a structure in which a plurality of rotational clap suction/pressure devices are combined and connected to each other through one shaft according to a modified example of the present invention.

FIGS. 42 A to 42E are views for explaining an non-uniform operation of a rotational clap suction/pressure device according to a second embodiment of the present invention.

FIG. 43 is a view for explaining a four-cycle operation structure of a rotary internal engine in a rotational clap suction/pressure device according to a ninth embodiment of the present invention.

<Description of reference symbol>

[0051]

1100: rotational clap suction/pressure device 1110: cylindrical housing
1110a: housing cylinder 1110b: housing side plate
1111: suction hole 1112: discharge hole
1120: crankshaft 1130: crankpin
1140: first rotational piston 1141: shaft driving hole
1142: slot(long hole) 1143: blade
1150: second rotational piston 1151: shaft driving hole
1152: slot 1153: blade
1160: gear ring 1161: fixed internal gear
1170: connection tube 1171: planetary external gear
1180: connecting rod 1181: rotation pin

MODE FOR CARRYING OUT THE INVENTION

[0052] Hereinafter, rotational clap suction/pressure devices according to preferable embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[First Embodiment]

[0053] A rotational clap suction/pressure device 1100 according to a first embodiment of the present invention, in which four blades 1143 and 1153 are disposed on each of first and second rotational pistons 1140 and 1150, will be described.

[0054] Referring to FIGS. 1 to 8, a rotational clap suction/pressure device 1100 according to a first embodiment includes: a cylindrical housing 1110 in which four suction holes 1111 and discharge holes 1112 are defined in a housing cylinder 1110a at a predetermined distance, and a housing side plate 1110b is disposed on each of both sides of the housing cylinder 1110a; a crankshaft 1120 configured to operate a central portion of the housing side plate 1110b, the crankshaft 1120 being rotatably supported by the cylindrical housing 1110; a crankpin 1130 that is eccentric to the crankshaft 1120 to extend from a central portion of the crankshaft 1120; a first rotational piston 1140 rotatably disposed within the cylindrical housing 1110, the first rotational piston 1140 having a shaft driving hole 1141 in a central portion thereof, a slot (a long hole) 1142 in a center thereof, and four blades 1143 on an outer circumference thereof; a second rotational piston 1150 rotatably disposed within the cylindrical housing 1110 to face the first rotational piston 1140, the second rotational piston 1150 having a shaft driving hole 1151 in a central portion thereof, a slot 1152 in a center thereof, and four blades 1153 on an outer circumference thereof; a gear ring 1160 fixedly disposed along an inner circumferential surface of the housing side plate 1110b, the gear ring 1160 including a fixed internal gear 1161 on an inner circumferential surface thereof; a connection tube 1170 coupled to an outer circumferential surface of the crankpin 1130 and integrally rotated together with the crankpin 1130, the connection tube 1170 including a planetary external gear 1171 corresponding to the fixed internal gear 1161 on an outer circumferential surface thereof; a connecting rod 1180 extending from the outer circumferential surface of the connection tube 1170; and a rotation pin 1181 disposed on an end of the connecting rod 1180, the rotation pin 1181 being inserted into the slot 1142 of the first rotational piston 1140 and the slot 1152 of the second rotational piston 1150.

[0055] In the rotational clap suction/pressure device 1100 according to the first embodiment of the present invention, the first rotational piston 1140 and the second rotational piston 1150 are rotated in the same direction to generate a non-uniform rotation. Here, a change in volume between each blade 1143 of the first rotational piston 1140 and each blade 1153 of the second rotational piston 1150 which are combined with each other is used for generating the non-uniform rotation. When the crankpin 1130 is rotated in a clockwise direction as the crankshaft 1120 is rotated in the clockwise direction, the planetary external gear 1171 is engaged with (tooth engagement) the fixed internal gear 1161 while being rotated. Thus, the connecting rod 1180 integrated with the connection tube 1170 rotates the first and second rotational pistons 1140 and 1150 in the same direction, i.e., in a counterclockwise direction at non-uniform cycles to suction and discharge a fluid through the suction hole 1111 and the discharge hole 1112 according to a change in volume of a pressure absorption chamber C defined between an inner wall A of the housing cylinder 1110a and the blades 1143 and 1153 of the first and second rotational pistons 1140 and 1150.

[0056] The suction hole 1111 and the discharge hole 1112 defined in the housing cylinder 1110a may be substituted by a structure in which a suction hole 111 and discharge hole 1112 having the same number as that of the suction hole 111 and the discharge hole 1112 are defined in the housing side plate 1110b in stead of the housing cylinder 1110a.

[0057] In the rotational clap suction/pressure device 1100 according to the first embodiment of the present invention, when the crankshaft 1120 rotatably supported to the cylindrical housing 1110 by a bearing B is uniformly rotated in the clockwise direction by a motor (not shown) that is a power source, the rotation pin 1181 of the connecting rod 1180 is rotated in the counterclockwise direction.

[0058] When the number N of each of blades 1143 and 1153 is four, the fixed internal gear 1161 and the planetary external gear 1171 is set to a gear ratio of about 4:3.

[0059] When the crankshaft 1120 and the crankpin 1130 are rotated at an angle of about 270°, since the gear ratio is about 4:3, the planetary external gear 1171 is inscribed with the fixed internal gear 1161 and rotated at an angle of about 360° in the counterclockwise direction.

[0060] Thus, considering a relative rotation angle, the planetary external gear 1171 is rotated at an angle of about 90° in the counterclockwise direction while the crankshaft 1120 is rotated at an angle of about 270°. As a result, the first rotational piston 1140 is rotated at an angle of about 90° in the counterclockwise direction. The rotation of the first rotational piston 1140 at the angle of about 90° represents rotation that continuously moves with respect to a contact point between the planetary external gear 1171 and the fixed internal gear 1161 as a rotation center. Here, since a rotation radius of the rotation pin 1181 is continuously changed, the first and second rotational pistons 1140 and 1150 are non-uniformly rotated.

[0061] Each of the non-uniform rotations of the first and second rotational pistons 1140 and 1150 has a predetermined cycle by an angle of about 90°. Here, the first and second rotational pistons 1140 and 1150 have a maximum rotation rate and a minimum rotation rate during the non-uniform rotation cycles. Thus, a ratio of the maximum rotation rate to the minimum rotation rate may be about 3:1, like a change in a length of the rotation radius. As a result, the first rotational piston 1140 and the second rotational piston 1150 are rotated one time at an angle of about 360° in the counterclockwise direction while the crankshaft 1120 is rotated three times at an angle of about 1080° in the clockwise direction. The first and second rotational pistons 1140 and 1150 may be non-uniformly rotated so that the maximum rotation rate and the minimum rotation rate are continuously changed to a ratio of about 3:1 with a cycle of an angle of about 90°.

[0062] The rotation pin 1181 of the connecting rod 1180 operating the first and second rotational pistons 1140 and 1150 is radially reciprocated within the slots 1142 and 1152 of the first and second rotational pistons 1140 and 1150 to operate the first and second rotational pistons 1140 and 1150. The rotation pin 1171 may have rotation centers opposite to each other at positions of the first and second rotational pistons 1140 and 1150.

[0063] When the first rotational piston 1140 has the maximum rotation rate, the second rotational piston 1150 has the minimum rotation rate. When the first rotational piston 1140 has the minimum rotation rate, the second rotational piston 1150 may have the maximum rotation rate. The connection tube 1170 and the connecting rod 1180 may be provided as separate components or an integrated component.

[0064] The operation of the above-described rotational flap suction/pressure device 1100 according to the first embodiment of the present invention will be described in more detail.

[0065] FIG. 9A to 9E are views of results in which the rotation of the crankpin 1130 at an angle of about 270° in the clockwise direction is divided into four sections to analyze the rotations of the first and second rotational pistons 1140 and 1150 at an angle of about 67.5° in the counterclockwise direction. Referring to rotation angles of the two blades 1143 and 1153 adjacent to each other, when the crankpin 1130 is firstly rotated at an angle of about 67.5° in the clockwise direction in a state where an angle between the two blades 1143 and 1153 adjacent to each other is about 0°, the preceding blade 1143 is acceleratedly rotated at an angle of about 33.75° in the counterclockwise direction, and the following blade 1153 is deceleratedly rotated at an angle of about 11.25° in the counterclockwise direction. As a result, an angle between the two blades 1143 and 1153 adjacent to each other may become to about 22.5°. Continuously, when the crankpin 1130 is secondly rotated in an angle of about 67.5° in the clockwise direction, the preceding blade 1143 is deceleratedly rotated again at an angle of about 33.75° in the counterclockwise direction, and the following blade 1153 is acceleratedly rotated again at an angle of about 11.25° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 adjacent to each other may become to maximum 45°. When the crankpin 1130 is thirdly rotated in an angle of about 67.5° in the clockwise direction, the preceding blade 1143 is deceleratedly rotated at an angle of about 11.25° in the counterclockwise direction, and the following blade 1153 is acceleratedly rotated at an angle of about 33.75° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 adjacent to each other may be decreased again to about 22.5°. When the crankpin 1130 is fourthly rotated at an angle of about 67.5° at the clockwise direction, the preceding blade 1143 is acceleratedly rotated again at an angle of about 11.25° in the counterclockwise direction, and the following blade 1153 is deceleratedly rotated at an angle of about 33.75° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 adjacent to each other may be minimized to about 0°. Thus, the two first and second rotational pistons 1140 and 1150 may be non-uniformly rotated opposite to each other at an angle of about 90° in the counterclockwise direction. As described above, when the rotation of the crankpin at the angle of about 270° is performed four times, i.e., becomes to about 1080°, the first and second rotational pistons 1140 and 1150 may be non-uniformly rotated at an angle of about 360° (one rotation) with cycles that are repeated four times. That is, the first and second rotational pistons 1140 and 1150 are dually non-uniformly rotated opposite to each other at an angle of about 360° (one rotation) due to the rotation of the crankshaft 1120 at an angle of about 1080° (three rotations). The rotational clap suction/pressure device 1100 according to the first embodiment of the present may realize a complete surface contact structure among the cylindrical housing 1110, the blades 1143 and 1153, and the rotational pistons 1143 and 1153 by using the non-uniform rotation principle to significantly reduce abrasion and improve durability and efficiency. Thus, the rotational clap suction/pressure device 1100 may be replaced with various pumps to realize a simplified structure, a small size, and high degree of vacuum. Also, various gas compressors may be small-sized and lightweight through a simplified structure such as a vane type compressor to perform a function of a high-pressure positive displacement compressor. In addition, the rotational clap suction/pressure device 1100 may be replaced with a gear type flow meter, a piston type flow meter, and a diaphragm type flow meter which are widely used as existing positive displacement flow meters to reduce a pressure loss and improve measurement accuracy.

[Second Embodiment]

[0066] A rotational clap suction/pressure device 2100 according to a second embodiment of the present invention will be described.

[0067] A rotational clap suction/pressure device 2100 according to the second embodiment of the present invention, in which three blades 1143 and 1153 are disposed on each of first and second rotational pistons 1140 and 1150, will be described. Here, since the rotational clap suction/pressure device 2100 according to the second embodiment of the present invention has the same constitution as the above-described rotational clap suction/pressure device 1100 according to the first embodiment of the present invention except for the number of blades, for convenience of description, the same component is denoted by the same reference numeral.

[0068] Referring to FIGS. 10A to 10E, when the number of each of blades 1143 and 1153 is three, a fixed internal gear 1161 and a planetary external gear 1171 is set to a gear ratio of about 3:2.

[0069] When a crankshaft 1120 is non-uniformly rotated in a clockwise direction by a motor (not shown) that is a power source, a rotation pin 1171 is rotated in a counterclockwise direction. Here, since a gear ratio of the fixed internal gear 161 to the planetary external gear 1171 is about 3:2, when the crankpin 1130 of the crankshaft 1120 is rotated at an angle of about 240° in a clockwise direction, the planetary external gear 1171 is inscribed with the fixed internal gear 1161 and rotated at about 360° in a counterclockwise direction. Thus, considering a relative rotation angle, the planetary external gear 1171 is rotated at an angle of about 120° in the counterclockwise direction while the crankshaft 1120 is rotated at an angle of about 240°. As a result, the first rotational piston 1140 and the second rotational piston 1150 are rotated at an angle of about 120° in the counterclockwise direction. The rotations of the first and second rotational pistons 1140 at the angle of about 120° represent a rotation that continuously moves with respect to a contact point between the planetary external gear 1171 and the fixed internal gear 1161 as a rotation center. Here, since a rotation radius of the rotation pin 1181 is continuously changed, the first and second rotational pistons 1140 and 1150 are non-uniformly rotated. Each of the non-uniform rotations of the first and second rotational pistons 1140 and 1150 has a predetermined cycle by an angle of about 120°. Here, the first and second rotational pistons 1140 and 1150 have a maximum rotation rate and a minimum rotation rate during the nun-uniform rotation cycle. Thus, a ratio of the maximum rotation rate to the minimum rotation rate may be about 3:1, like a change in a length of the rotation radius. As a result, the first rotational piston 1140 and the second rotational piston 1150 are rotated one time at an angle of about 360° in the counterclockwise direction while the crankshaft 1120 is rotated two times at an angle of about 720° in the clockwise direction. The first and second rotational pistons 1140 and 1150 may be non-uniformly rotated so that the maximum rotation rate and the minimum rotation rate are continuously changed to a ratio of about 3:1 with a cycle of an angle of about 120°.

[0070] FIG. 10A to 10E are views of results in which the rotation of the crankpin 1130 at an angle of about 240° in the clockwise direction is divided into four sections to analyze the rotations of the first and second rotational pistons 1140 and 1150 at an angle of about 60° in the counterclockwise direction. Referring to rotation angles of the two blades 1143 and 1153 adjacent to each other, when the crankpin 1130 is firstly rotated at an angle of about 60° in the clockwise direction in a state where an angle between the two blades 1143 and 1153 adjacent to each other is about 0°, the preceding blade 1143 is acceleratedly rotated at an angle of about 45° in the counterclockwise direction, and the following blade 1153 is deceleratedly rotated at an angle of about 15° in the counterclockwise direction. As a result, an angle between the two blades 1143 and 1153 adjacent to each other may become to about 30°. Continuously, when the crankpin 1130 is secondly rotated in an angle of about 60° in the clockwise direction, the preceding blade 1143 is deceleratedly rotated again at an angle of about 45° in the counterclockwise direction, and the following blade 1153 is acceleratedly rotated again at an angle of about 15° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 may become to maximum 60°. When the crankpin 1130 is thirdly rotated in an angle of about 60° in the clockwise direction, the preceding blade 1143 is deceleratedly rotated again at an angle of about 15° in the counterclockwise direction, and the following blade 1153 is acceleratedly rotated again at an angle of about 45° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 may be decreased again to about 30°. When the crankpin 1130 is fourthly rotated at an angle of about 240° at the clockwise direction, the preceding blade 1143 is acceleratedly rotated again at an angle of about 15° in the counterclockwise direction, and the following blade 1153 is deceleratedly rotated at an angle of about 45° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 may be minimized to about 0°. Thus, the two first and second rotational pistons 1140 and 1150 may be non-uniformly rotated opposite to each other at an angle of about 120° in the counterclockwise direction. As described above, when the rotation of the crankpin at the angle of about 240° is performed three times, i.e., becomes to about 720°, the first and second rotational pistons 1140 and 1150 may be non-uniformly rotated at an angle of about 360° (one rotation) with cycles that are repeated three times. That is, the first and second rotational pistons 1140 and 1150 are dually non-uniformly rotated opposite to each other at an angle of about 360° (one rotation) due to the rotation of the crankshaft 1120 at an angle of about 720° (two rotations).

[Third Embodiment]

[0071] A rotational clap suction/pressure device 3100 according to a third embodiment of the present invention, in which two blades 1143 and 1153 are disposed on each of first and second rotational pistons 1140 and 1150, will be described. Here, since the rotational clap suction/pressure device 3100 according to the third embodiment of the present invention has the same constitution as the above-described rotational clap suction/pressure device 1100 according to the first embodiment of the present invention except for the number of blades, for convenience of description, the same component is denoted by the same reference numeral.

[0072] Referring to FIGS. 11A to 11E, when the number of each of blades 1143 and 1153 is two, a fixed internal gear 1161 and a planetary external gear 1171 is set to a gear ratio of about 3:2.

[0073] When a crankshaft 1120 is non-uniformly rotated in a clockwise direction by a motor (not shown) that is a power source, a rotation pin 1181 of a connecting rod 1180 is rotated in a counterclockwise direction. Here, since a gear ratio of the fixed internal gear 161 to the planetary external gear 1171 is about 2:1, when the crankpin 1130 of the crankshaft 1120 is rotated at an angle of about 180° in a clockwise direction, the planetary external gear 1171 is inscribed with the fixed internal gear 1161 and rotated at about 360° in a counterclockwise direction. Thus, considering a relative rotation angle, the planetary external gear 1171 is rotated at an angle of about 180° in the counterclockwise direction while the crankshaft 1120 is rotated at an angle of about 180°. As a result, the first rotational piston 1140 and the second rotational piston 1150 are rotated at an angle of about 180° in the counterclockwise direction. The rotations of the first and second rotational pistons 1140 at the angle of about 180° represent a rotation that continuously moves with respect to a contact point between the planetary external gear 1171 and the fixed internal gear 1161 as a rotation center. Here, since a rotation radius of the rotation pin 1181 is continuously changed, the first and second rotational pistons 1140 and 1150 are non-uniformly rotated. Each of the non-uniform rotations of the first and second rotational pistons 1140 and 1150 has a predetermined cycle by an angle of about 180°. Here, the first and second rotational pistons 1140 and 1150 have a maximum rotation rate and a minimum rotation rate during the nun-uniform rotation cycle. Thus, a ratio of the maximum rotation rate to the minimum rotation rate may be about 3:1, like a change in a length of the rotation radius. As a result, the first rotational piston 1140 and the second rotational piston 1150 are rotated one time at an angle of about 360° in the counterclockwise direction while the crankshaft 1120 is rotated one time at an angle of about 720° in the clockwise direction. The first and second rotational pistons 1140 and 1150 may be non-uniformly rotated so that the maximum rotation rate and the minimum rotation rate are continuously changed to a ratio of about 3:1 with a cycle of an angle of about 180°.

[0074] FIG. 11A to 11E are views of results in which the rotation of the crankpin 1130 at an angle of about 180° in the clockwise direction is divided into four sections to analyze the rotations of the first and second rotational pistons 1140 and 1150 at an angle of about 45° in the counterclockwise direction. Referring to rotation angles of the two blades 1143 and 1153 adjacent to each other, when the crankpin 1181 is firstly rotated at an angle of about 45° in the clockwise direction in a state where an angle between the two blades 1143 and 1153 adjacent to each other is about 0°, the preceding blade 1143 is acceleratedly rotated at an angle of about 67.5° in the counterclockwise direction, and the following blade 1153 is deceleratedly rotated at an angle of about 22.5° in the counterclockwise direction. As a result, an angle between the two blades 1143 and 1153 adjacent to each other may become to about 45°. Continuously, when the crankpin 1130 is secondly rotated in an angle of about 45° in the clockwise direction, the preceding blade 1143 is deceleratedly rotated again at an angle of about 67.5° in the counterclockwise direction, and the following blade 1153 is acceleratedly rotated again at an angle of about 22.5° in the counterclockwise direction. As a result, an angle between the blades 1143.1153 and 1153 may become to maximum 90°. When the crankpin 1130 is thirdly rotated in an angle of about 45° in the clockwise direction, the preceding blade 1143 is deceleratedly rotated again at an angle of about 22.5° in the counterclockwise direction, and the following blade 1153 is acceleratedly rotated again at an angle of about 67.5° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 may be decreased again to about 45°. When the crankpin 1130 is fourthly rotated at an angle of about 180° at the clockwise direction, the preceding blade 1143 is acceleratedly rotated again at an angle of about 22.5° in the counterclockwise direction, and the following blade 1153 is deceleratedly rotated at an angle of about 67.5° in the counterclockwise direction. As a result, an angle between the blades 1143 and 1153 may be minimized to about 0°. Thus, the two first and second rotational pistons 1140 and 1150 may be non-uniformly rotated opposite to each other at an angle of about 180° in the counterclockwise direction. As described above, when the rotation of the crankpin at the angle of about 180° is performed two times, i.e., becomes to about 360°, the first and second rotational pistons 1140 and 1150 may be non-uniformly rotated at an angle of about 360° (one rotation) with cycles that are repeated two times. That is, the first and second rotational pistons 1140 and 1150 are dually non-uniformly rotated opposite to each other at an angle of about 360° (one rotations) due to the rotation (one time) of the crankshaft 1120 at an angle of about 360°.

