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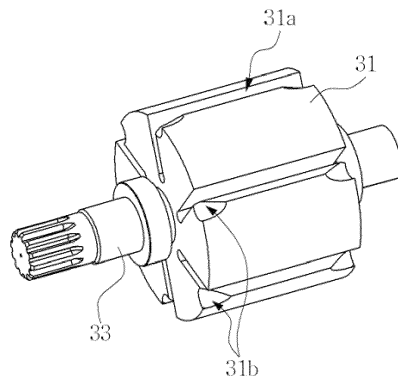
(54) **VANE MOTOR**

(57) Disclosed is a vane motor including: a casing including an inlet port and an outlet port, through which a pressurized fluid comes in or out; and a rotor being installed in the casing, turning around a rotational shaft by the pressurized fluid and including a rotor body which has a substantially cylindrical shape and an axis coinciding with an axis of the rotational shaft and a plurality of vanes which is installed in grooves formed on an outer circumferential surface of the rotor body and has a portion protruding from the groove and having a length varied in

accordance with a rotational phase, wherein a rear edge portion of the opening of the groove formed on the rotor body to receive the vane is partially removed to form an enlarged portion through which a rear surface of the vane is more exposed.

According to the present invention, more pressurized fluid flows quickly in the space between the rotor body and the casing, thereby increasing the pressure applied to the vane and improving rotation efficiency of the rotor which is rotated by the pressure.

[Fig. 3]



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**Description****BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates to a vane motor that can generate a rotational force by a hydraulic force to improve output efficiency.

**Background of the Related Art**

[0002] A vane motor is a mechanical actuator that converts hydraulic pressure into rotation power. FIG. 1 shows one example of a vane motor according to the related art.

[0003] Referring to FIG. 1, a rotor is rotatably installed in a casing 211. The casing 211 is provided with a fluid inlet 253 through which a fluid for generating pressure flows in, and a fluid outlet through which the fluid flows out. If the pressurized fluid flows in through the fluid inlet, the pressurized fluid acts on vanes 235 each of which spreads toward the outside of the rotor, and has a variable length. Accordingly, the vanes 235 are moving to the pressurized direction, the rotor turns within the casing 211. If the pressurized fluid for applying the pressure to the vanes 235 arrives at the fluid outlet 255 of the casing, the fluid is discharged through the fluid outlet 255 which is a low pressure side.

[0004] Specifically, if the pressurized fluid flowing in through the fluid inlet arrives at the fluid outlet which is the low pressure side, the fluid is discharged through the fluid outlet, and thus the pressurized fluid applies the pressure to the vanes in the path to turn the rotor.

[0005] The vanes 235 are engaged to a rotor body 231, and the length of the respective vanes protruding from the rotor body 231 is variable. For the variable feature, the vanes 235 are inserted in grooves 231a formed on an outer peripheral surface of the rotor body 231, and are able to move in a longitudinal direction of the groove. Since a gap between the inner wall surface of the casing 211 and a rotational shaft 233 of the rotor body 231 is varied according to a position of the inner wall surface of the casing, the vane 235 moves out from the groove 231a of the rotor body 231 at the wide gap to increase a protruding length of the vane 235, while the vane 235 moves in the groove of the rotor body at the narrow gap to decrease the protruding length of the vane.

[0006] A resilient member, such as a spring, may be provided between a bottom portion of the rotor groove 231 and the vane 235 so that the vane can smoothly move in or out from the groove of the rotor body 231. Otherwise, since the vane can slide out from the groove by a centrifugal force of the rotor, a separate spring may not be provided.

[0007] At the narrow gap in which the gap between the rotor body 231 and the inner wall surface of the casing becomes narrow, when the rotor body 231 turns, a distal

end of the vane 235 is pressurized so that the vane moves in the groove 231a while contacting against the inner wall surface.

[0008] However, the vane motor of the related art has problems in that if the gap between the distal end of the vane 235 and the inner wall surface of the casing 211 is too wide, the fluid leaks through the gap to lead to a loss of pressure, and in that if the gap is too narrow, friction between the vane and the inner wall surface of the casing is increased, so that a lot of energy generated by the pressurized fluid is significantly lost, and thus maintenance costs are increased due to abrasion of the vanes and the inner wall surface. These problems are in a trade-off relation and cannot be completely solved in the vane motor of the prior art. Therefore, for vane motors of various materials and sizes, a proper size of the gap should be acquired on an experimental basis to increase the efficiency and the durability of each vane motor.

[0009] In order to increase the rotational force of the rotor by use of the pressurized fluid, the total amount of the force of the fluid acting on the vane should be increased. Since the total amount of the force is equal to the result obtained by multiplying the pressure, which is a force acting on a unit area, by an area of the inner wall surface, to which the pressure is applied, it is necessary to increase the area of the inner wall surface, with which the fluid and the vanes come into contact.

[0010] However, if the vane moves out too far from the groove, the vane may be completely released from the groove, or the vane may be vibrated or be in an unstable state while producing the friction between the vane and the inner wall surface of the casing. Therefore, the vane motor should be designed to increase the contact area with the fluid within a limit to keep the connection between the vanes and the rotor in stable.

**Patent Literatures****[0011]**

Patent Document 1: Korean Patent No.: 10-1116511, entitled "Air Vane Motor with Liner"

Patent Document 2: Korean Patent No.: 10-1874583, entitled "Vane Motor"

**SUMMARY OF THE INVENTION**

[0012] Therefore, the invention has been made in view of the above problems included in a vane motor of the related art, and one object of the invention is to provide a vane motor having configuration capable of improving efficiency.

[0013] According to one aspect of the present invention, there is provided a vane motor including: a casing including an inlet port and an outlet port, through which a pressurized fluid comes in or out; and a rotor which is installed in the casing and is able to turn around a rotational shaft which is installed to the casing, by the pres-

surized fluid. The rotor includes a rotor body of a substantially cylindrical shape. An axis of the rotor body coincides with that of the rotational shaft. The rotor also includes a plurality of vanes which are installed in grooves formed on an outer circumferential surface of the rotor body. A portion of the vane protrudes from the groove and the length of the portion is varied depending upon a rotation phase. And, in both edges of the opening of the groove formed on the rotor body to receive the vane, the rear side edge portion is partially removed to form enlarged portion through which a rear surface of the vane is more exposed.

**[0014]** According to the first embodiment of the invention which brings in a vane motor of the related art with a rotor turning in the casing while coming into contact with the inner wall surface of the casing, a distal end of the vane may be made of a smooth material or may be processed to be easily slid.

**[0015]** According to the first embodiment, the casing is configured in such a way that both ends of an outer liner of a cylindrical shape larger than the rotor are closed by disc-shaped finish plates.

**[0016]** At least one of the finish plates is provided with a hole through which the rotational shaft of the rotor passes to transmit the rotational force, and a bearing is mounted in the hole for reducing the friction between the rotational shaft and the finish plates.

**[0017]** According to the first embodiment, there is a fine gap between the finish plates and the rotor body, and between the finish plates and the both ends of the vane so that components are able to slide with each other, but the pressurized fluid is hardly leaked through the gap.

**[0018]** At least one of the finish plates may be provided with a fluid inlet and a fluid outlet. The fluid inlet and the fluid outlet are formed in such a way that at least a portion of the fluid inlet and at least a portion of the fluid outlet are overlapped with a gap or space between the casing and the rotor body, when seen from a cross-sectional view of the rotational shaft, and the fluid inlet and the fluid outlet are extended in an arc shape in a circumferential direction.

**[0019]** According to the second embodiment, the vane motor further includes an inner liner of a cylindrical shape which is installed in the casing and receives the rotor therein, in which a distal end of the vane comes into contact with an inner wall surface of the inner liner while the pressurized fluid is retained therein until the pressurized fluid flowing through the inlet port of the casing is discharged from the outlet port of the casing, and an imaginary rotational axis of the inner liner is spaced apart from a rotational axis of the rotational shaft in a parallel state, but is able to rotate together with the rotor when the rotor turns.

**[0020]** The imaginary rotational axis of the inner liner and the rotational shaft of the rotor can be maintained at constant positions. The vane motor includes a rolling member which, when the inner liner is rotated in the cas-

ing, is interposed between an outer surface of the inner liner and the inner wall surface of the casing to reduce friction therebetween.

**[0021]** In this embodiment, the casing is configured in such a way that both ends of an outer liner of a cylindrical shape larger than the inner liner are closed by disc-shaped finish plates.

**[0022]** At least one of the finish plates is configured in such a way that the rotational shaft pass through and is exposed out of the finish plate to transmit the rotational force, and a bearing is mounted between the rotational shaft and the finish plate.

**[0023]** According to the embodiment, there is a fine gap between the finish plates and other components like the inner liner, the vanes in axial direction, so that the components are able to slide with the finish plates, but the pressurized fluid is hardly leaked through the gap.

**[0024]** At least one of the finish plates may be provided with a fluid inlet and a fluid outlet. The fluid inlet and the fluid outlet are formed in such a way that at least a portion of the fluid inlet and at least a portion of the fluid outlet is overlapped with a gap or space between the inner liner and the rotor body, when seen in an axial direction, and the fluid inlet and the fluid outlet are extended in an arc shape in a circumferential direction.