[0075] Hereinafter, variously modified examples of the components of the present invention will be described.

[0076] FIG. 12 is a perspective view illustrating a modified example of a structure for engaging the fixed internal gear 1161 with the planetary external gear 1171. Here, the engaging structure may be provided on only one side of both fixed internal gear 1161 and planetary external gear 1171, and the other side may have a circular contact structure C to guide rotation.

[0077] Also, FIGS. 13 and 14 are perspective and front views of a structure in which a contact conversion ring is installed in a slot. Here, a slidably contact conversion ring 1195 is disposed in a slot 1142, and the rotation pin 1181 is coupled to the contact conversion ring 1195. Thus, since the contact conversion ring 1195 is slidably moved in a state where the contact conversion ring 1195 surface-contacts the slot 1142, abrasion of the components may be minimized.

[0078] Also, FIG. 15 is a cross-sectional view illustrating a modified example of the crankpin. Here, the crankpin 1130 is bisectionally divided in a semicircular section shape at a center thereof. The bisectionally divided ends of the crankpin 1130 may be instead into both sides of the connection tube 1170 and then be engaged with and connected to each other.

[0079] Also, FIG. 16 is a cross-sectional view illustrating modified examples of the crankpin. Here, the crankpin 1130 is bisectionally divided into two parts, and each of the bisectionally divided ends may be inserted into a groove 1170a of the connection tube 1170 and then be connected to each other.

[0080] Also, FIG. 17 is a cross-sectional view illustrating a modified example of the connecting rod. Here, the connecting rods 1180 symmetrically extend at a predetermined distance from a center of an outer surface of the connection tube 1170, and the rotation pins 1181 disposed on both ends of the connecting rod 1180 may be bent to face each other.

[0081] Also, FIG. 18 is a view illustrating a modified example of the present invention, wherein a plurality of rotational clap suction/pressure devices 1100 may be connected to one crankshaft 1120 in series.

[Fourth Embodiment]

[0082] FIG. 19 is a view for explaining a four-cycle operation structure of a rotary internal engine to which the first embodiment is reflected in a rotational clap suction/pressure device according to a fourth embodiment of the present invention.

[0083] Since the rotational clap suction/pressure device 4100 according to the fourth embodiment of the present invention has the same constitution as the above-described rotational clap suction/pressure device 1100 according to the first embodiment of the present invention except for an ignition plug 4190, descriptions and reference numerals with respect to the same components will be omitted, and also be described with reference to FIGS. 4 and 9A to 9E.

[0084] Referring to FIGS. 19A to 19H, a rotational clap suction/pressure device 4100 according to a fourth embodiment includes: a cylindrical housing in which a suction hole 1111 and a discharge hole 1112 are defined in a housing cylinder 1110a at a predetermined distance, and a housing side plate is disposed on each of both sides of the housing cylinder; a crankshaft configured to pass through a central portion of the housing side plate, the crankshaft being rotatably supported by the cylindrical housing; a crankpin that is eccentric to the crankshaft to extend from a central portion of the crankshaft; a first rotational piston rotatably disposed in a space part, the first rotational piston having a shaft driving hole in a central portion thereof, a slot in a center thereof, and a plurality of blades on an outer circumference thereof; a second rotational piston rotatably disposed in the space part to face the first rotational piston, the second rotational piston having a shaft driving hole in a central portion thereof, a slot in a center thereof, and a plurality of blades on an outer circumference thereof; a gear ring fixedly disposed along an inner circumferential surface of the housing side plate, the gear ring including a fixed internal gear on an inner circumferential surface thereof; a connection tube coupled to an outer circumferential surface of the crankpin and integrally rotated together with the crankpin, the connection tube including a planetary external gear corresponding to the fixed internal gear on an outer circumferential surface thereof; a connecting rod extending from the outer circumferential surface of the connection tube, wherein the rotation pins disposed on ends of the connecting rod are inserted into the slot of the first rotational piston and the slot of the second rotational piston, respectively, and an ignition plug 4190 disposed on the cylindrical cylinder.

[0085] When the crankpin 1130 is eccentrically rotated in a clockwise direction by the rotation of the crankshaft 1120, the planetary external gear 1171 is engaged (tooth engagement) with the fixed internal gear 1161 while being rotated. The connecting rod 1180 integrated with the connection tube 1170 rotates the first and second rotational pistons 1140 and 1150 in the same direction, i.e., in the counterclockwise direction with non-uniform cycles to suction or compress a combustion gas into a suction/pressure chamber C defined between an inner wall of the housing cylinder 1110a and the blades 1143 and 1153 of the first and second rotational pistons 1140 and 1150. Thus, the ignition plug 4190 is ignited according to a change in volume of the suction/pressure chamber C to explode and exhaust the combustion gas.

[0086] In the rotational clap suction/pressure device 4100 according to the fourth embodiment of the present invention, the suction hole 1111 and the discharge hole 1112 which are defined in the housing cylinder 1110a are provided in a plurality of pairs. A portion of the pairs of suction and discharge holes 1111 and 1112 may be replaced with (constituted by) the ignition plug 419. Thus, eight suction/pressure chambers C serve as one cylinder in a reciprocating internal combustion engine to provide an internal combustion engine having eight cylinders. While the first and second rotational pistons 1140 and 1150 are rotated at an angle of about 180°, four cycles such as suction, compression, expansion, and exhaustion may be completely performed in each of the suction/pressure chambers C. Here, the two ignition plugs 4190 are disposed in the cylindrical housing 110.

[Fifth Embodiment]

[0087] FIG. 20 is a view for explaining a four-cycle operation structure of a rotary internal engine to which the third embodiment is reflected in a rotational clap suction/pressure device according to a fifth embodiment of the present invention

[0088] Since a rotational clap suction/pressure device 5100 according to the fifth embodiment of the present invention has the same constitution as the above-described rotational clap suction/pressure device 3100 according to the third embodiment of the present invention except for an ignition plug 5190, descriptions and reference numerals with respect to the same components will be omitted, and also be described with reference to FIGS. 4 and 11A to 11E.

[0089] Referring to FIG. 20A to 20H, in the rotational clap suction/pressure device 5100 according to the fifth embodiment of the present invention, four suction/pressure chambers C serve as one cylinder in a reciprocating internal combustion engine to provide an internal combustion engine having four cylinders. While first and second rotational pistons 1140 and 1150 are rotated at an angle of about 360°, four cycles such as suction, compression, expansion, and exhaustion may be completely performed in each of the suction/pressure chambers C. Here, one ignition plug 5190 is disposed in a cylindrical housing 110.

[Sixth Embodiment]

[0090] A rotational clap suction/pressure device 6100 according to a sixth embodiment of the present invention having a structure, in which two blades 6162 and 6172 are disposed on each of first and second rotational pistons 6171 and 6161, and applied to a positive displacement rotational clap pump will be described.

[0091] Referring to FIGS. 21 to 25 and 29, a rotational clap suction/pressure device 6100 according to a sixth embodiment of the present invention includes: a cylindrical housing 6180 in which a suction hole 6181 and a discharge hole 6182 are defined in a housing cylinder 6180a at a predetermined distance, and a housing front plate 6180b and a housing rear plate 6180c are disposed on each of both sides of the housing cylinder 6180a; a first rotational piston 6171 rotatably disposed in a space part within the cylindrical housing 6180, the first rotational piston 6171 including a solid shaft 6170 extending toward a driving part at a central portion thereof and a plurality of blades on an outer circumference thereof;

a second rotational piston 6161 rotatably disposed in the space part to face the first rotational piston 6171, the second rotational piston 6161 including a hollow shaft 6160 extending toward the driving part at a central portion thereof and a plurality of blades on an outer circumference thereof; a first rotational piston driving gear 6150 coupled to the solid shaft 6170 of the first rotational piston 6171; a second rotational piston driving gear 6151 coupled to the hollow shaft 6160 of the second rotational piston 6161; a first power transmission gear 6140 engaged with the first rotational piston driving gear 6150; a second power transmission gear 6141 engaged with the second rotational piston driving gear 6151; a first power transmission shaft 6130 and a first driving eccentric gear 6120 which are coupled to the first power transmission gear 6140; a second power transmission shaft 6131 and a second driving eccentric gear 6121 which are coupled to the second power transmission gear 6141; a main shaft eccentric gear 6110 engaged with the first and second driving eccentric gears 6120 and 6121; and a main shaft 6100 coupled to the main shaft eccentric gear 6110.

[0092] The rotational clap suction/pressure device 6100 according to the sixth embodiment of the present invention rotates the first and second rotational pistons 6171 and 6161 in the same direction to generate non-uniform rotations. Here, the rotational clap suction/pressure device 6100 uses a change in volume of a suction/pressure chamber 6210 defined between each of blades 6172 of the first rotational piston 6171 and each of blades 6162 of the second rotational piston 6161 which are combined with each other. The first and second power transmission shafts 6130 and 6131 generate the non-uniform rotations opposite to each other in a counterclockwise direction by the first driving eccentric gear 6120 and the second driving eccentric gear 6121 which are engaged with the main shaft eccentric gear 6110 by the rotation of the main shaft 6100 in a clockwise direction.

[0093] The first and second power transmission gears 6140 and 6141 which are respectively coupled to the first and second power transmission shafts 6130 and 6131 may transmit the non-uniform rotations opposite to each other in the clockwise direction to the first and second rotational piston driving gears 6150 and 6151 which respectively have adequate gear ratios. The first rotational piston 6171 coupled to the first rotational piston driving gear 6150 through the solid shaft 6170 and the second rotational piston 6161 coupled to the second rotational piston driving gear 6151 through the hollow shaft 6160 are non-uniformly rotated opposite to each other. Here, a fluid is suctioned and discharged through the suction hole 6181 and the discharge hole 6182 according to a change in volume of the suction/pressure chamber 6210.

[0094] In the rotational clap suction/pressure device 6100 according to the sixth embodiment, a ratio of a maximum rotation rate to a minimum rotation rate in the non-uniform rotation rates may be determined according to eccentricity of the main shaft eccentric gear 6110, the first driving eccentric gear 6120, and the second driving eccentric gear 6121. Also, the repeated non-uniform rotation cycle may be determined according to a gear ratio (N:1) of the first and second power transmission gears 6140 and 6141 to the first and second rotational piston driving gears 6150 and 6151. In addition, the number N of blades disposed on the rotational pistons 6161 and 6171 may be determined according to the gear ratio.

[0095] The non-uniform rotational clap suction/pressure device 6100 according to the sixth embodiment may realize a complete surface-contact structure between the blades 6162 and 6172 of the cylindrical housing 6180 and the rotational pistons 6161 and 6171 by using the non-uniform rotation principle to significantly reduce abrasion and improve durability and efficiency. Also, the rotational clap suction/pressure device 6100 may be replaced with various positive displacement pumps to realize a high pressure and flow with a simplified structure and small size.

[0096] Also, in the rotational clap suction/pressure pump to which the embodiments according to the present invention are applied, since the power transmission machine elements are disposed outside the cylindrical housing 6180, the rotational pistons 6161 and 6171 may be significantly improved in mechanical strength and be advantageously used for pumping a high-temperature high-pressure fluid.

[Seventh Embodiment]

[0097] Hereinafter, a rotational clap suction/pressure device according to a seventh embodiment of the present invention will be described.

[0098] FIG. 30 is a view for explaining a four-cycle operation structure of a rotary internal engine in a rotational clap suction/pressure device according to a seventh embodiment of the present invention. Since the rotational clap rotary internal combustion engine according to the seventh embodiment of the present invention has the same component as the rotational clap suction/pressure device according to the first embodiment except for an ignition plug 7200, descriptions and reference numerals with respect to the same components will be omitted, and also be described with reference to FIGS. 25 and 29A to 29E.

[0099] Referring to FIGS. 30A to 30I, a rotational clap rotary engine (rotational clap suction/pressure device) 7100 according to a seventh embodiment of the present invention includes: a cylindrical housing 6180 in which a suction hole 6181, a discharge hole 6182, and an ignition plug 7200 are provided in a housing cylinder 6180a at a predetermined distance, and a housing front plate 6180b and a housing rear plate 6180c are disposed on each of both sides of the housing cylinder 6180a; a first rotational piston 6171 rotatably disposed in a space part within the cylindrical housing 6180, the first rotational piston 6171 including a solid shaft 6170 extending toward a driving part at a central portion thereof and a plurality of blades on an outer circumference thereof; a second rotational piston 6161 rotatably disposed in the space part to face the first rotational piston 6171, the second rotational piston 6161 including a hollow shaft 6160 extending toward the driving part at a central portion thereof and a plurality of blades on an outer circumference thereof; a first rotational piston driving gear 6150 coupled to the solid shaft 6170 of the first rotational piston 6171; a second rotational piston driving gear 6151 coupled to the hollow shaft 6160 of the second rotational piston 6161; a first power transmission gear 6140 engaged with the first rotational piston driving gear 6150; a second power transmission gear 6141 engaged with the second rotational piston driving gear 6151; a first power transmission shaft 6130 and a first driving eccentric gear 6120 which are coupled to the first power transmission gear 6140; a second power transmission shaft 6131 and a second driving eccentric gear 6121 which are coupled to the second power transmission gear 6141; a main shaft eccentric gear 6110 engaged with the first and second driving eccentric gears 6120 and 6121; and a main shaft 6100 coupled to the main shaft eccentric gear 6110.

[0100] According to the seventh embodiment of the present invention, fuel and air are suctioned and compressed into a suction/pressure chamber 6210 defined between an inner wall of the housing cylinder 6180a and the blades 6172 and 6162 of the first and second rotational pistons 6171 and 6161 to ignite the ignition plug 7200 according to a change in volume of the suction/pressure chamber 6210, thereby exploding, expanding, and exhausting the combustion gas.

[0101] In the rotational clap suction/pressure device (the rotary engine) 7100 according to the seventh embodiment of the present invention, the suction hole 6181 and the discharge hole 6182 which are defined in the housing cylinder 6,180a are provided in a plurality of pairs. A portion of the pairs of suction and discharge holes 6181 and 6182 may be replaced with (constituted by) the ignition plug 7200. Thus, four suction/pressure chambers serve as one cylinder in a reciprocating internal combustion engine to provide an internal combustion engine having four cylinders. While the first and second rotational pistons 6171 and 6171 are rotated at an angle of about 360°, typical four cycles such as suction, compression, expansion, and exhaustion may be completely performed in each of the suction/pressure chambers. Here, one or plurality of ignition plugs 200 is/are disposed in the cylindrical housing 6180.

Hereinafter, variously modified examples of the components according to the sixth and seventh embodiments of the present invention will be described.

[0102] FIG. 26 illustrates a modified example in which the discharge hole 6182 of the present invention is defined in the housing rear plate 6180c. Since the suction hole 6181 is defined in the housing cylinder 6180a, and the discharge hole 6182 is defined in the housing rear plate 6180c, the suction and the discharge may be smoothly performed, and a manifold may be easily constituted for the suction and discharge.

[0103] FIG. 27 is a perspective view illustrating a modified example of the rotational piston, the suction hole, and the discharge hole according to the present invention. Here, the blades 6172 and 6162 of the first and second rotational pistons may be inclined to allow a fluid to smoothly flow. In addition, the inclination of each of the blades 6172 and 6162 may have a linear and curved shape.

[0104] FIG. 28 is a view illustrating a modified example of the present invention, wherein a plurality of rotational clap suction/pressure devices may be disposed in the same axial line and be connected to each other by gear parts 1 and 2.

[Eight Embodiment]

[0105] A rotational clap suction/pressure device 8100 according to an eight embodiment of the present invention having a structure, in which two blades 8170 and 8171 are disposed on each of first and second rotational pistons 8160 and 8161, and applied to a positive displacement rotational clap pump will be described.

[0106] Referring to FIGS. 31 to 35 and 42, a rotational clap suction/pressure device 8100 according to an eight embodiment of the present invention includes: a cylindrical housing 8180 in which a suction hole 8181 and a discharge hole 8182 are defined in a housing cylinder 8181 at a predetermined distance, and housing side plates 8182a and 8182b are disposed on each of both sides of the housing cylinder 8181; fixing gears 8130a and 8130b respectively extending from central portions of the housing side plates 8182a and 8182b, the fixing gears 8130a and 8130b being integrated with the housing side plates 8182a and 8182b; a first rotational piston 8160 rotatably disposed in a space part within the cylindrical housing 8180, the first rotational piston 8160 having a crankshaft driving hole in a central portion thereof, a slot hole 8210a in a middle portion thereof, and a plurality of blades 8170 on an outer circumference thereof; a second rotational piston 8161 rotatably disposed in the space part to face the first rotational piston 8160, the second rotational piston 8161 having a crankshaft driving hole in a central portion thereof, a slot hole 8210b in a middle portion thereof, and a plurality of blades 8171 on an outer circumference thereof; a crankshaft 8100 passing through central portions of the housing side plates 8182a and 8182b, the crankshaft 8100 being rotatably supported by the cylindrical housing 8180; a crank arm 8110 integrated with a central portion of the crankshaft 8100; crankpins 8120a, 8120b, 8120c, and 8120d integrated with the crank arm 8110; planetary gears 8140a, 8140b, 8140c, and 8140d inserted into and rotatably coupled to the crankpins 8120a, 8120b, 8120c, 8120d, the planetary gears 8140a, 8140b, 8140c, and 8140d being circumscribed and engaged with the fixing gears 8130a and 8130b; and rotation pins 8150a, 8150b, 8150c, and 8150d extending and integrated with the planetary gears 8140a, 8140b, 8140c, and 8140d, the rotation pins 8150a, 8150b, 8150c, and 8150d being inserted into the slot holes 8210a and 8210b of the rotational pistons 8160 and 8161.

[0107] The rotational clap suction/pressure device 8100 according to the eight embodiment of the present invention rotates the first and second rotational pistons 8160 and 8161 in the same direction to generate non-uniform rotations. Here, the rotational clap suction/pressure device 8100 uses a change in volume of a suction/pressure chamber 8220 defined between each of blades 8170 of the first rotational piston 8160 and each of blades 8171 of the second rotational piston 8161 which are combined with each other. The plate-shaped crank arm 8110 integrated with the crankshaft 8100 by the rotation of the crankshaft 8100 in a clockwise direction may be naturally rotated in the clockwise direction, and thus the two crankpins 8120a and 8120b integrated with the crank arm 8110 may be rotated in the clockwise direction.

[0108] The two planetary gears 8140a and 8140b inserted into and coupled to the crankpins 8120a and 8120b by the rotation of the crankpins 8120a and 8120b in the clockwise direction are circumscribed and engaged with the fixing gear 8130a and then rotated around the fixing gear 8130a.

[0109] When the two planetary gears 8140a and 8140b are rotated in the clockwise direction, the two rotation pins 8150a and 8150b integrated with the planetary gears 8140a and 8140b is reciprocated within the slot hole 8210c defined in the first rotational piston 8160 and rotated in an epicycloid curve shape in the clockwise direction. As a result, the two rotation pins 8150a and 8150b may be non-uniformly rotated so that a rotation radius is periodically changed to drive the first rotation piston 8160.

[0110] Also, the rotation of the crankshaft 8100 in the clockwise direction may allow the two rotation pins 8150c and 8150d opposite to each other to be rotated in the epicycloid curve shape. As a result, the two rotation pins 8150c and 8150d may be non-uniformly rotated with the same cycle and opposite to each other to drive the second rotation piston 8161.

[0111] As described above, since the first and second rotational pistons 8160 and 8161 are non-uniformly rotated opposite to each other, the space part defined between the first rotational piston blade 8170 and the second rotational piston blade 8171 which are integrated with the rotational piston may form a plurality of suction/pressure chambers 8220 of which a volume is continuously changed. Here, a fluid may be suctioned and discharged through the suction hole 8211 and the discharge hole 8212 according to the change in volume of the formed suction/pressure chamber 8220.

[0112] In the rotational clap suction/pressure device 8100 according to the eight embodiment, a ratio of a maximum rotation rate to a minimum rotation rate may be determined according to ratios of distances changed between a center of the crankshaft 8100 and centers of the rotation pins 8150a, 8150b, 8150c, and 8150d. Also, the repeated non-uniform rotation cycle may be determined according to a gear ratio (N:1) of the planetary gears 8140a, 8140b, 8140c, and 8140d to the fixed gears 8130a and 8130b. In addition, the number N of blades disposed on the rotational pistons 8160 and 8161 may be determined according to the gear ratio. The non-uniform rotational clap suction/pressure device 8100 according to the eight embodiment may realize a complete surface-contact structure between the blades 8170 and 8171 of the cylindrical housing 8180 and the rotational pistons 8160 and 8161 by using the non-uniform rotation principle to significantly reduce abrasion and improve durability and efficiency. Also, the rotational clap suction/pressure device 8100 may be replaced with various positive displacement pumps to realize a high pressure and flow with a simplified structure and small size.