**[0025]** In this instance, the enlarged portion may be provided on both ends thereof in the longitudinal direction. The enlarged portion may be formed at the portion in which the start portion of the arch-shaped fluid inlet is overlapped.

**[0026]** According to the invention, the rear portion of the opening of the respective grooves formed on the rotor body is partially removed, when seen in a rotation direction of the rotor, so that the rear surface of the vane is more exposed to the pressurized fluid. Also, more pressurized fluid flows quickly in the space between the rotor body and the casing, thereby increasing the pressure applied to the vane and improving rotation efficiency of the rotor which is rotated by the pressure.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0027]** Reference is now made briefly to the accompanying drawings, in which:

FIG. 1 is a cross-sectional view illustrating a configuration of a vane motor according to the prior art;

FIG. 2 is a perspective view illustrating an exterior of a vane motor according to one embodiment of the invention;

FIG. 3 is a perspective view illustrating a rotor body including a rotational shaft of the vane motor in FIG. 2;

FIG. 4 is an exploded perspective view illustrating a vane motor according to another embodiment of the invention, of which an exterior is similar to that in FIG. 2, but an inner liner is provided in a casing;

FIG. 5 is a perspective view of the vane motor in FIG.

4 to illustrate an assembled state of the rotor and the inner liner in FIG. 4;

FIG. 6 is a side view illustrating the assembled state of the rotor and the inner liner in FIG. 5; and

FIG. 7 is a cross-sectional view illustrating a relative relationship of the rotor, the inner liner, a fluid inlet and a fluid outlet which are provided on a finish plate engaged to the rotor and the inner liner FIG. 6.

**[0028]** Repeated use of reference characters throughout the present invention and appended drawings is intended to represent the same or analogous features or elements of the invention.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

**[0029]** Hereinafter, preferred embodiments of the invention will be explained in detail in conjunction with the accompanying drawings.

##### Embodiment 1

**[0030]** FIG. 2 is a perspective view illustrating an exterior of a vane motor according to the first embodiment of the invention.

**[0031]** The vane motor of the first embodiment includes a casing forming the exterior, and a rotor positioned in the casing, and the general configuration of the casing and the rotor is substantially identical to that of the vane motor of the related art.

**[0032]** The casing includes a casing body 11 formed of a substantially cylindrical shape, and finish plates 13 and 15 for covering both ends of the casing body 11 in a longitudinal direction. Each of the finish plates 13 and 15 is provided with a rotational shaft mounting hole, through which a rotational shaft 33 connected to the rotor passes, an arc-shaped fluid inlet 135, through which a pressurized fluid supplied from the outside comes in, and an arc-shaped fluid outlet 133, through which the pressurized fluid comes out. A bearing is installed in the rotational shaft mounting hole, so that the rotational shaft 33 does not come into direct contact with the finish plates 13 and 15, thereby reducing friction between the rotational shaft 33 and the finish plates 13 and 15. With the above configuration, the rotor turns in the casing body 11, with the rotor coming into contact with the inner surface of the casing body 11.

**[0033]** FIG. 3 is a perspective view illustrating the rotor body 31 including the rotational shaft 33 of the vane motor in FIG. 2.

**[0034]** The rotor body 31 is provided with a plurality of grooves 31a on an outer peripheral surface thereof in a longitudinal direction, but the groove 31a may be formed in various shapes, if necessary. In this embodiment, the grooves 31a are formed in parallel with each other at regular intervals, in other words, at the same central angle or arc length when seen from a cross section. A vane

slidably moving in or out along the groove 31a is formed of a substantially rectangular plate. The vane may be provided in a direction perpendicular to a vertical plane of the cylindrical rotor body 31, but protrudes at a desired angle with respect to the vertical plane according to the angle of the groove 31a formed on the rotor body. Specifically, the groove is slightly sloped at a desired angle with respect to a radial direction pointing along a radius from the rotational shaft 33, and thus the vane protrudes at a desired angle toward a rotational direction with respect to the vertical plane of the rotor body.

**[0035]** The vane installed in the groove 31a has a thickness slightly shorter than the gap width of the groove so that the groove is wider. If the rotor turns, the vane tends to protrude always outwardly from the groove due to a centrifugal force, but the vane is restricted by the inner wall surface of the casing body. The inner wall surface of the casing body pushes the vane toward the groove as the rotor turns. Accordingly, even though a resilient member, such as a spring, is not installed in the groove, the vane can slide in or out along the groove, as the rotor turns.

**[0036]** The operation of components in the vane motor with the above configuration will now be described. The fluid inlet 135 of the vane motor is connected with a supplier (not illustrated) for supplying a pressurized fluid from the outside. Since both of the finish plates 13 and 15 installed to both sides of the vane motor are provided with the fluid inlets 135 and the fluid outlets 133, the supplier is branched at any point to supply the pressurized fluid to both fluid inlets of the finish plates 13 and 15. Similarly, a collector is branched at any point to receive the pressurized fluid from both fluid outlets of the finish plates 13 and 15, of which the pressure of the fluid used in the vane motor is decreased.

**[0037]** Preferably, a distal end of the vane is made of a smooth material or is processed to be easily slid, thereby reducing a frictional heat caused by resistance against rotation when the distal end comes into contact with the inner wall surface of the casing body.

**[0038]** The finish plates 13 and 15, the rotor body 31 and the vanes are preferably designed to form a gap between the finish plates and the rotor body, and between the finish plates and both ends of the vane, through which the pressurized fluid is hard to leak, as well as being able to be easily slid with each other.

**[0039]** The fluid inlet 135 and the fluid outlet 133 formed on both finish plates 13 and 15 are formed in such a way that at least a portion of the fluid inlet and at least a portion of the fluid outlet are overlapped with the gap space between the outer peripheral surface of the rotor body 31 and the casing body 11, when seen from a cross-sectional view of the rotational shaft, that is, when seen in an axial direction of the rotational shaft. The fluid inlet 135 and the fluid outlet 133 are extended in an arc shape in a circumferential direction.

**[0040]** The difference between the vane motor of this embodiment and the vane motor of the prior art is that a

portion of the groove 31a formed on the rotor body 31 to receive the vane is specifically designed, as illustrated in FIG. 3.

**[0041]** Specifically, both ends of the groove 31a in longitudinal direction formed on the rotor body 31 are partially removed from an opening of a rear side to form enlarged portions 31b. A rear surface of the vane installed in the groove 31a is more exposed through the enlarged portions 31b.

**[0042]** A curved surface of the groove 31a which is formed by partially removing both ends from the opening of the rear side, that is, a curved surface of the enlarged portion 31b, is formed as a concaved portion, when seen from the opening of the groove toward the inside of the groove and when seen from an end of the rotor body toward a center thereof in a longitudinal direction of the rotor body. When the rotor turns and the enlarged portions are positioned to align with the fluid inlets of the finish plates 13 and 15, as illustrated in FIG. 7, the pressurized fluid of high pressure flowing in the longitudinal direction from the fluid inlet flows along the concaved surface, and then collides with the rear surface of the vane to push the vane.

**[0043]** While the rotor is turning by the pressurized fluid, the pressurized fluid flows in the section in which the gap between the rotor body 31 and the casing body 11 is increased. The distal end of the vane further protrudes from the groove 31a by the centrifugal force, with the distal end contacting against the inner wall surface of the casing body 11. The more the rotor turns, the more the gap between the casing body 11 and the rotor body 31 increases.

**[0044]** In this embodiment, the fluid inlet is formed at an angle of substantially 60 degrees with respect to a plane passing the center. In the section provided with the fluid inlet, the space between the casing body 11 and the rotor body 31 is continuously connected with the fluid inlet. The space is continuously filled with the pressurized fluid to push the rear surface of the vane, which is substantially identical to the vane motor of the prior art. In the invention, however, since the rear surface of the vane is more exposed through the enlarged portion 31b, the entire rotational force becomes large.

**[0045]** The space between the casing body 11 and the rotor body 31 starts to communicate with the fluid inlet at a position where the gap between the rotor body 31 and the inner wall surface of the casing body 11 is first formed. At the position, since the gap between the rotor body and the casing body is very narrow even though the fluid inlet is large, the pressurized fluid is hardly supplied in a quick and effective way. In this embodiment, since the enlarged portion 31b is formed at the position where the rotor body starts to communicate with the fluid inlet, the pressurized fluid flows easily and quickly in the space.

**[0046]** The enlarged portion 31b may be formed along the entire length of the rotor from the opening of the rear side of each groove 31a formed on the rotor body 31.

**[0047]** Of course, since both of the finish plates 13 and 15 are provided with the fluid inlets, the enlarged portion 31b is formed on both ends of the rotor body. If only one finish plate is provided with the fluid inlet, the enlarged portion is formed on only the opening of the rear side thereof.