[0113] Also, the rotational clap suction/pressure device applied to the present invention may have structures completely different from those of the existing rotational clap suction/pressure device and driving elements. Thus, the crank arm 8110 may be integrated with the crankshaft 8100, but not be integrated with the cylinder to significantly improve coupling strength. In addition, since one rotation piston is dispersed into two rotation pins to operate, power transmission efficiency and mechanical strength may be significantly improved.

[Ninth Embodiment]

[0114] Hereinafter, a rotational clap suction/pressure device according to a ninth embodiment of the present invention will be described.

[0115] FIG. 43 is a view for explaining a four-cycle operation structure of a rotary internal engine in a rotational clap suction/pressure device according to a ninth embodiment of the present invention.

[0116] Since the rotational clap rotary internal combustion engine according to the ninth embodiment of the present invention has the same component as the rotational clap suction/pressure pump according to the eight embodiment except for an ignition plug 9200, descriptions and reference numerals with respect to the same components will be omitted, and also be described with reference to FIGS. 35 and 42A to 42E.

[0117] Referring to FIGS. 43A to 43I, a rotational clap rotary engine (rotational clap suction/pressure device) 9100 according to a ninth embodiment of the present invention includes: a cylindrical housing 8180 in which a suction hole 8211 and a discharge hole 8212 are defined in a housing cylinder 8181 at a predetermined distance, and housing side plates 8182a and 8182b are disposed on each of both sides of the housing cylinder 8181; fixing gears 8130a and 8130b respectively extending from central portions of the housing side plates 8182a and 8182b, the fixing gears 8130a and 8130b being integrated with the housing side plates 8182a and 8182b; a first rotational piston 8160 rotatably disposed in a space part within the cylindrical housing 8180, the first rotational piston 8160 having a crankshaft driving hole in a central portion thereof, a slot hole 8210a in a middle portion thereof, and a plurality of blades 8170 on an outer circumference thereof; a second rotational piston 8161 rotatably disposed in the space part to face the first rotational piston 8160, the second rotational piston 8161 having a crankshaft driving hole in a central portion thereof, a slot hole 8210b in a middle portion thereof, and a plurality of blades 8171 on an outer circumference thereof; a crankshaft 8100 passing through central portions of the housing side plates 8182a and 8182b, the crankshaft 8100 being rotatably supported by the cylindrical housing 8180; a crank arm 8110 integrated with a central portion of the crankshaft 8100; crankpins 8120a, 8120b, 8120c, and 8120d integrated with the crank arm 8110; planetary gears 8140a, 8140b, 8140c, and 8140d inserted into and rotatably coupled to the crankpins 8120a, 8120b, 8120c, 8120d, the planetary gears 8140a, 8140b, 8140c, and 8140d being circumscribed and engaged with the fixing gears 8130a and 8130b; and rotation pins 8150a, 8150b, 8150c, and 8150d extending and integrated with the planetary gears 8140a, 8140b, 8140c, and 8140d, the rotation pins 8150a, 8150b, 8150c, and 8150d being inserted into the slot holes 8210a and 8210b of the rotational pistons 8160 and 8161.

[0118] According to the ninth embodiment of the present invention, fuel and air are suctioned and compressed into a suction/pressure chamber 8220 defined between an inner wall of the cylindrical housing 8180 and the blades 8170 and 8171 of the first and second rotational pistons 8160 and 8161 to ignite the ignition plug 9200 according to a change in volume of the suction/pressure chamber 8220, thereby exploding, expanding, and exhausting the combustion gas.

[0119] In the rotational clap rotary engine (rotational clap suction/pressure device) 9100 according to the ninth embodiment of the present invention, the suction hole 8211 and the discharge hole 8212 which are defined in the housing cylinder 8181 are provided in a plurality of pairs. A portion of the pairs of suction and discharge holes 8211 and 8212 may be replaced with the ignition plug 9200. Thus, four suction/pressure chambers serve as one cylinder in a reciprocating internal combustion engine to provide an internal combustion engine having four cylinders. While the first and second rotational pistons 8160 and 8161 are rotated at an angle of about 360°, typical four cycles such as suction, compression, expansion, and exhaustion may be completely performed in each of the suction/pressure chambers. Here, one or plurality of ignition plugs 9200 is/are disposed in the cylindrical housing 8180.

Hereinafter, variously modified examples of the components of the present invention will be described.

[0120] FIG. 36 illustrates a modified example in which the fixing gears 8130a and 8130b are replaced with the fixing gears 8131a and 8131b which has an oval shape, but does not have a circular shape, and the planetary gears 8140a, 8140b, 8140c, and 8140d are replaced with the eccentric planetary gears 8141a, 8141b, 8141c, and 8141d, and then the fixing gears 8131a and 8131b and the planetary gears 8140a, 8140b, 8140c, and 8140d are engaged with each other. The ratio of a maximum rotation rate to a minimum rotation rate in each of the first and second rotational pistons 8160 and 8161 may be changed and increased. Thus, each of the first and second rotational piston blades 8170 and 8171 may be decreased in thickness to increase a volume of each of the suction/pressure chambers 8220.

[0121] FIG. 37 illustrates a modified example in which the discharge hole 8212 of the present invention is defined in the housing side plate 8182a. Since the suction hole 8211 is defined in the housing cylinder 8181, and the discharge hole 8212 is defined in the housing side plate 8182a, the suction and the discharge may be smoothly performed, and a manifold may be easily constituted for the suction and discharge.

[0122] FIG. 38 is a perspective view illustrating a modified example of the rotational piston, the suction hole, and the discharge hole according to the present invention. Here, the blades 8160 and 8161 of the first and second rotational pistons may be inclined to allow a fluid to smoothly flow. In addition, the inclination of each of the blades 8160 and 8161 may have a linear and curved shape.

[0123] FIG. 39 is an exploded perspective view illustrating a modified example in which a contact conversion ring 8151 is installed in a slot hole 8210b of a rotational piston 8171, and a rotation pin is coupled thereto according to the present invention. Since the contact conversion ring 8151 is slidably moved in a state where the contact conversion ring 8151 surface-contacts the slot hole 8210b, the parts may be minimized in abrasion.

[0124] FIG. 40 is an exploded perspective view illustrating a modified example in which a crank arm 8110 is divided into two crank arms 8111 and 8112 according to the present invention. Here, the two crank arms 8111 and 8112 may operate the first and second rotational pistons 8160 and 8161, respectively, to effectively cope with a case in which it is needed to increase a length of each of the blades so as to increase a volume of the suction/pressure chamber 8220.

[0125] FIG. 41 is a view a structure in which a plurality of rotational clap suction/pressure devices are combined and connected to each other through the same shaft according to a modified example of the present invention.

[0126] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

[0127] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. A rotational clap suction/pressure device comprising:

   a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and a housing side plate is disposed on each of both sides of the housing cylinder;
   a crankshaft passing through a central portion of the housing side plate, the crankshaft being rotatably supported by the cylindrical housing;
   a crankpin extending from a central portion of the crankshaft;
   a first rotational piston rotatably disposed within the cylindrical housing, the first rotational piston having a shaft driving hole in a central portion thereof, a slot (a long hole) in a center thereof, and a plurality of blades on an outer circumference thereof;
   a second rotational piston rotatably disposed in the cylindrical housing to face the first rotational piston, the second rotational piston having a shaft driving hole in a central portion thereof, a slot in a center thereof, and a plurality of blades on an outer circumference thereof;
   a gear ring fixedly disposed along an inner circumferential surface of the housing side plate, the gear ring comprising a fixed internal gear on an inner circumferential surface thereof;
   a connection tube coupled to an outer circumferential surface of the crankpin and slidably rotated together with the crankpin, the connection tube comprising a planetary external gear corresponding to the fixed internal gear on an outer circumferential surface thereof;
   a connecting rod extending from the outer circumferential surface of the connection tube; and
   a rotation pin disposed on an end of the connecting rod, the rotation pin being inserted into the slots of the first and second rotational pistons,
   wherein, when the crankpin is rotated in a clockwise direction by rotation of the crankshaft, the planetary external gear is engaged (tooth engagement) with the fixed internal gear while being rotated, and the first and second rotational pistons are non-uniformly rotated in the same direction, i.e., in a counterclockwise direction through the connection tube, the connecting rod, and the rotation pin to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

2. The rotational clap suction/pressure device of claim 1, wherein, when the number of blades of each of the first and second rotational pistons is N, a gear ratio between the fixed internal gear and the planetary gear is N:N-1.

3. The rotational clap suction/pressure device of claim 1 or 2, wherein the suction and discharge holes which are defined in the housing cylinder are provided in a plurality of pairs, and a portion of the plurality of pairs of suction and discharge holes comprises an ignition plug.

4. The rotational clap suction/pressure device of claim 1 or 2, wherein a structure for engaging the fixed internal gear with the planetary external gear is provided on only one of both sides of the fixed internal gear and the planetary external gear, and a structure for guiding a circular contact on the other one of the fixed internal gear and the planetary external gear.

5. The rotational clap suction/pressure device of claim 1 or 2, wherein a slidably movable contact conversion ring is disposed on the slot, and the rotation pin is coupled to the contact conversion ring.

6. The rotational clap suction/pressure device of claim 1 or 2, wherein the crankpin is bisectionally divided into two parts each having a semicircular shape in a middle sectional, and ends of the divided parts are respectively inserted into both sides of the connection tube and then are engaged with and coupled to each other.

7. The rotational clap suction/pressure device of claim 1 or 2, wherein the crankpin is bisectionally divided into two parts, and ends of the divided parts are respectively fitted into inner tubes defined in both sides of the connection tube of which a middle portion is blocked.

8. The rotational clap suction/pressure device of claim 1 or 2, wherein a plurality of rotational clap suction/pressure devices are connected to one same crankshaft in series.

9. A rotational clap suction/pressure device comprising:

a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and a housing side plate is disposed on each of both sides of the housing cylinder;
a crankshaft passing through a central portion of the housing side plate, the crankshaft being rotatably supported by the cylindrical housing;
a crankpin extending from a central portion of the crankshaft;
a first rotational piston rotatably disposed within the cylindrical housing, the first rotational piston having a shaft driving hole in a central portion thereof, a slot (a long hole) in a center thereof, and a plurality of blades on an outer circumference thereof;
a second rotational piston rotatably disposed in the cylindrical housing to face the first rotational piston, the second rotational piston having a shaft driving hole in a central portion thereof, a slot in a center thereof, and a plurality of blades on an outer circumference thereof;
a gear ring fixedly disposed along an inner circumferential surface of the housing side plate, the gear ring comprising a fixed internal gear on an inner circumferential surface thereof;
a connection tube coupled to an outer circumferential surface of the crankpin and slidably rotated together with the crankpin, the connection tube comprising a planetary external gear corresponding to the fixed internal gear on an outer circumferential surface thereof;
connecting rods symmetrically extending from a central portion of the outer circumferential surface of the connection tube with a predetermined distance therebetween; and
rotation pins respectively disposed on ends of the connecting rods, the rotation pins being bent in directions facing each other and inserted into the slots of the first and second rotational pistons, respectively,
wherein, when the crankpins are rotated in a clockwise direction by rotation of the crankshaft, the planetary external gear is engaged (tooth engagement) with the fixed internal gear while being rotated, and the first and second rotational pistons are non-uniformly rotated in the same direction, i.e., in a counterclockwise direction through the connection tube, the connecting rods, and the rotation pins to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

10. The rotational clap suction/pressure device of claim 9, wherein a plurality of rotational clap suction/pressure devices are connected to one same crankshaft in series.

11. A rotational clap suction/pressure device comprising:

a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and a housing front plate and a housing rear plate are disposed on each of both sides of the housing cylinder;
a first rotational piston rotatably disposed in a space part within the cylindrical housing, the first rotational piston comprising a solid shaft extending toward a driving part at a central portion thereof and a plurality of blades on an outer circumference thereof;
a second rotational piston 6161 rotatably disposed in the space part to face the first rotational piston, the second rotational piston comprising a hollow shaft extending toward the driving part at a central portion thereof and a plurality of blades on an outer circumference thereof;
a first rotational piston driving gear coupled to the solid shaft of the first rotational piston;
a second rotational piston driving gear coupled to the hollow shaft of the second rotational piston;
a first power transmission gear engaged with the first rotational piston driving gear;
a second power transmission gear engaged with the second rotational piston driving gear;
a first power transmission shaft and a first driving eccentric gear which are coupled to the first power transmission gear;
a second power transmission shaft and a second driving eccentric gear which are coupled to the second power transmission gear;
a main shaft eccentric gear engaged with the first and second driving eccentric gears; and
a main shaft coupled to the main shaft eccentric gear,
wherein, when the first and second driving eccentric gears are non-uniformly rotated opposite to each other in a counterclockwise direction by rotation of the main shaft in a clockwise direction, the first power transmission gear rotates the first rotational piston driving gear and the first rotational piston at a decelerated rate in the clockwise direction, and the second power transmission gear rotates the second rotational piston driving gear and the second rotational piston at a decelerated rate in the clockwise direction to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

12. The rotational clap suction/pressure device of claim 11, wherein when a gear ratio of each of between the first rotational piston driving gear and the second rotational piston driving gear and between the first power transmission gear and the second power transmission gear is N:1, the number of each of the first and second rotational pistons is N.

13. The rotational clap suction/pressure device of claim 11 or 12, wherein all or portions of the plurality of suction and discharge holes defined in the housing cylinder are replaced with suction and discharge holes defined with the same number as the plurality of suction and discharge holes in the housing rear plate instead of the housing cylinder.

14. The rotational clap suction/pressure device of claim 11 or 12, wherein the suction and discharge holes which are defined in the housing cylinder are provided in a plurality of pairs, and a portion of the plurality of pairs of suction and discharge holes comprises an ignition plug.

15. The rotational clap suction/pressure device of claim 14, wherein one ignition plug is provided in one suction/pressure chamber, or at least two ignition plugs are provided in the suction/pressure chamber when the suction/pressure chamber is longitudinally provided.

16. The rotational clap suction/pressure device of claim 11 or 12, wherein each of the blades of the first and second rotational pistons has a linear shape inclined at a predetermined angle with respect to the housing front and rear plates or a curved shape.

17. The rotational clap suction/pressure device of claim 11 or 12, wherein a plurality of rotational clap suction/pressure devices are combined with each other and connected to one shaft.

18. A rotational clap suction/pressure device comprising:

a cylindrical housing in which a suction hole and a discharge hole are defined in a housing cylinder at a predetermined distance, and housing side plates are disposed on each of both sides of the housing cylinder;
a fixing gear respectively extending from a central portion of each of the housing side plates, the fixing gear being integrated with each of the housing side plate;
a first rotational piston rotatably disposed in a space part within the cylindrical housing, the first rotational piston comprising a crankshaft driving hole in a central portion thereof, a slot hole in a middle portion thereof, and a plurality of blades on an outer circumference thereof;
a second rotational piston rotatably disposed in the space part to face the first rotational piston, the second rotational piston comprising a crankshaft driving hole in a central portion thereof, a slot hole in a middle portion thereof, and a plurality of blades on an outer circumference thereof;
a crankshaft passing through central portions of the housing side plates, the crankshaft being rotatably supported by the cylindrical housing;
a crank arm integrated with a central portion of the crankshaft;
a crankpin integrated with the crank arm;
a planetary gear inserted into and rotatably coupled to the crankpin, the planetary gear being circumscribed and engaged with the fixing gear; and
a rotation pin extending and integrated with the planetary gear, the rotation pin being inserted into the slot hole of each of the rotational pistons,
wherein, when the planetary gear is circumscribed on the fixed gear and rotated by the rotation of the crank shaft in a clockwise direction, the rotation pin is rotated in a epicycloid curve shape to non-uniformly oppositely rotate the first and second rotational pistons in the clockwise direction to suction and discharge a fluid through the suction hole and the discharge hole according to a change in volume of a suction/pressure chamber defined between an inner wall of the housing cylinder and the blades of the first and second rotational pistons.

19. The rotational clap suction/pressure device of claim 18, wherein, when a gear ratio between the fixed gear and the planetary gear is N:1, the number of each of the first and second rotational pistons is N.

20. The rotational clap suction/pressure device of claim 18 or 19, wherein the fixed gear has an oval shape, and the planetary gear is eccentric.

21. The rotational clap suction/pressure device of claim 18 or 19, wherein the plurality of suction and discharge holes defined in the housing cylinder are replaced with suction and discharge holes defined with the same number as the plurality of suction and discharge holes in the housing rear plate instead of the housing cylinder.

22. The rotational clap suction/pressure device of claim 18 or 19, wherein the suction and discharge holes which are defined in the housing cylinder are provided in a plurality of pairs, and a portion of the plurality of pairs of suction and discharge holes comprises an ignition plug.

23. The rotational clap suction/pressure device of claim 22, wherein one ignition plug is provided in one suction/pressure chamber, or at least two ignition plugs are provided in the suction/pressure chamber when the suction/pressure chamber is longitudinally provided.

24. The rotational clap suction/pressure device of claim 18 or 19, wherein each of the blades of the first and second rotational pistons has a linear shape inclined at a predetermined angle with respect to the housing side plate or a curved shape.

25. The rotational clap suction/pressure device of claim 18 or 19, wherein a slidably movable contact conversion ring is disposed on the slot hole, and the rotation pin is coupled to the contact conversion ring.

26. The rotational clap suction/pressure device of claim 25, wherein a roller instead of the contact conversion ring is disposed on the slot hole, and the rotation pin is coupled to the roller.

27. The rotational clap suction/pressure device of claim 18 or 19, wherein the crank arm is separated into two crank arms for respectively operating the first and second rotational pistons at a predetermined distance on the crankshaft.

28. The rotational clap suction/pressure device of claim 18 or 19, wherein a plurality of rotational clap suction/pressure devices are connected to one same crankshaft in series.