#### Embodiment 2

**[0048]** Referring to a vane motor according to the second embodiment illustrated in FIGS. 4 to 7, this embodiment is substantially identical to the first embodiment, except for the inner liner 20 further installed in the casing. The length of the inner liner 20 is substantially identical to that of the casing body 11, and both ends of the inner liner 20 contact against the inner surfaces of the finish plates 13 and 15 of the casing in a longitudinal direction, with a fine gap between both ends and the inner surfaces. When the inner liner 20 turns in the casing, the inner liner produces sliding friction between the inner surfaces of the finish plates 13 and 15 and the inner liner. The inner liner 20 is laid on a plurality of rolling members 19 which are disposed on a concave portion 119 formed on the inner wall of the casing wall 11, when the inner liner 20 is installed in the casing. The rolling member has a roller 19a and a rolling shaft 19b, and the rolling shaft 19b is formed in the shape of a cylinder or a rotational shaft, and is rotatably installed in parallel with the rotational shaft 33. If the inner liner 20 turns in the casing body 11, the rolling shaft coming into contact with the outer surface of the inner liner rotates, and thus there is no sliding friction between the turning inner liner 20 and the inner surface of the casing body 11.

**[0049]** The rotor is installed in the inner liner 20, and includes a cylindrical rotor body 31 having the rotational shaft 33, and a plurality of vanes 35 engaged with each groove 31a of the rotor body 31. The length of the cylinder forming the rotor body 31 is substantially identical to that of the casing body 11, and when the rotor turns, both ends of the cylinder come into contact with the inner surfaces of the finish plates 13 and 15 in the state in which a fine gap is therebetween, thereby producing sliding friction between the inner surfaces of the finish plates 13 and 15 and both ends thereof.

**[0050]** This embodiment is substantially identical to the first embodiment, except that the rotor is not installed to come into directly contact with the inner surface of the casing body 11, but is installed to come into directly contact with the inner surface of the inner liner 20.

**[0051]** The rotational shaft 33 of the rotor is parallel with an imaginary rotational axis of the inner liner 20, but is spaced apart from the rotational axis of the inner liner at a distance. The finish plates 13 and 15 of the casing are respectively provided with a hole through which the rotational shaft 33 penetrates. The position of the hole is spaced apart from the rotational axis of the cylinder forming the casing at a distance.

**[0052]** With the above configuration, the rotor disposed

in the casing body 11 pushes the inner liner 20 of the cylindrical shape against the rolling member 19 of the casing body 11, so that an imaginary rotational axis of the cylinder forming the casing body is spaced apart from the imaginary rotational axis of the inner liner 20 of the cylindrical shape at an interval. The distance between the rotor body 31 and the inner wall surface of the inner liner 20 is minimized at the position where the rotor pushes the inner liner 20, and thus the vane 35 is completely inserted in the groove 31a so that the rotor body 31 contacts against the inner liner 20, or a protruding length of the vane 35 from the rotor body 31 is decreased. At the opposite side (an opposite side on the basis of the rotational shaft), the distance between the rotor body 31 and the inner surface of the inner liner 20 is maximized, thereby increasing the protruding length of the vane 35 from the rotor body 31.

**[0053]** The operation of components of the vane motor with the above configuration will now be described. A supplier for supplying the pressurized fluid to the fluid inlets 135 and 155 of the vane motor from the outside and a collector for receiving the pressurized fluid from the fluid outlets 133 and 153 may be connected to the vane motor of this embodiment, similar to the first embodiment, but the rotor body 31 and the vanes 35 of the rotor are not operated in the casing body 11, but is operated in the inner liner 20.

**[0054]** Specifically, if the arc-shaped fluid inlets 135 and 155 are supplied with the pressurized fluid, the pressurized fluid passing through the arc-shaped fluid inlets of the finish plate flows in the space between the rotor body and the inner wall surface of the inner liner at that position. The pressurized fluid applies the pressure to the vane forming a portion of an interface of the space. If the pressure applied to the rear surface of the vane is higher than that applied to the front surface, the vane moves forward. Since the rotor provided with the vanes is rotatably fixed by the rotational shaft, the rotor does not move in parallel, but is just rotated. The space between the rotor and the inner wall surface of the inner liner 20 is gradually increased from the positions of the fluid inlets 135 and 155, and the vane 35 protrudes at the most from the groove 31a, so that the pressure applied to the vane is gradually increased. Since the arc-shaped fluid outlets 133 and 153 start to appear next to the position of the maximum gap, the pressurized fluid comes out through the fluid outlets, so that the pressure of the fluid is decreased.

**[0055]** The rotor of this embodiment is rotated by the pressure difference, similar to the rotor of the vane motor according to the prior art, but the inner liner 20 of the cylindrical shape forms the space in which the pressurized fluid operates, instead of the casing. Since the inner liner is not stationary, the rotational force is transferred to the inner liner 20 of the cylindrical shape which comes into contact with the distal end of the vane 35, due to the friction, when the rotor turns. The inner liner 20 is rotated at the nearly equal linear velocity at the position of the

distal end of the respective vanes which forms the outermost circumference of the rotor.

**[0056]** The inner liner is rotated in the casing, and the rolling members 19, such as a rolling shaft, are interposed between the inner liner and the casing to reduce the sliding friction between the inner liner and the casing body 11.

**[0057]** As a result, the abrasion caused by the sliding between the vane and the inner wall surface of the inner liner and the energy consumed by the frictional heat are decreased, and thus the efficiency of producing the rotational force by the pressurized fluid is increased.

**[0058]** Of course, since the finish plates 13 and 15 of the casing are stationary, and the rotor and the inner liner 20 of the cylindrical shape which come into contact with the finish plates are rotated, both ends of the inner liner, the rotor body 31 and the vanes come into slidable contact with the finish plates to produce the frictional heat and consume the energy. As compared to the related art, the energy consumed by the friction is decreased. In order to further improve the efficiency, the size and surface of the finish plates, the rotor body and the vane should be maintained, similar to the prior art, and the bearing 17 is interposed between the finish plates of the casing and the rotational shafts to reduce the friction.

**[0059]** As illustrated in FIG. 3 of the first embodiment, a portion of the groove 31a formed on the rotor body 31 to receive the vane 35 is designed differently from that of the vane motor according to the prior art.

**[0060]** Both ends of the groove 31a in longitudinal direction formed on the rotor body 31 are partially removed from an opening of a rear side to form enlarged portions 31b at both ends of the rotor body in the longitudinal direction. The rear surface of the vane 35 installed in the groove 31a is more exposed through the enlarged portion 31b.

**[0061]** The operation of the enlarged portion 31b is substantially identical to that of the first embodiment in view of the basic operation of the vane motor for generating the rotational force by the pressurized fluid supplied from the outside, in spite of the difference between the configuration of this embodiment and the configuration of the first embodiment.

**[0062]** Specifically, a curved surface of the groove 31a which is formed by partially removing both ends from the opening of the rear side is formed as a concaved portion. When the enlarged portions are positioned to align with the fluid inlets of the finish plates 13 and 15, the pressurized fluid of high pressure flowing in the longitudinal direction from the fluid inlet flows along the concaved surface, and then collides with the rear surface of the vane to apply impact or pressure to the vane. Also, as the rear surface of the vane is more exposed by the enlarged portion, the whole rotational force is further increased.

**[0063]** While the present invention has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments but only by the appended claims.

**[0064]** It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

Brief Description of Reference Numerals

**[0065]**

- 11: Casing body
- 13, 15: Finish plate
- 17: Bearing
- 19: Rolling member
- 19a: Roller
- 19b: Rolling shaft
- 20: Inner liner
- 31, 231: Rotor body
- 31a, 231a: Groove
- 31b: Enlarged portion
- 33, 233: Rotational shaft
- 35, 235: Vane
- 119: Concave portion
- 135, 155, 253: Fluid inlet
- 133, 153, 255: Fluid outlet
- 211: Casing

**Claims**

1. A vane motor comprising:

a casing including an inlet port and an outlet port, through which a pressurized fluid comes in or out; and

a rotor being installed in the casing, turning around a rotational shaft by the pressurized fluid and including a rotor body which has a substantially cylindrical shape and an axis coinciding with an axis of the rotational shaft and a plurality of vanes which is installed in grooves formed on an outer circumferential surface of the rotor body and has a portion protruding from the groove and (the portion) having a length varied in accordance with a rotational phase,

wherein a rear edge portion of the opening of the groove formed on the rotor body to receive the vane is partially removed to form an enlarged portion through which a rear surface of the vane is more exposed.

2. The vane motor according to claim 1, wherein the enlarged portion is formed by partially removing at least one of the longitudinal end of the groove from the opening of the rear portion of the groove which is formed on the rotor body, and