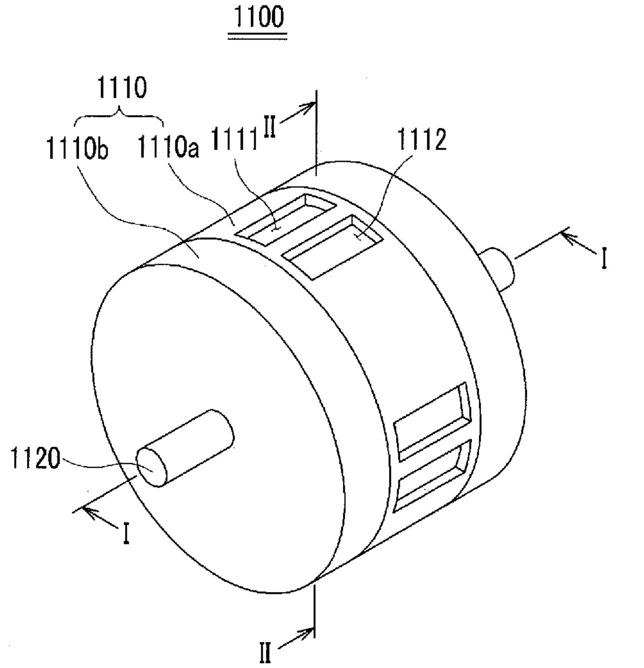
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Fig. 1

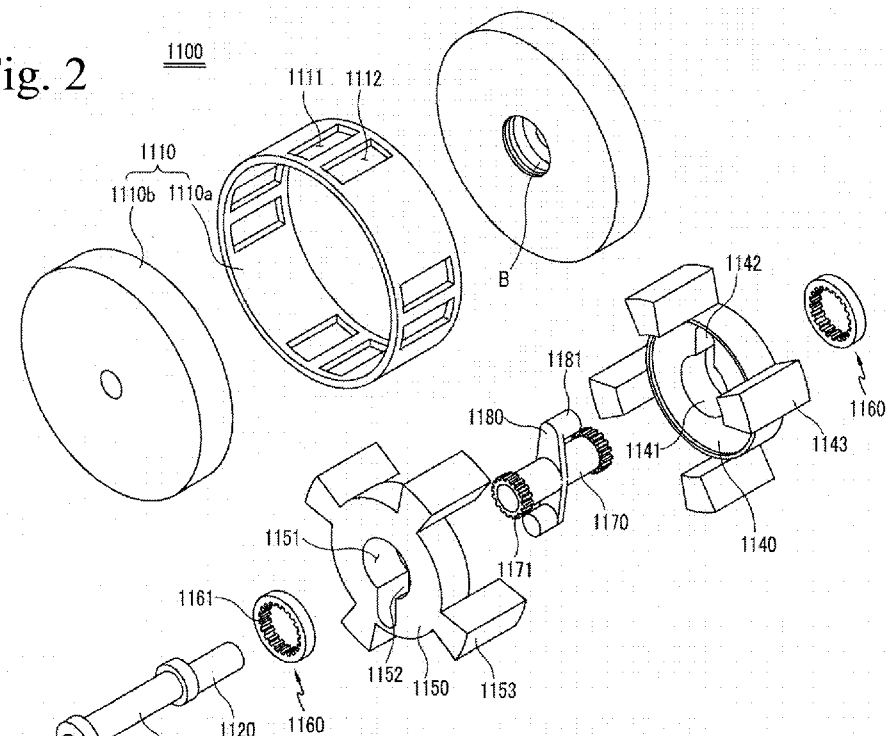
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Fig. 2

Fig. 3

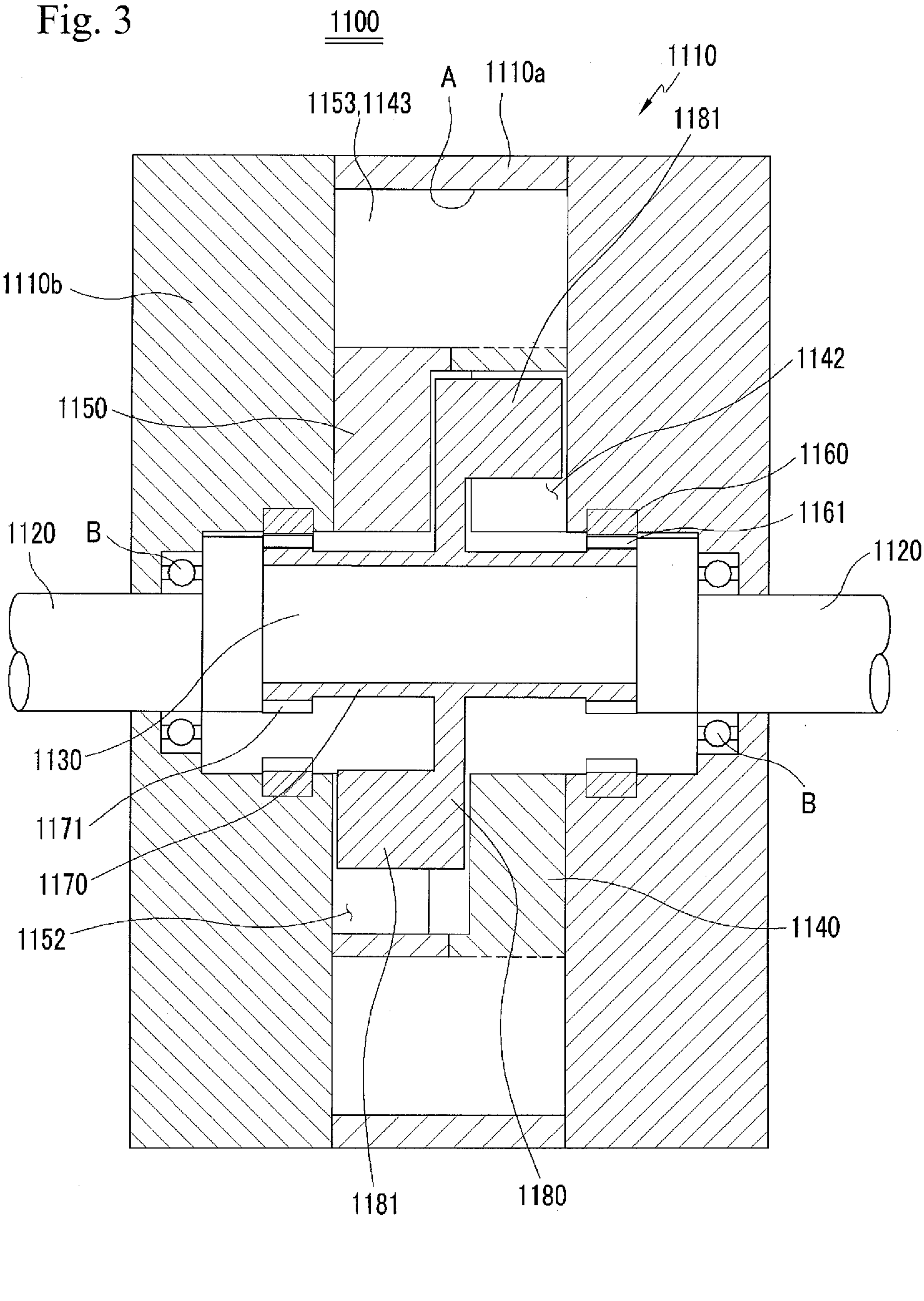
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Fig. 4

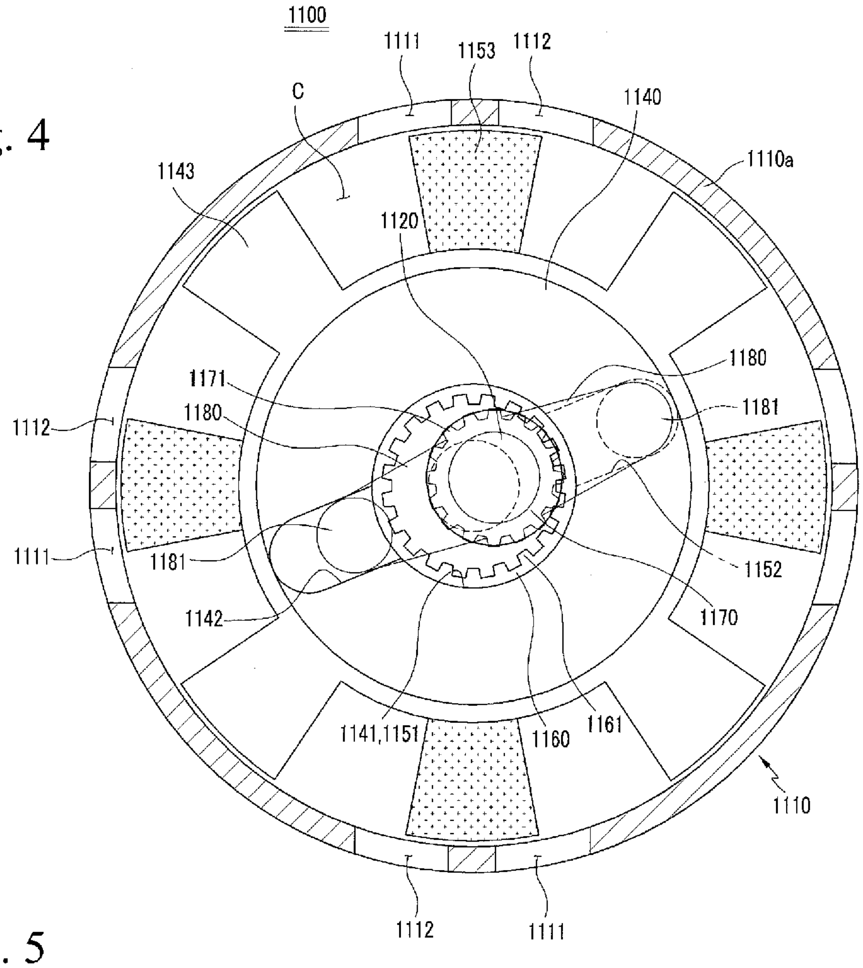
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Fig. 5

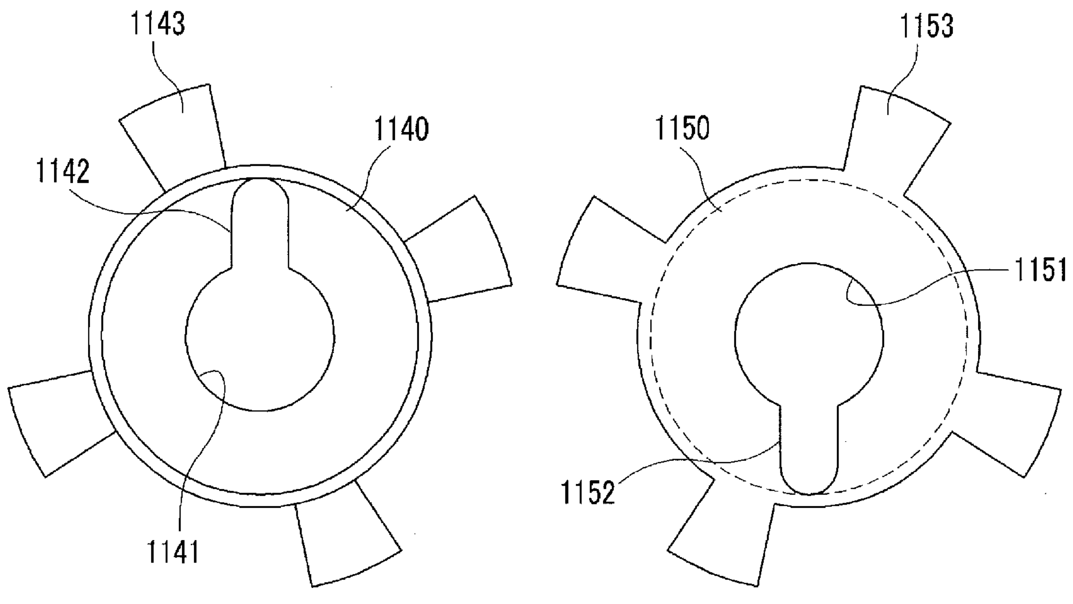
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Fig. 6

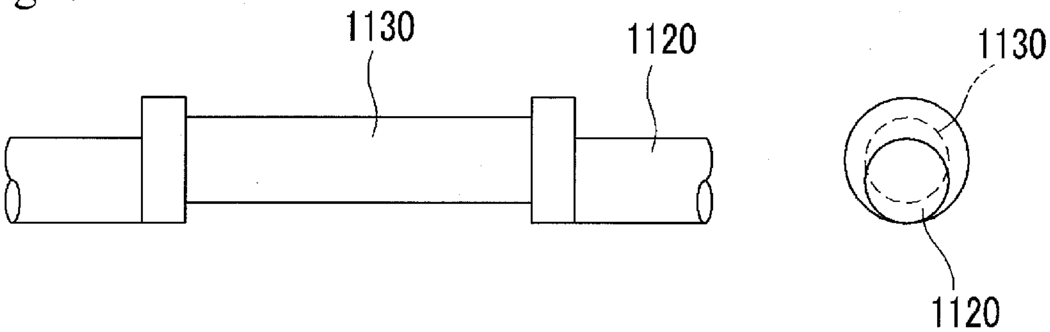


Fig. 7

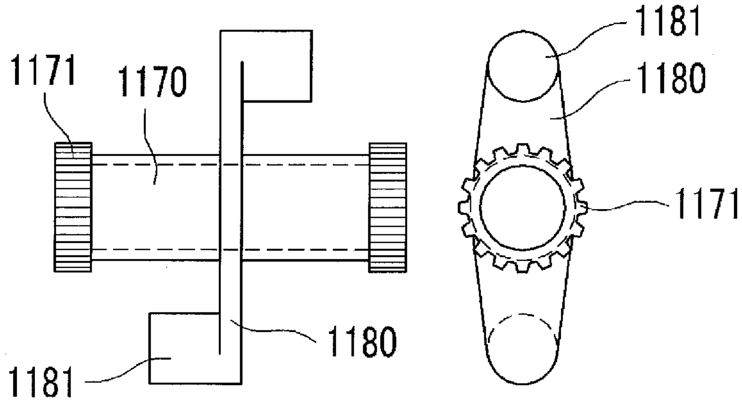
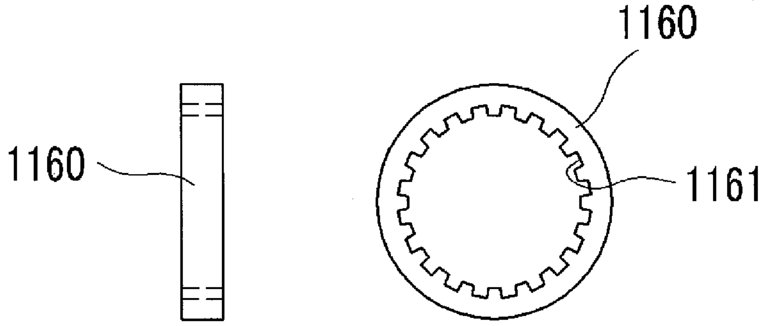