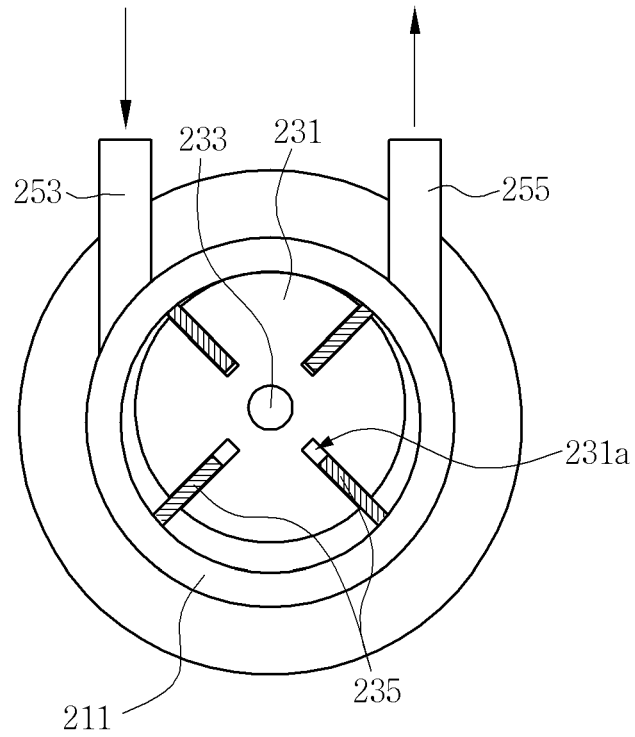
a curved surface of the enlarged portion is formed as a concaved portion, when seen from the opening of the groove toward the inside of the groove and when seen from the end of the rotor body toward a

center thereof in a longitudinal direction of the rotor body, in which when the rotor turns and the enlarged portion is positioned to align with the fluid inlet of the finish plate, the portion of the groove joining the fluid inlet is enlarged by the enlarged portion, so that the pressurized fluid flows in a space between the rotor body and the casing faster and more than in case where the rotor has no enlarged portion, thereby applying higher force to a rear surface of the vane.

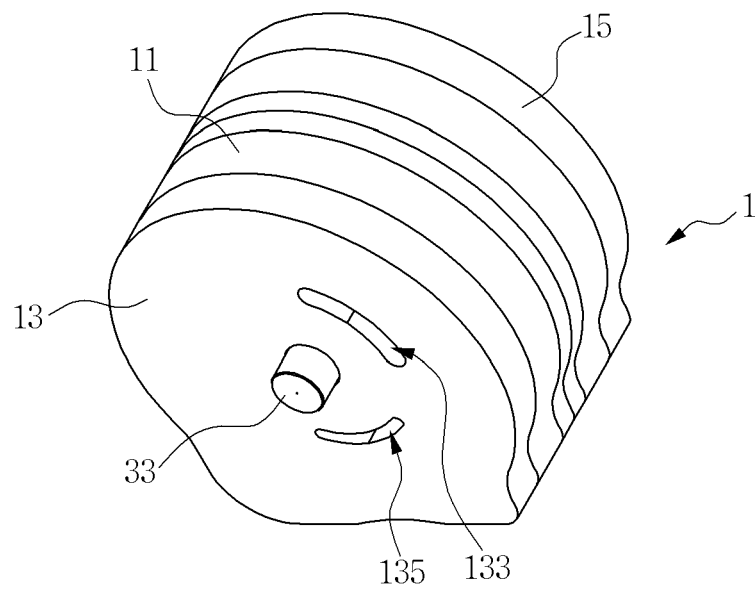
3. The vane motor according to claim 1 or 2, further comprising an inner liner of a cylindrical shape which is installed in the casing and receives the rotor therein, in which a distal end of the vane comes into contact with an inner wall surface of the inner liner while the pressurized fluid is retained therein until the pressurized fluid flowing through the inlet port of the casing is discharged from the outlet port of the casing, and an imaginary rotational axis of the inner liner is spaced apart from a rotational axis of the rotational shaft in a parallel state, but is able to rotate together with the rotor when the rotor turns, and a rolling member which is interposed between an outer surface of the inner liner and the inner wall surface of the casing to reduce friction therebetween, when the inner liner is rotated in the casing in a state in which the imaginary rotational axis of the inner liner and the rotational shaft of the rotor are maintained at constant positions.

4. The vane motor according to claim 3, wherein both ends of the casing are closed by disc-shaped finish plates, and at least one of the finish plates is provided with a fluid inlet and a fluid outlet, in which the fluid inlet and the fluid outlet are formed in such a way that at least a portion of the fluid inlet is overlapped with at least a portion of the fluid outlet in a space between the inner liner and the rotor body, and the fluid inlet and the fluid outlet are extended in an arc shape in a circumferential direction.