Fig. 8



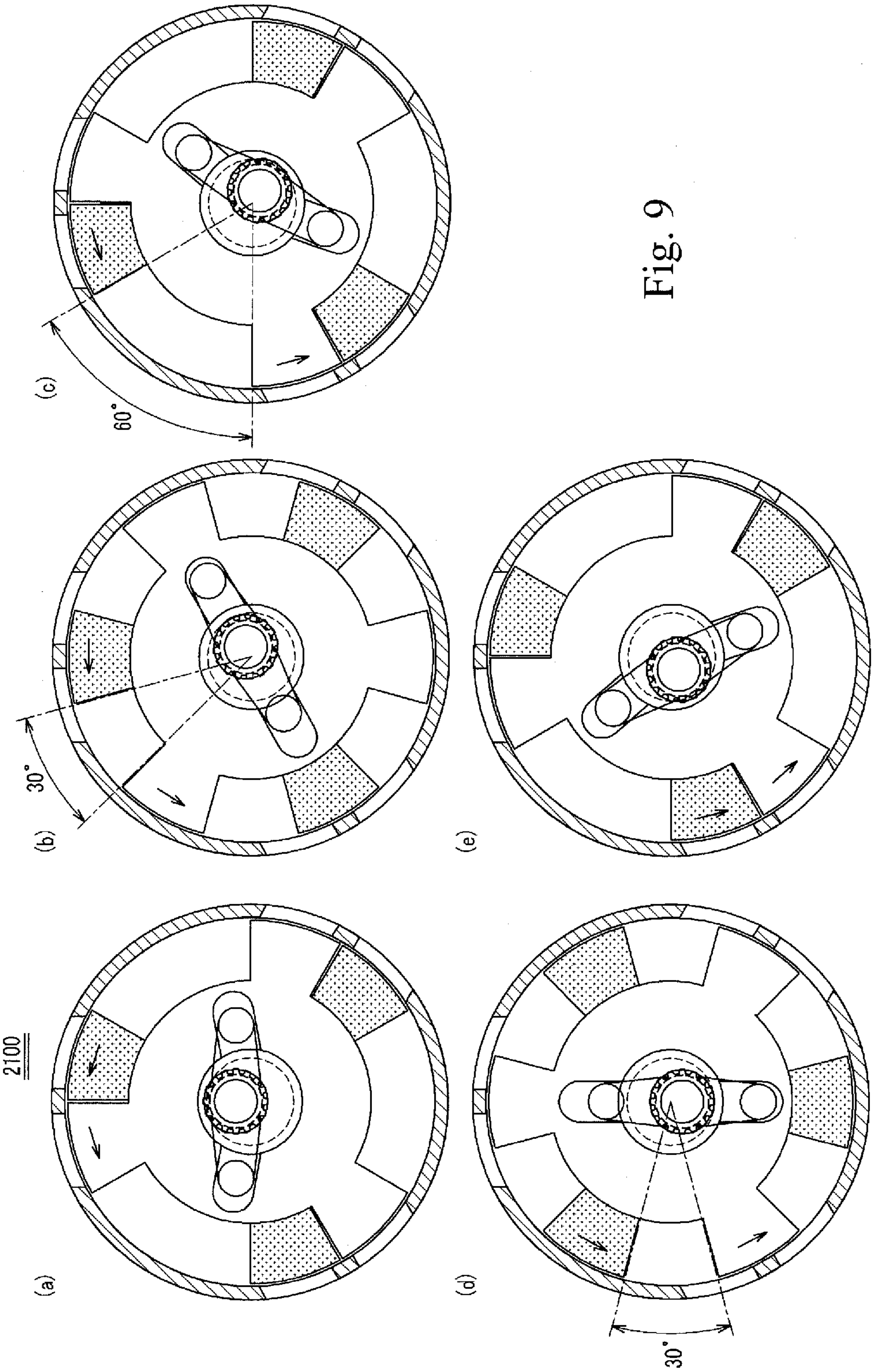


Fig. 9

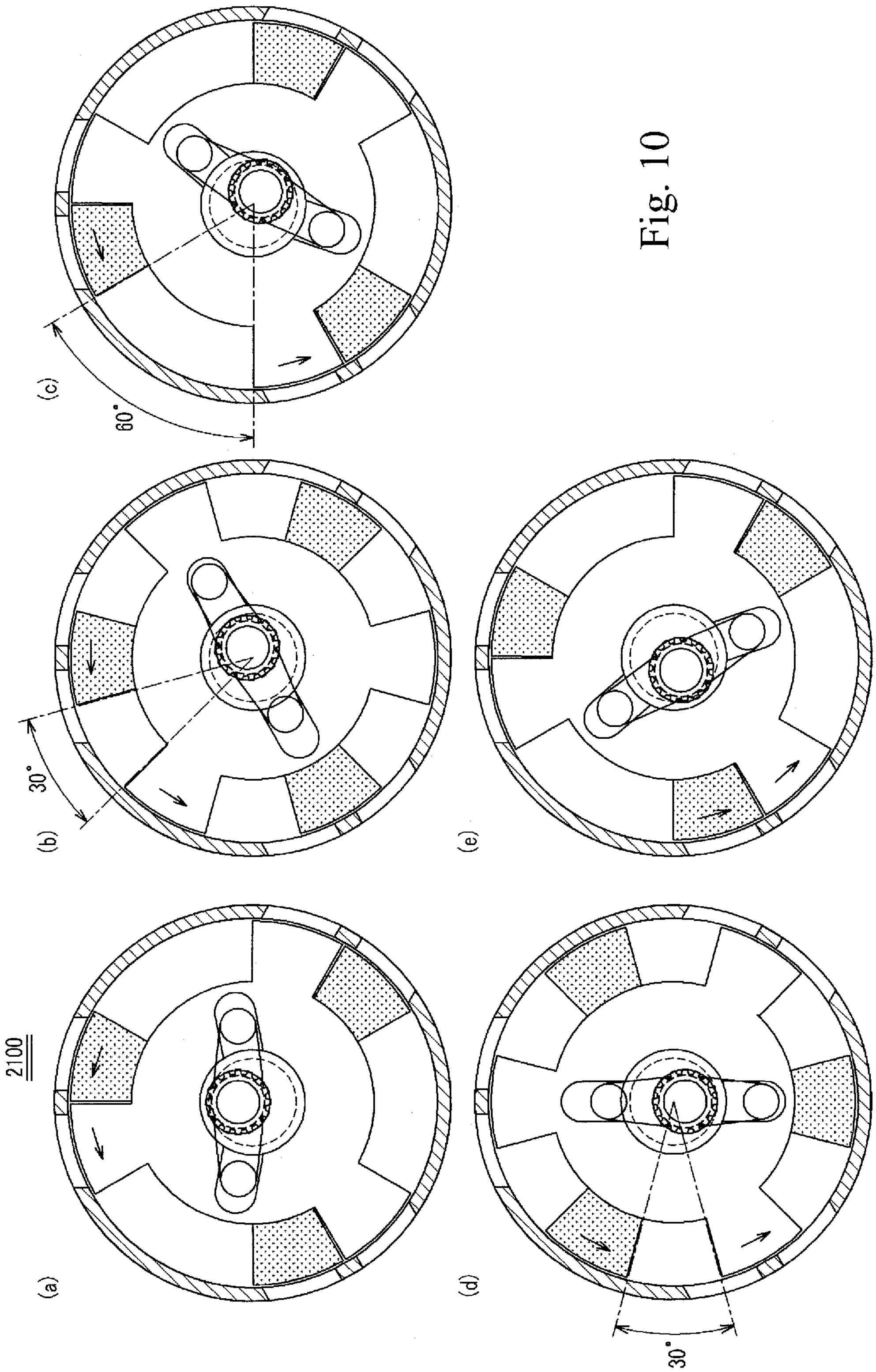


Fig. 10

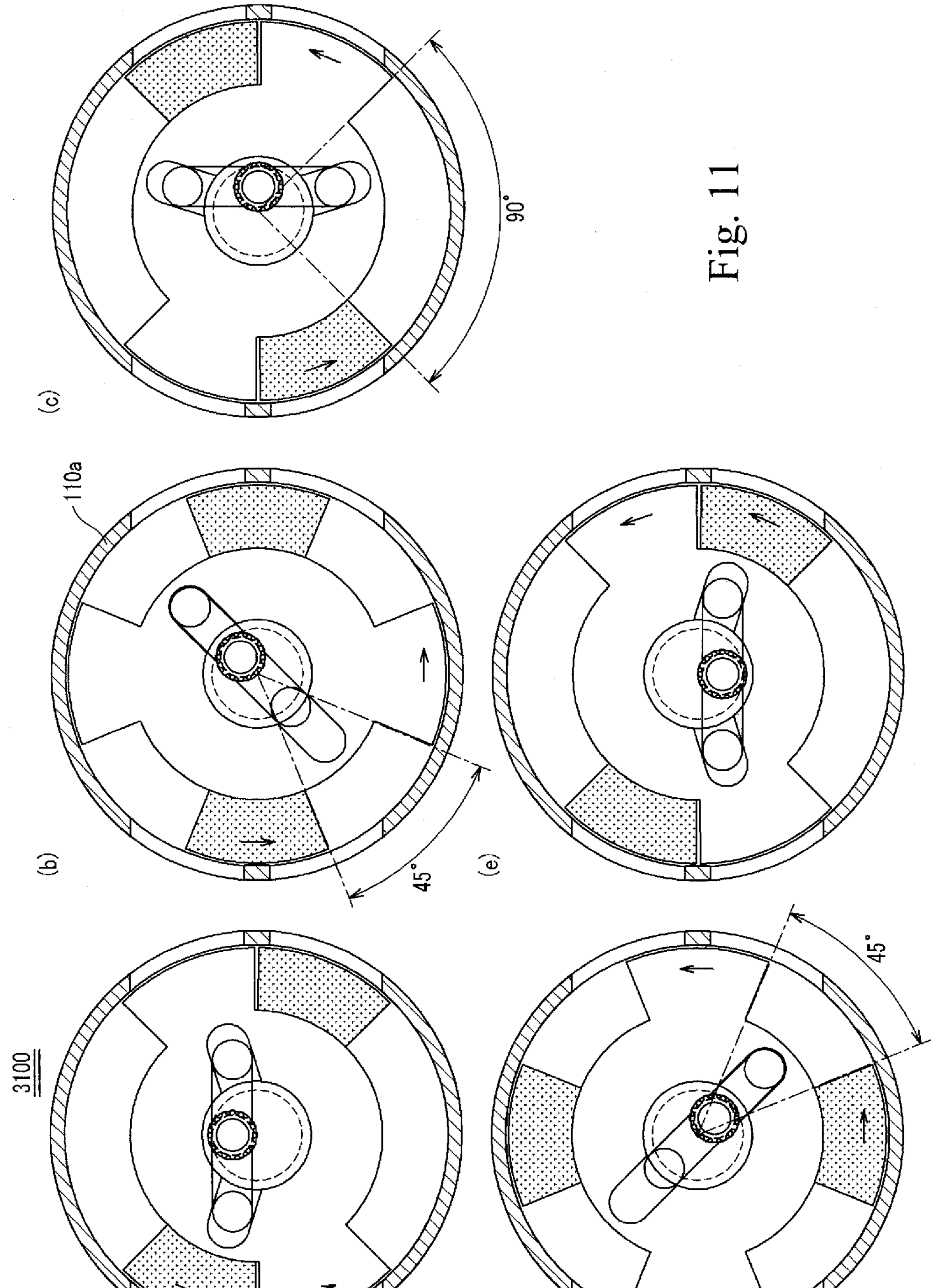
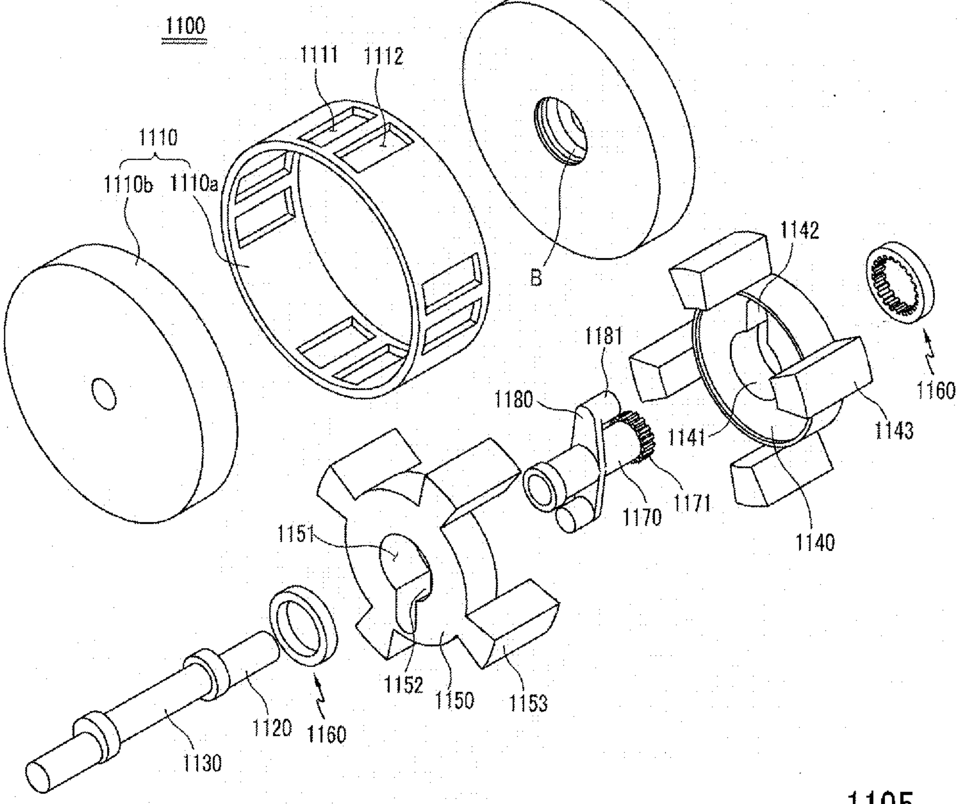


Fig. 11

Fig. 12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1151
1152
1150
1153
1120
1160
1130

Fig. 13

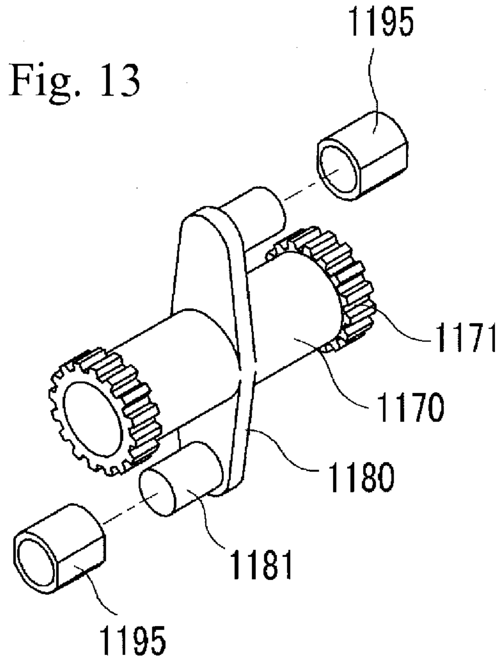

1195
1171
1170
1180
1181
1195

Fig. 14

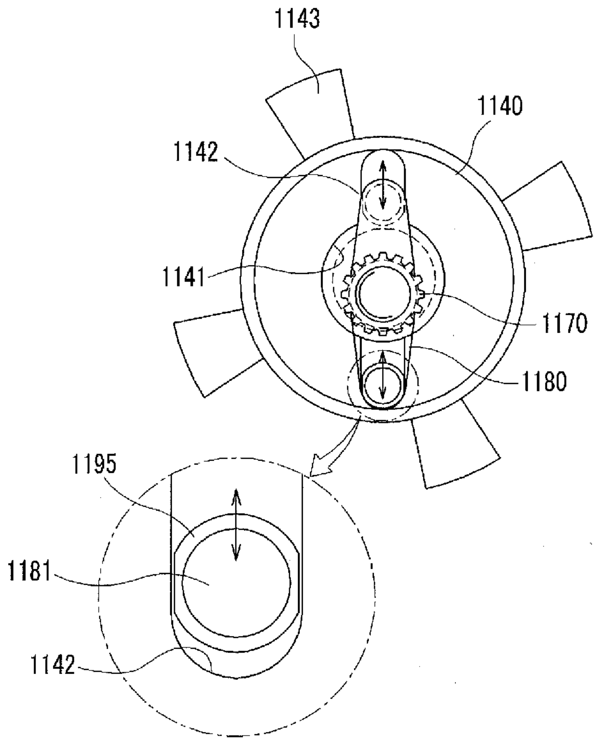


Fig. 15

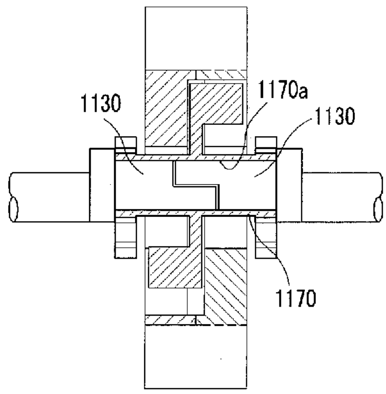


Fig. 16

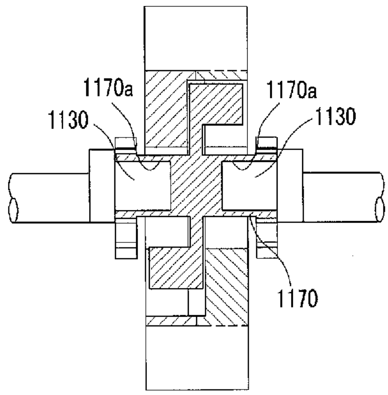


Fig. 17

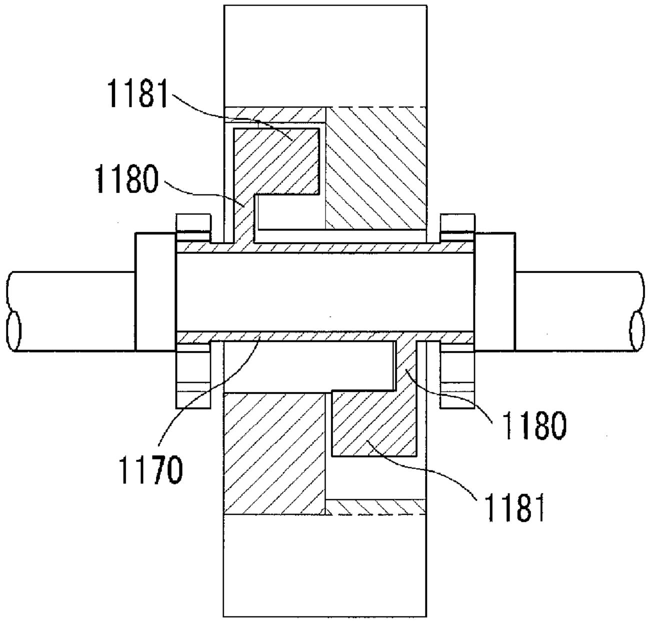
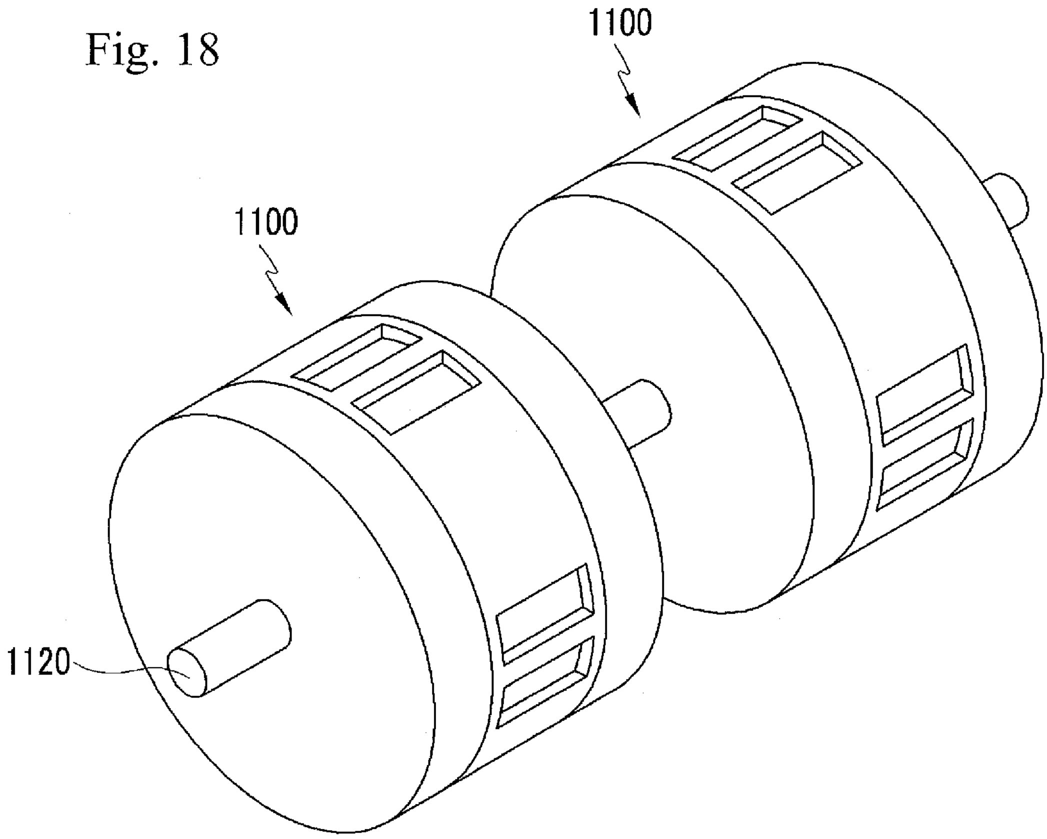


Fig. 18



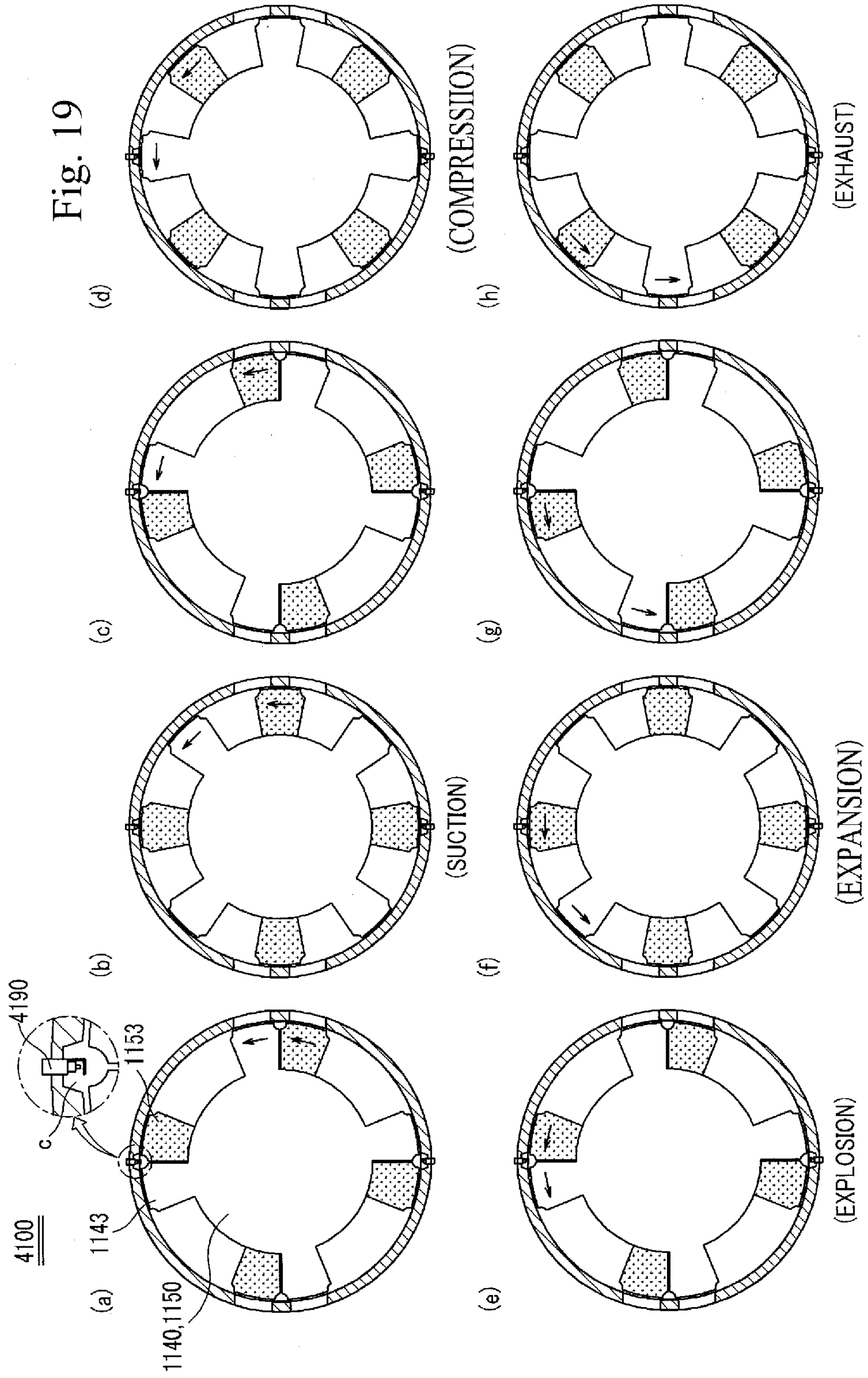
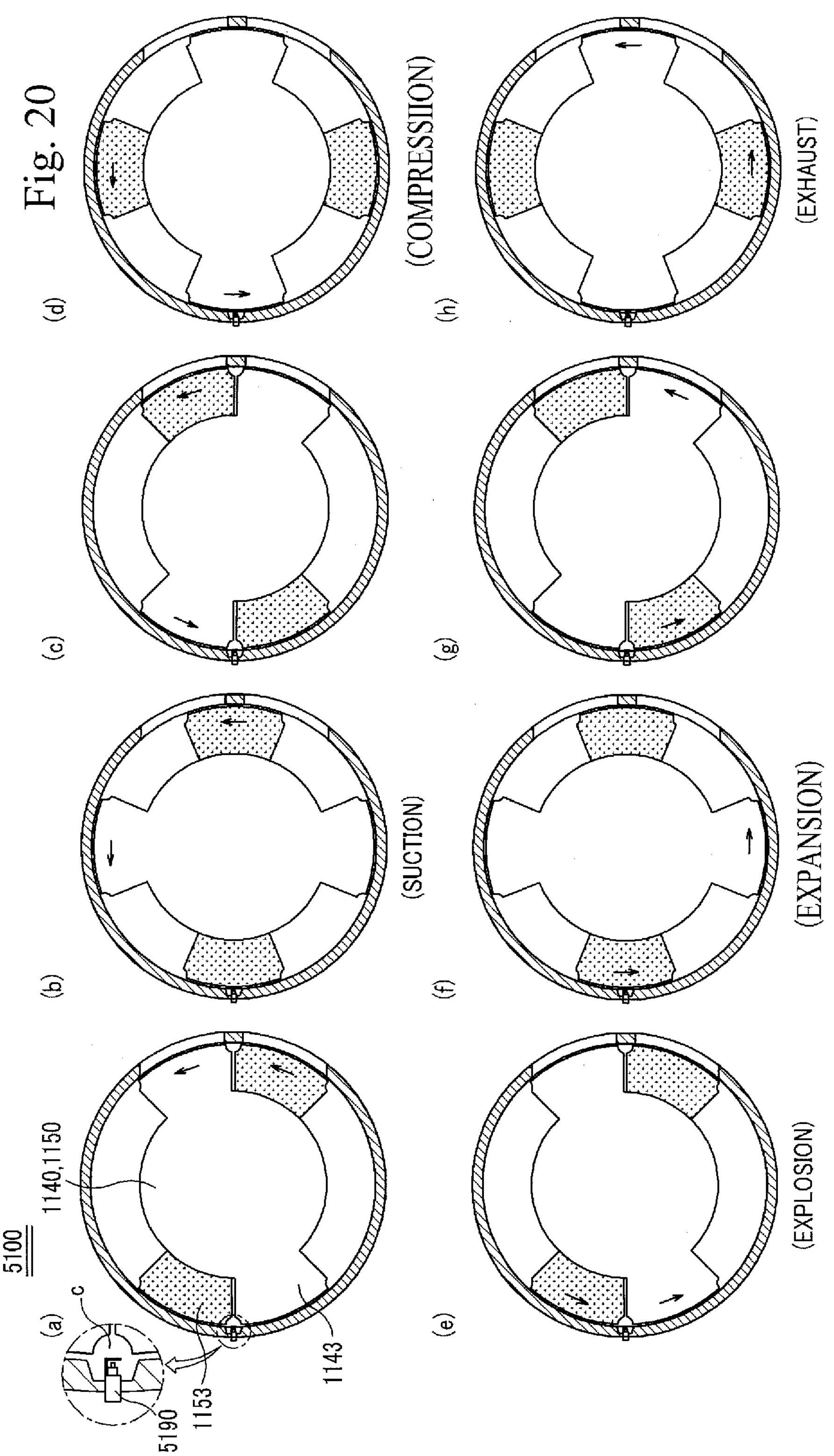

4100
4190
c
1153
1143
1140,1150
(a)
(b)
(c)
(d)
(e)
(f)
(g)
(h)
(EXPLOSION)
(SUCTION)
(EXPANSION)
(COMPRESSIION)
(EXHAUST)

Fig. 19



5100
1140,1150
c
5190
1153
1143
(a)
(b)
(SUCTION)
(c)
(d)
(COMPRESSIION)
(e)
(EXPLOSION)
(f)
(EXPANSION)
(g)
(h)
(EXHAUST)

Fig. 20

Fig. 21

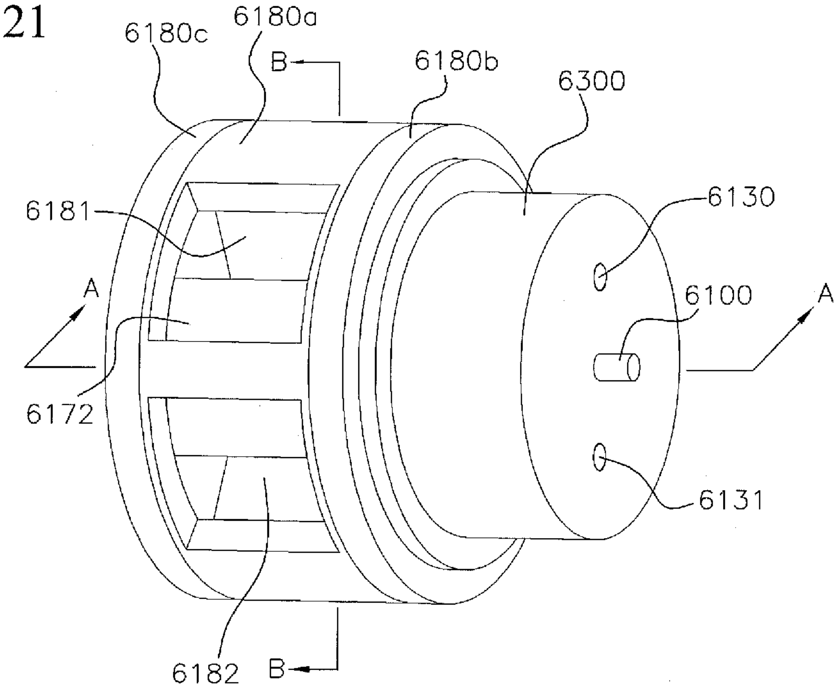

6180c
6180a
B
6180b
6300
6130
6181
A
6100
A
6172
6131
6182
B

Fig. 22

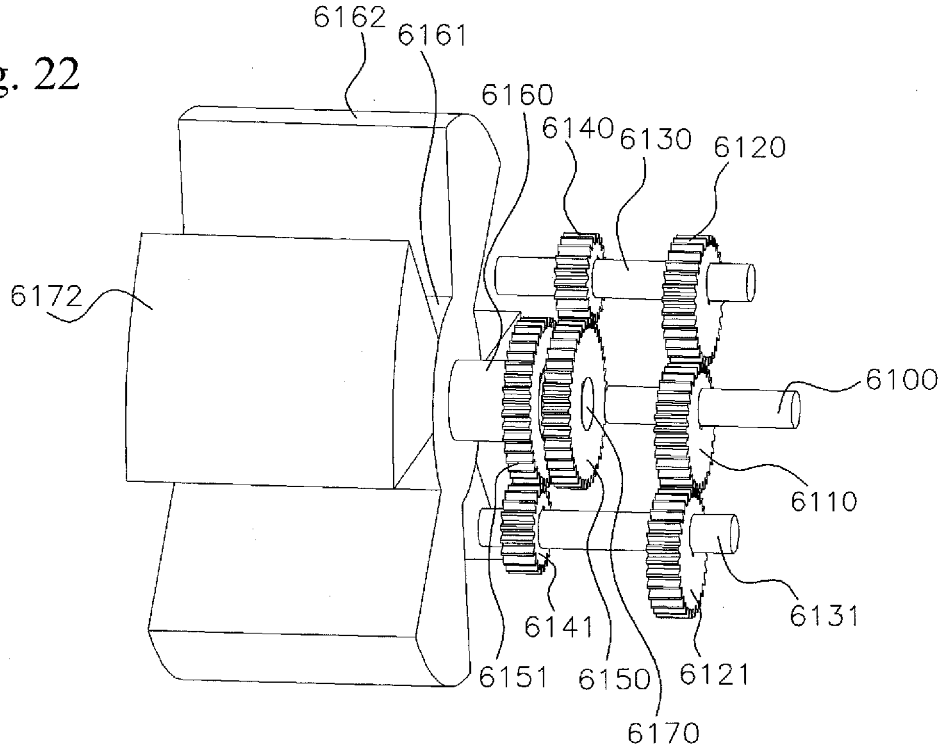

6162
6161
6160
6140
6130
6120
6172
6100
6110
6131
6141
6151
6150
6121
6170

Fig. 23

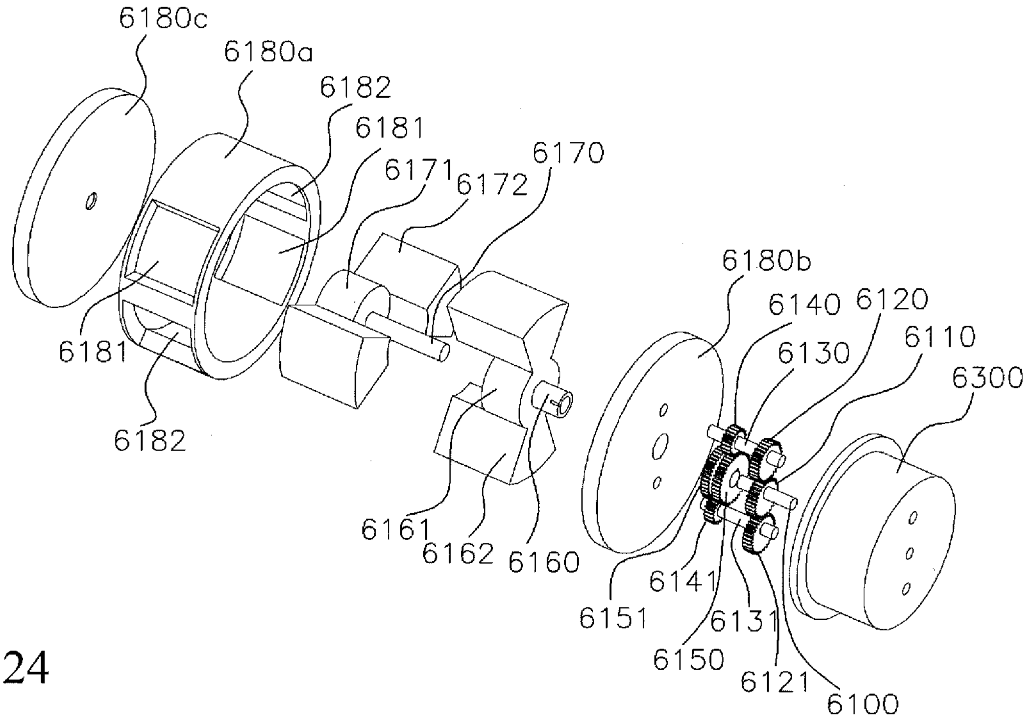

6180c
6180a
6182
6181
6171
6172
6170
6181
6182
6180b
6140
6120
6130
6110
6300
6161
6162
6160
6141
6151
6131
6150
6121
6100

Fig. 24

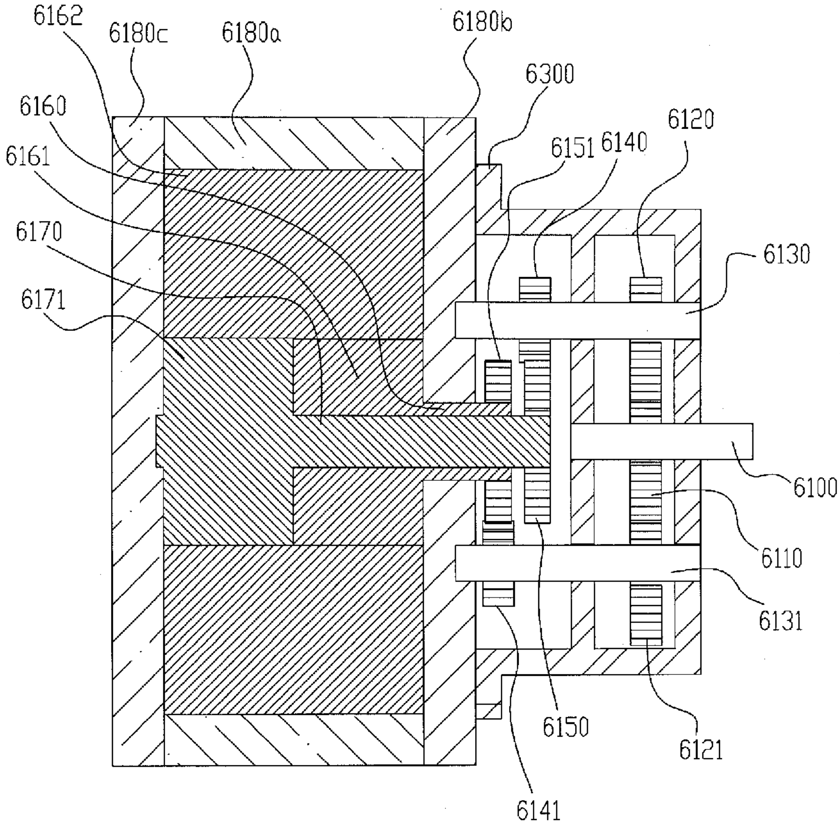

6162
6180c
6180a
6180b
6300
6160
6161
6151
6140
6120
6170
6130
6171
6100
6110
6131
6150
6121
6141

Fig. 25

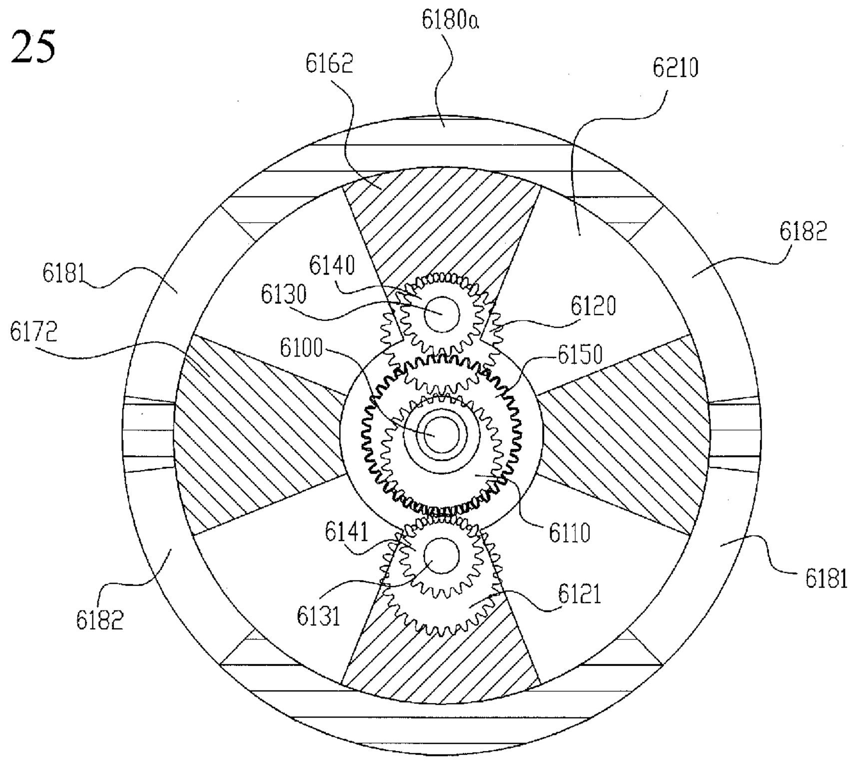

6180a
6162
6210
6182
6181
6140
6130
6120
6172
6100
6150
6110
6141
6181
6182
6131
6121

Fig. 26

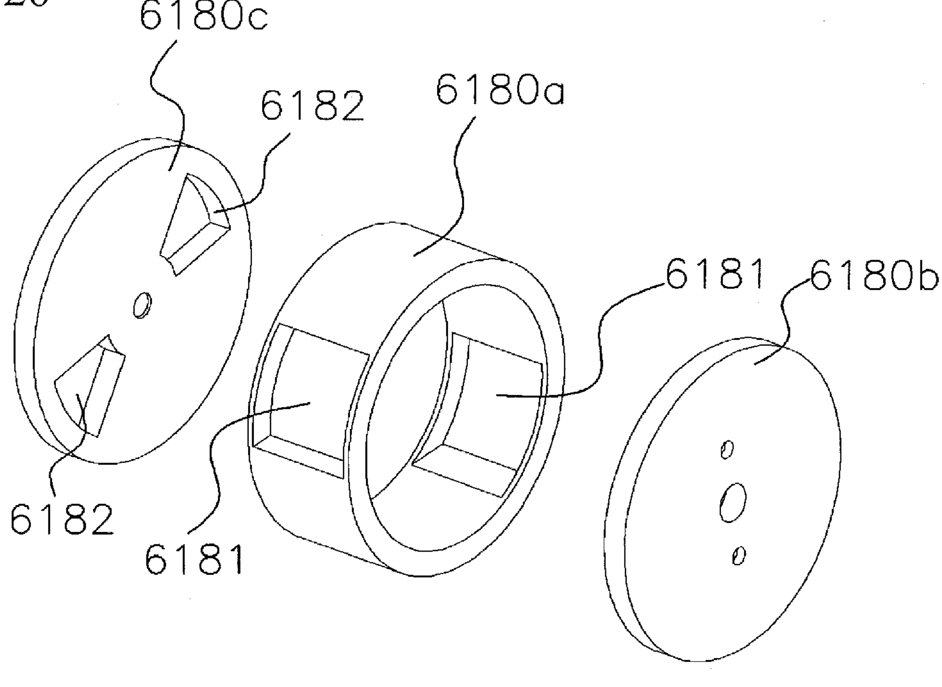

6180c
6182
6180a
6181
6180b
6182
6181

Fig. 27

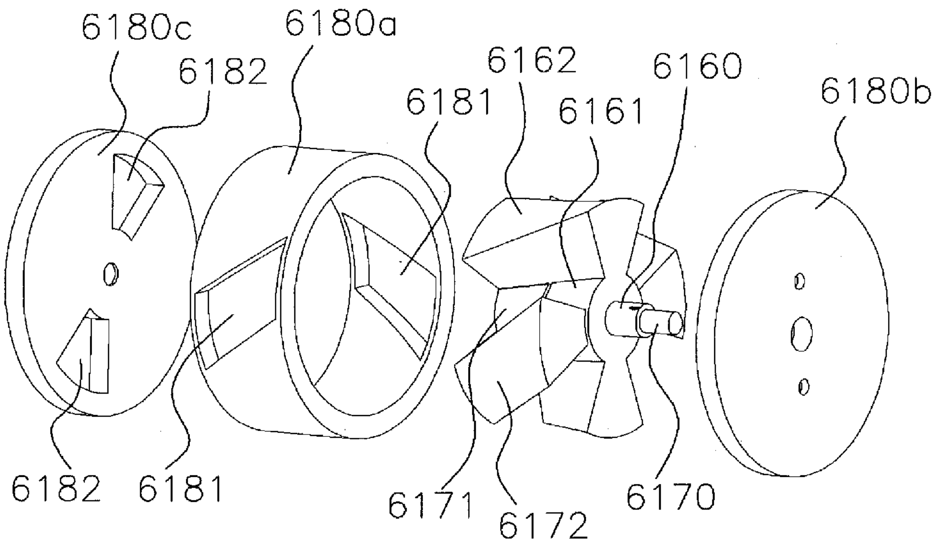
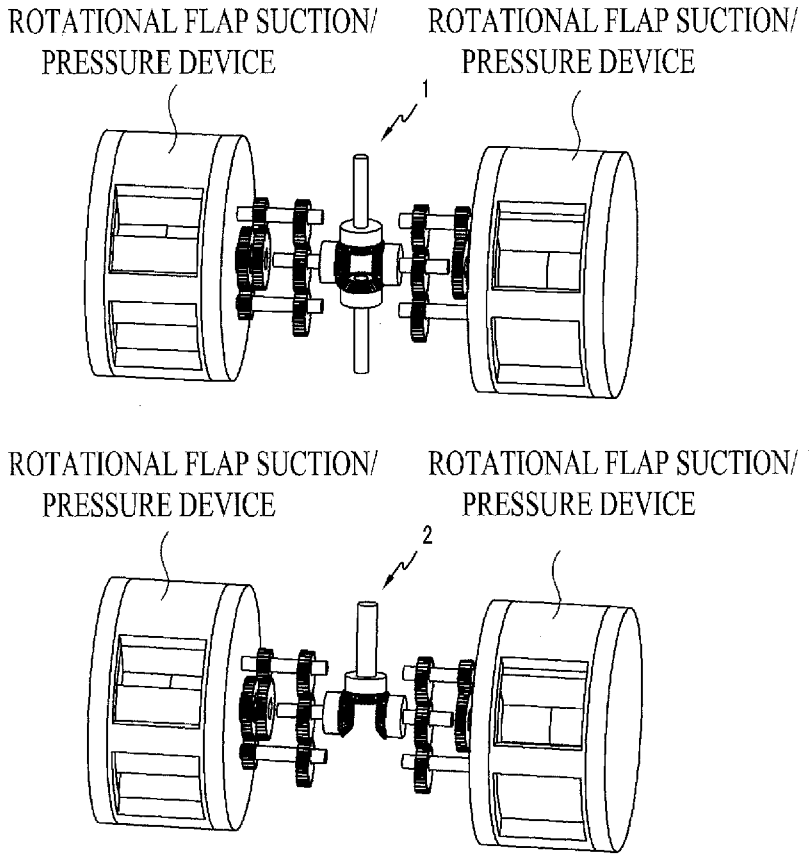

6180c
6180a
6182
6162
6160
6181
6161
6180b
6182
6181
6171
6172
6170

Fig. 28


ROTATIONAL FLAP SUCTION/ PRESSURE DEVICE
ROTATIONAL FLAP SUCTION/ PRESSURE DEVICE
1
ROTATIONAL FLAP SUCTION/ PRESSURE DEVICE
ROTATIONAL FLAP SUCTION/ PRESSURE DEVICE
2

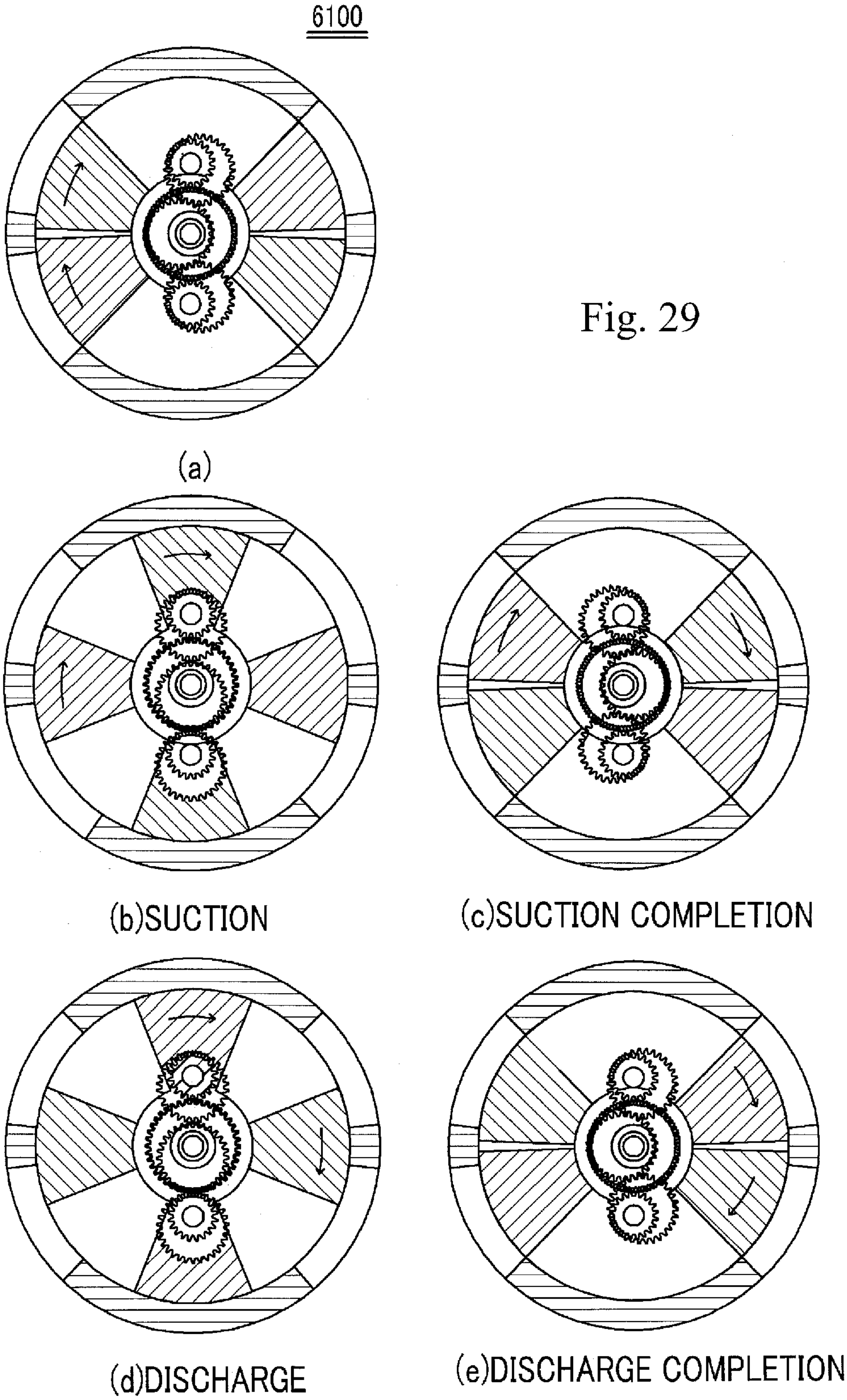

6100
(a)
(b)SUCTION
(c)SUCTION COMPLETION
(d)DISCHARGE
(e)DISCHARGE COMPLETION

Fig. 29

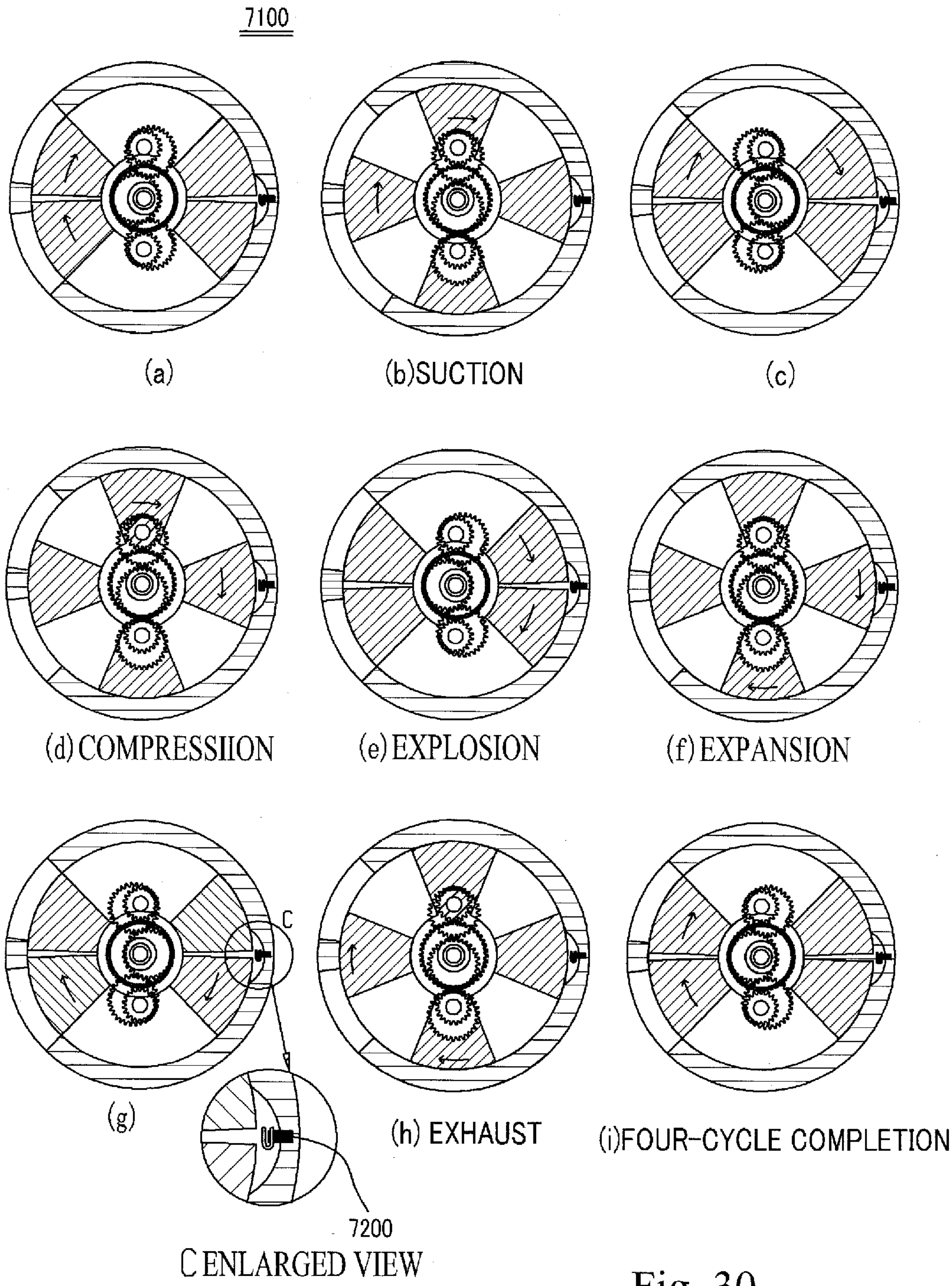

7100
(a)
(b)SUCTION
(c)
(d) COMPRESSIION
(e) EXPLOSION
(f) EXPANSION
C
(g)
(h) EXHAUST
(i)FOUR-CYCLE COMPLETION
7200
C ENLARGED VIEW

Fig. 30

Fig. 31

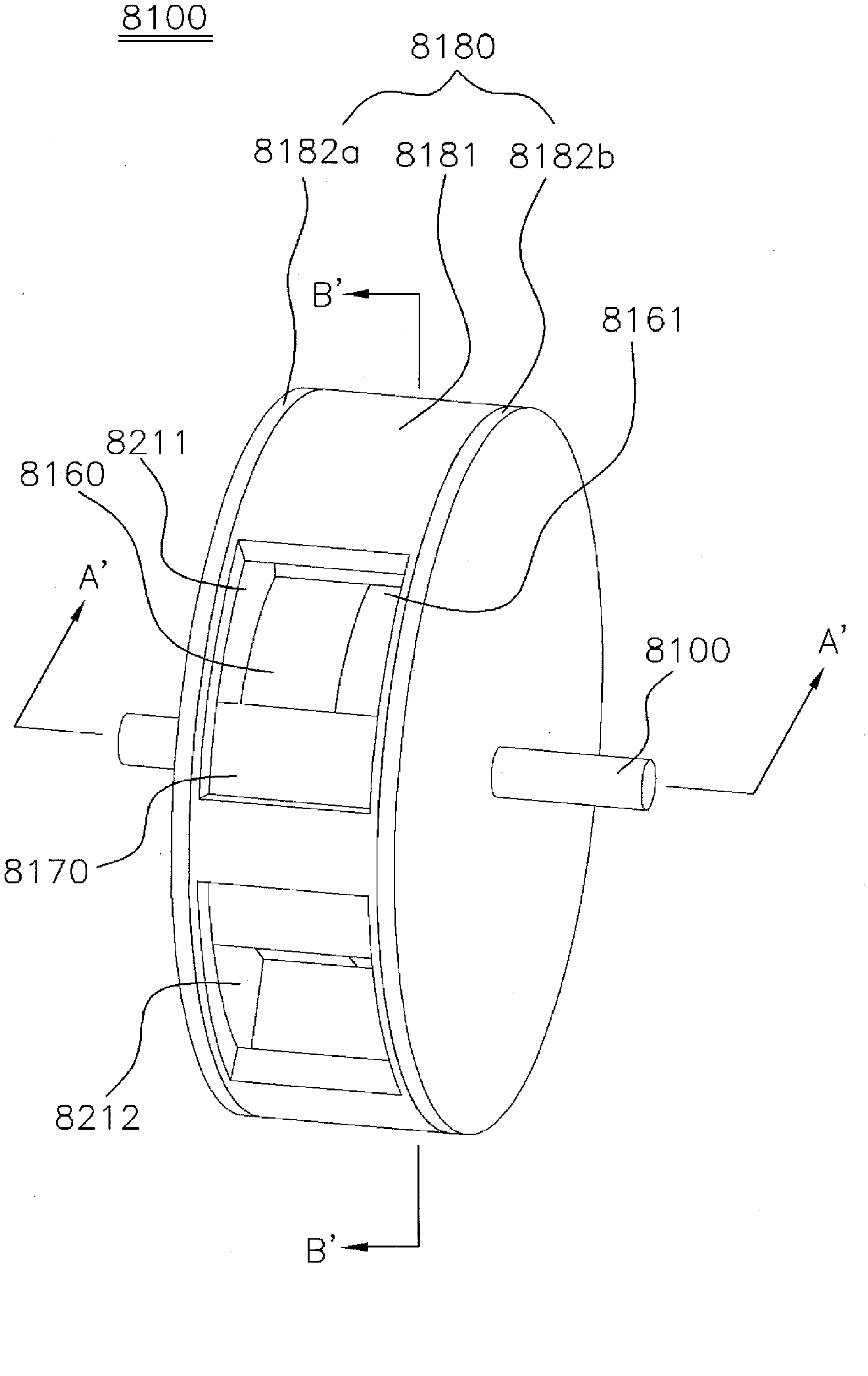

8100
8180
8182a
8181
8182b
B'
8161
8211
8160
A'
8100
A'
8170
8212
B'

Fig. 32

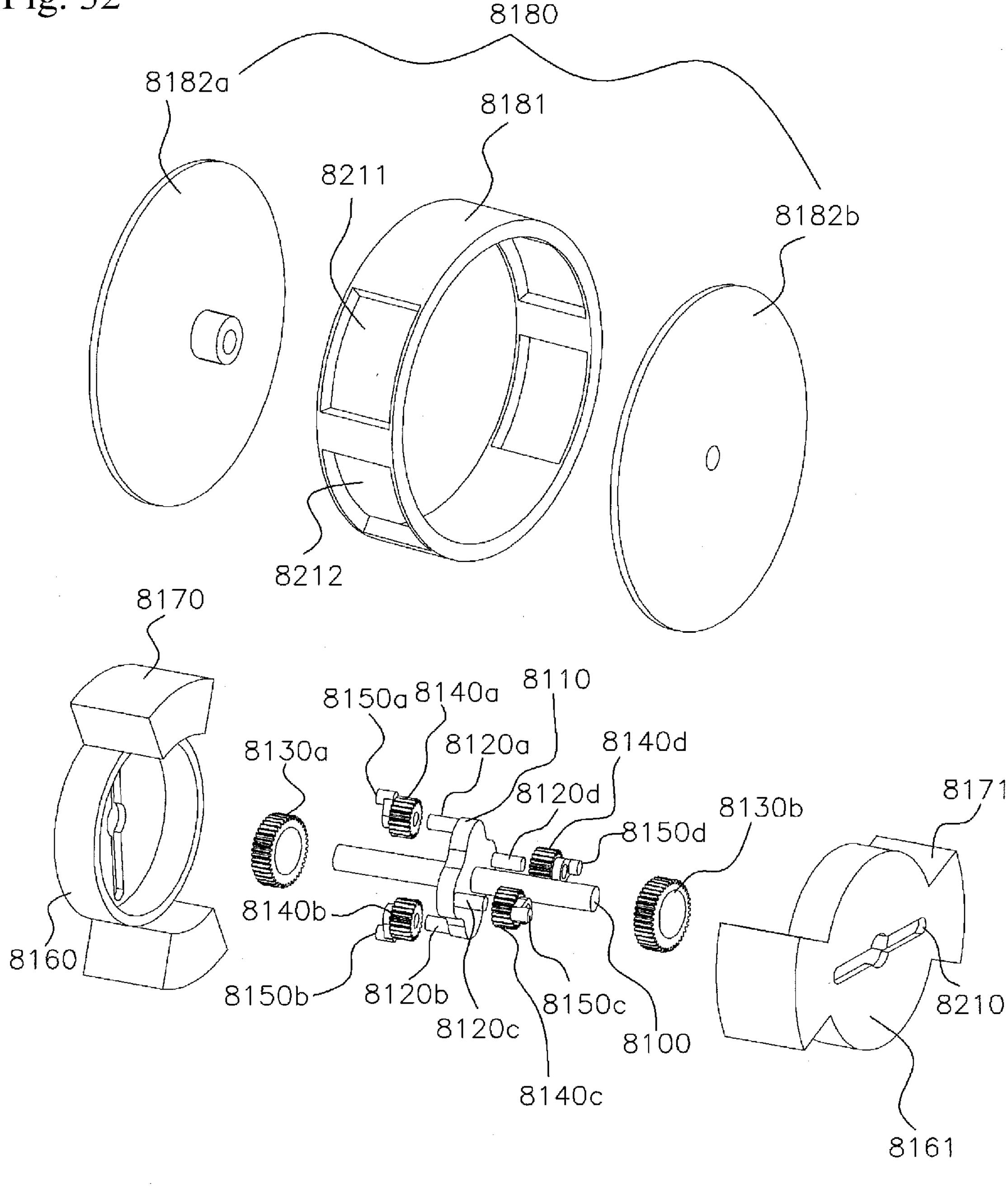

8180
8182a
8181
8211
8182b
8212
8170
8150a
8140a
8110
8130a
8120a
8140d
8120d
8171
8130b
8150d
8140b
8160
8150b
8120b
8120c
8150c
8100
8210
8140c
8161

Fig. 33

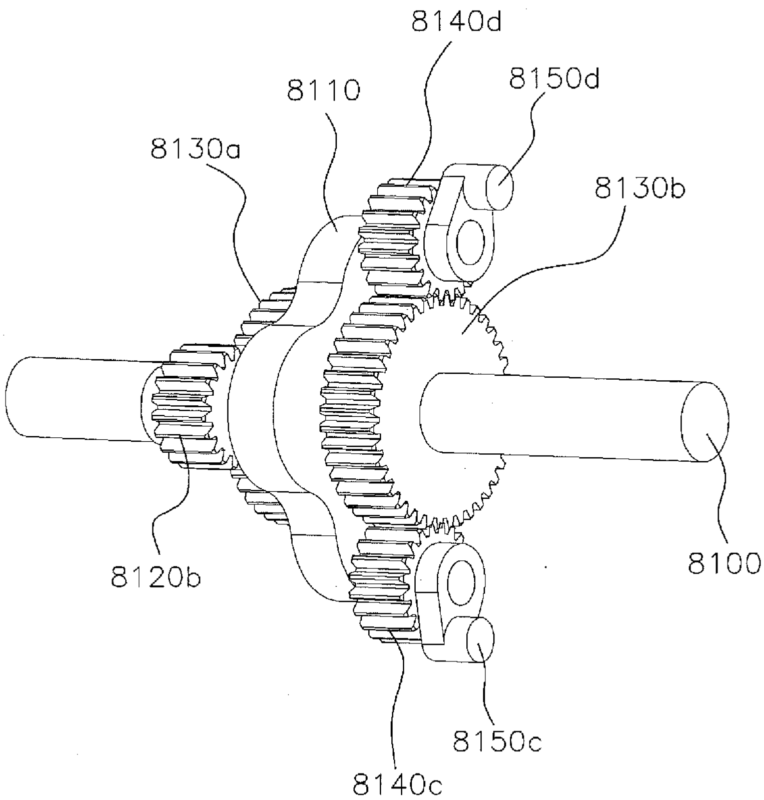

8140d
8110
8150d
8130a
8130b
8120b
8100
8150c
8140c

Fig. 34

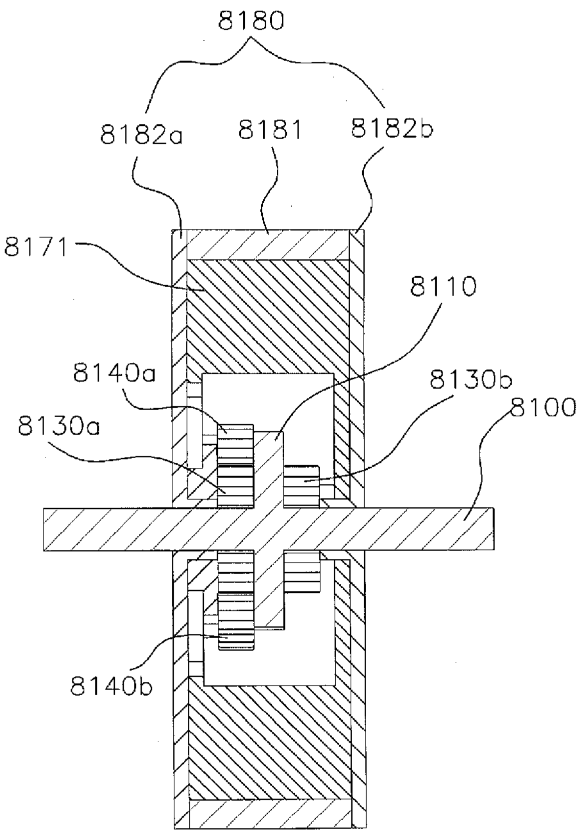

8180
8182a
8181
8182b
8171
8110
8140a
8130b
8130a
8100
8140b

Fig. 35

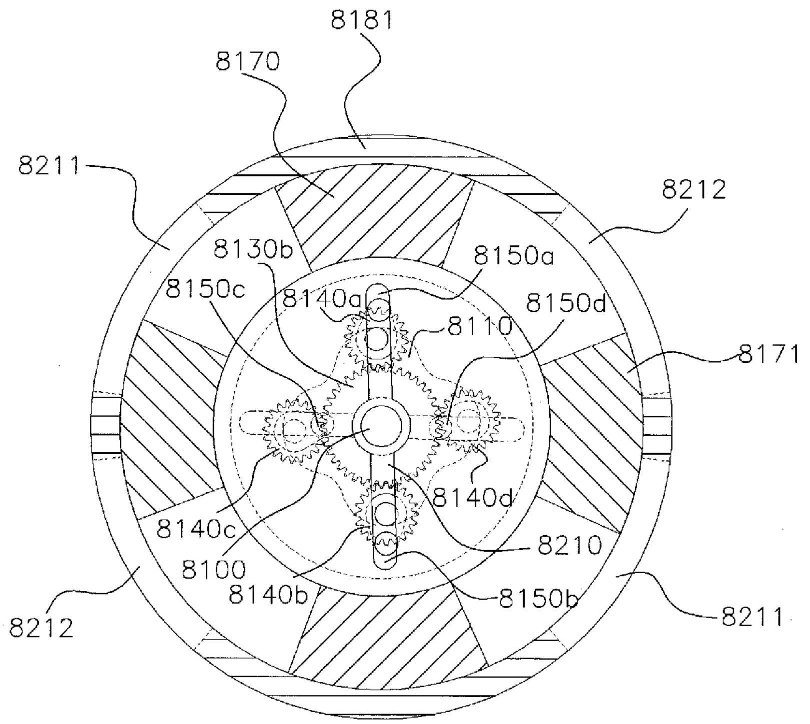

8181
8170
8211
8212
8130b
8150a
8150c
8140a
8110
8150d
8171
8140d
8140c
8210
8100
8140b
8150b
8211
8212

Fig. 36

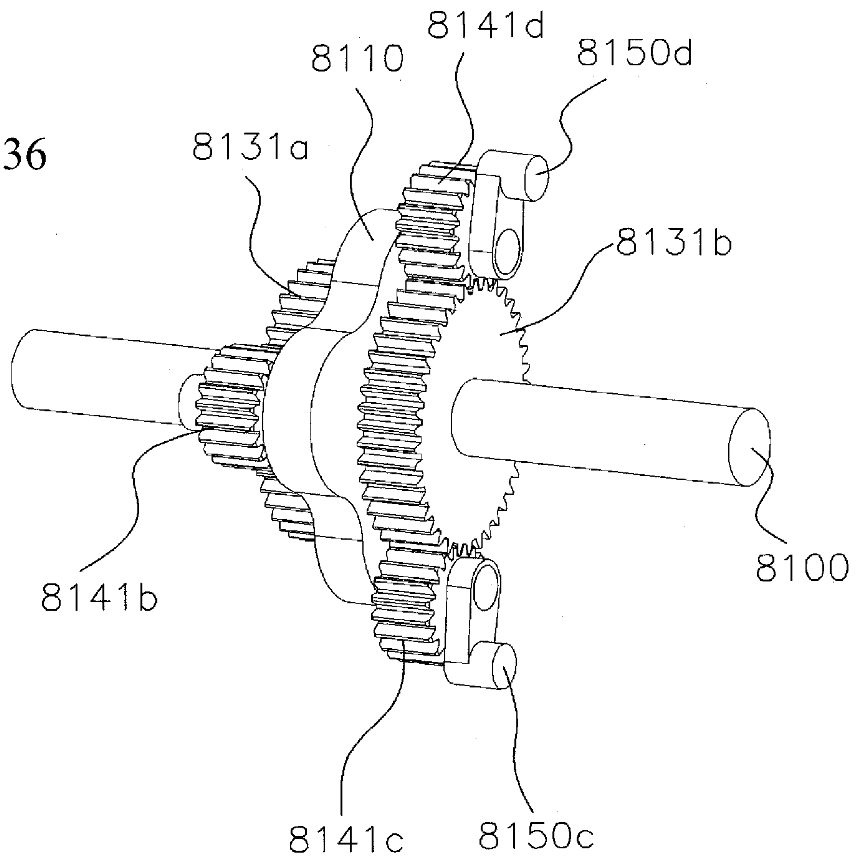

8141d
8110
8150d
8131a
8131b
8100
8141b
8141c
8150c

Fig. 37

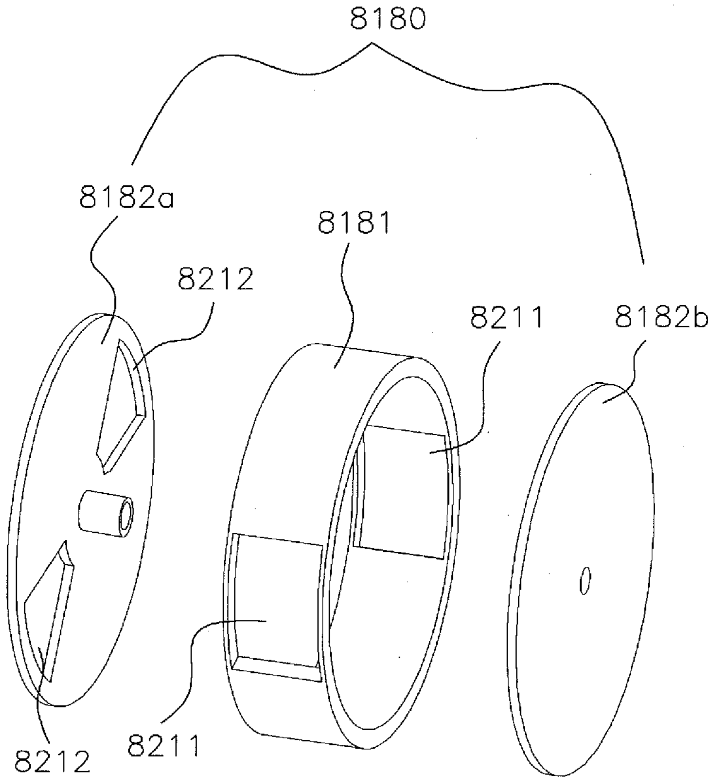

8180
8182a
8181
8212
8211
8182b
8211
8212

Fig. 38

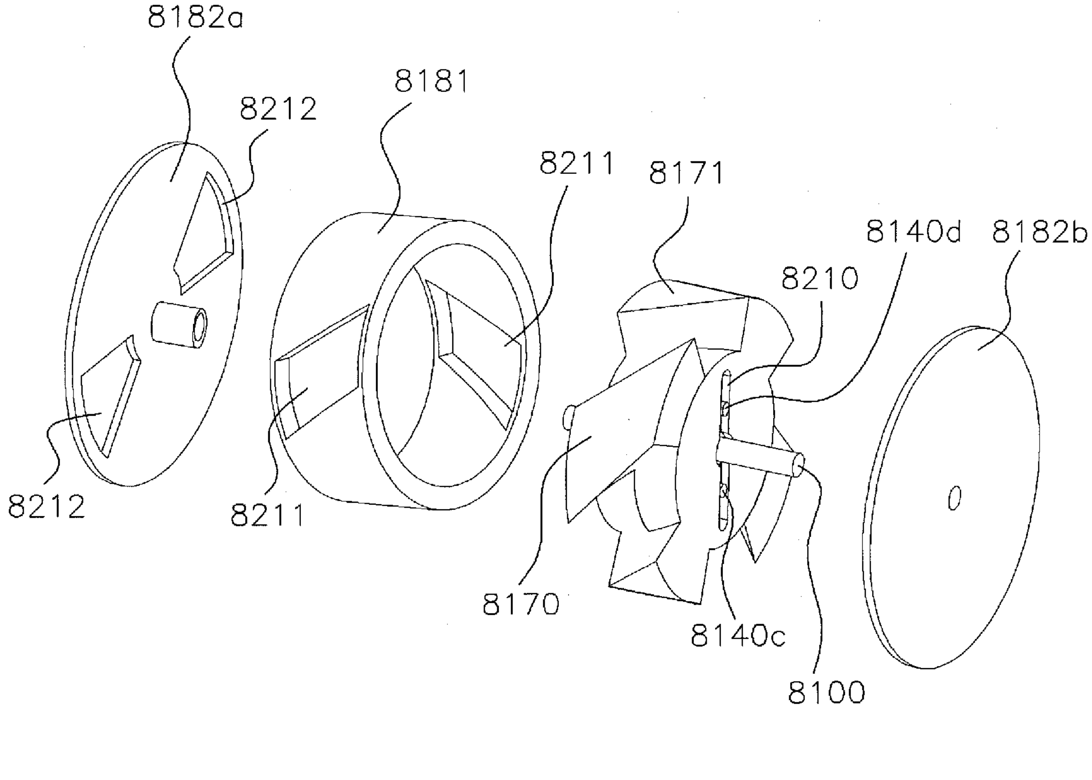

8182a
8181
8212
8211
8171
8140d
8182b
8210
8212
8211
8170
8140c
8100

Fig. 39

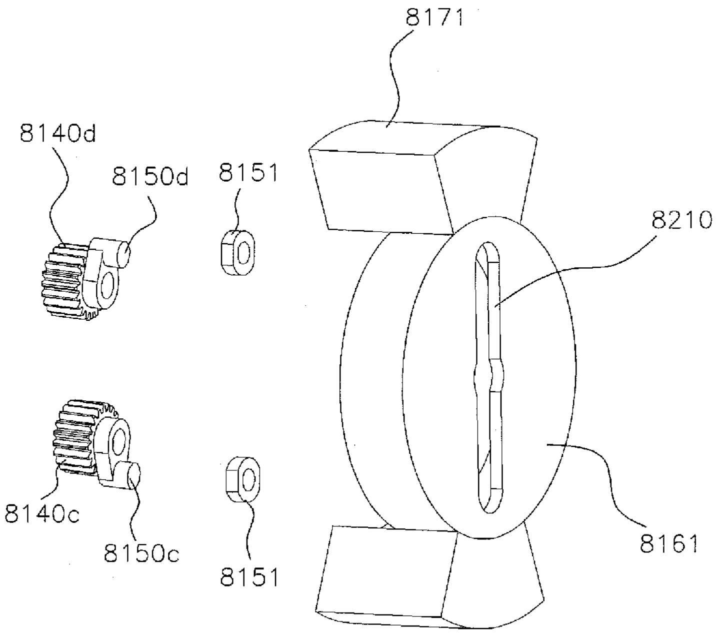

8171
8140d
8150d
8151
8210
8140c
8150c
8151
8161

Fig. 40

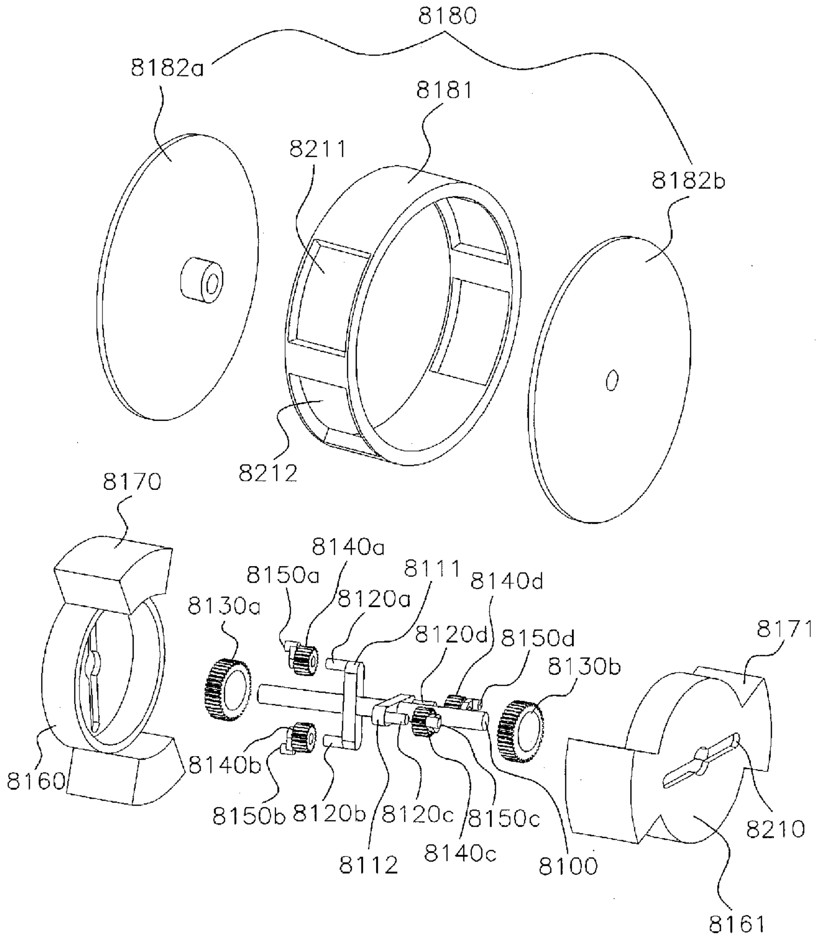

8180
8182a
8181
8211
8182b
8212
8170
8140a
8150a
8111
8140d
8130a
8120a
8120d
8150d
8171
8130b
8160
8140b
8150b
8120b
8120c
8150c
8210
8112
8140c
8100
8161

Fig. 41

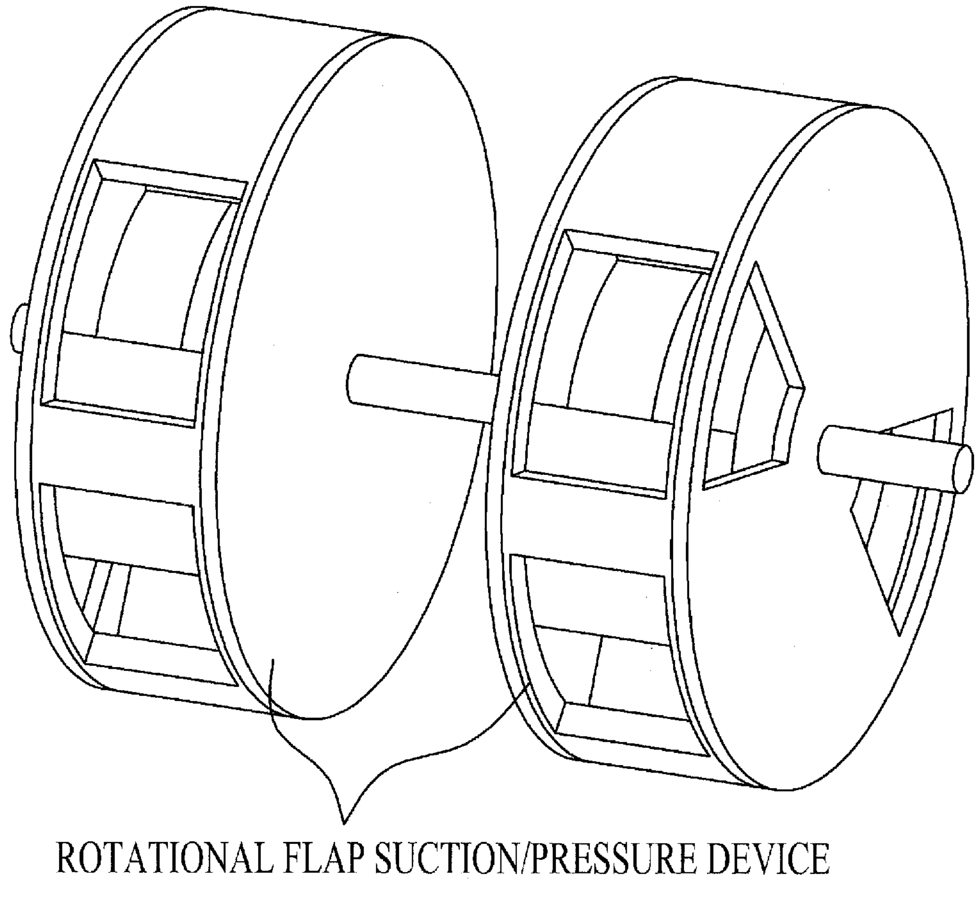
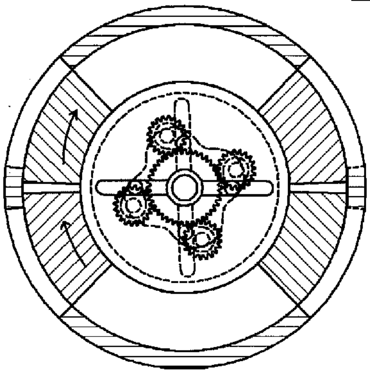
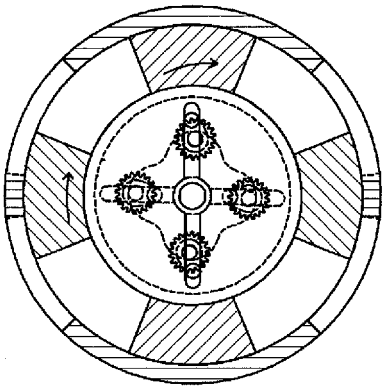


Fig. 42

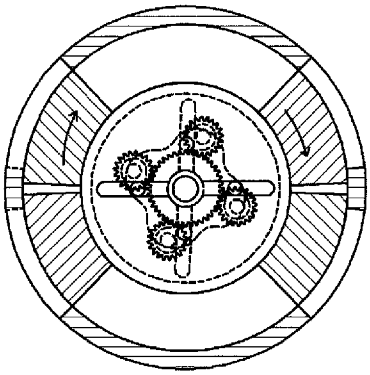
8100



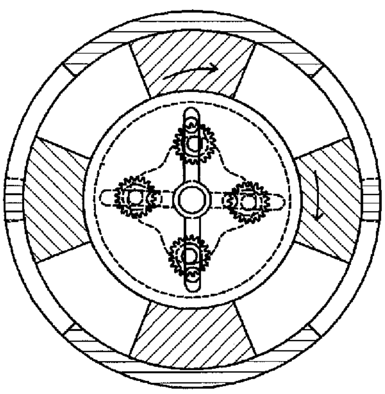
(a)



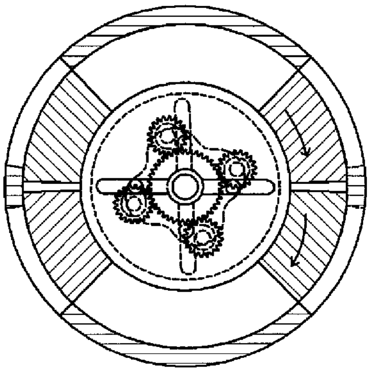
(b)SUCTION



(c)SUCTION COMPLETION



(d)DISCHARGE



(e)DISCHARGE COMPLETION

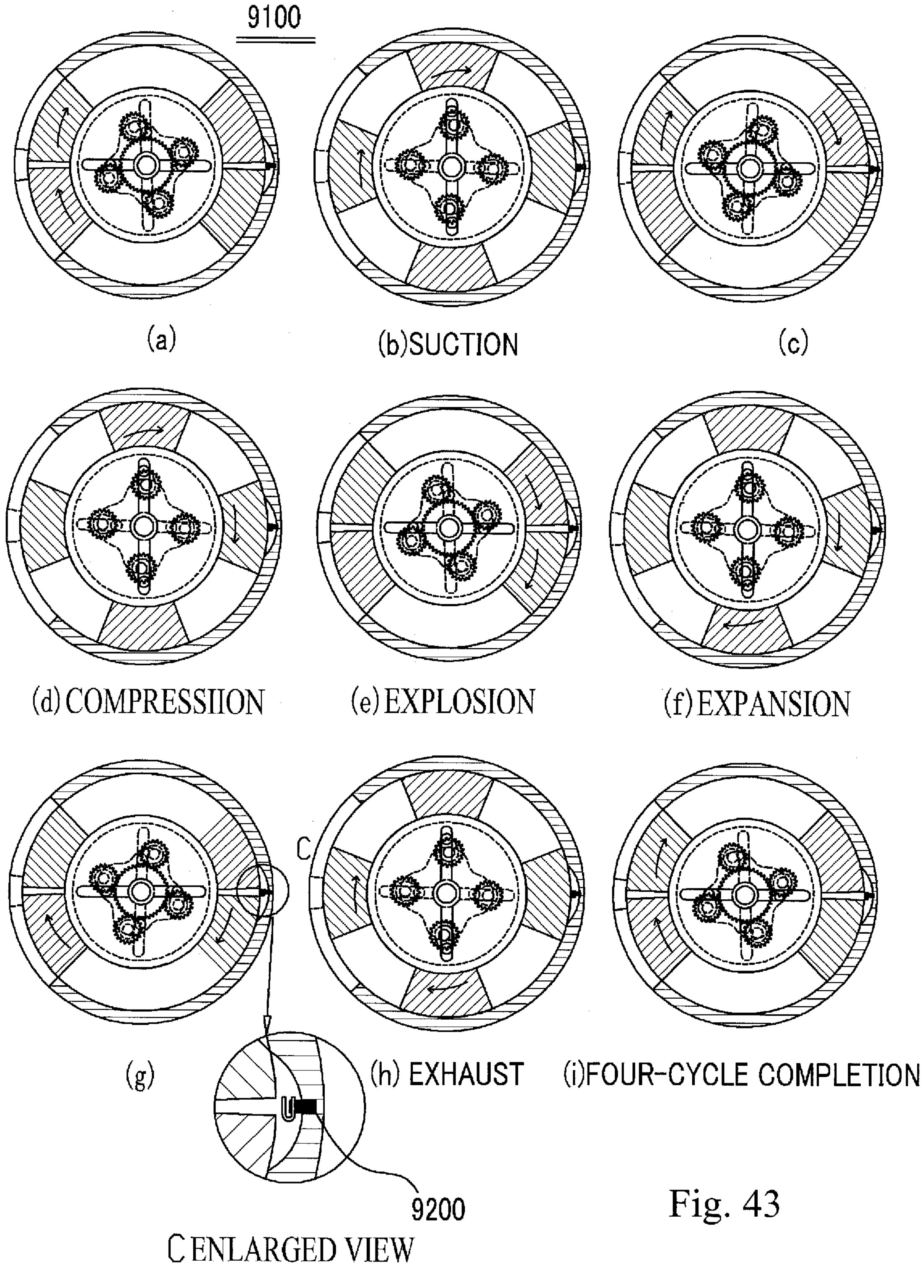

9100
(a)
(b)SUCTION
(c)
(d)COMPRESSIION
(e)EXPLOSION
(f)EXPANSION
C
(g)
(h) EXHAUST
(i)FOUR-CYCLE COMPLETION
9200
C ENLARGED VIEW

Fig. 43