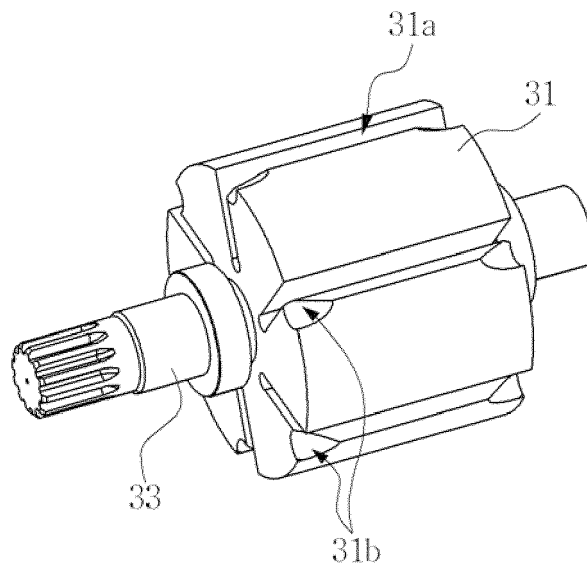
[Fig. 1]



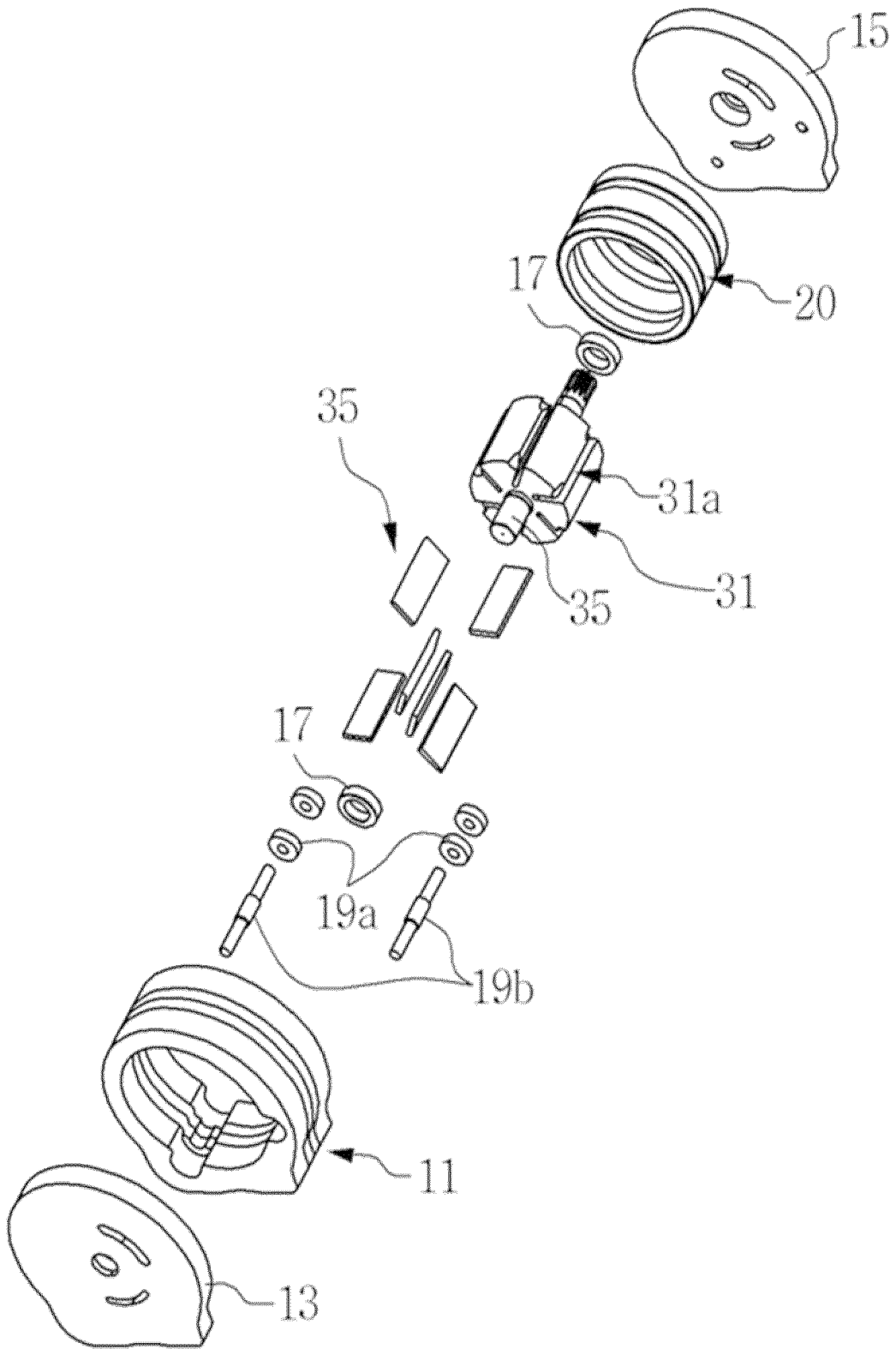
[Fig. 2]



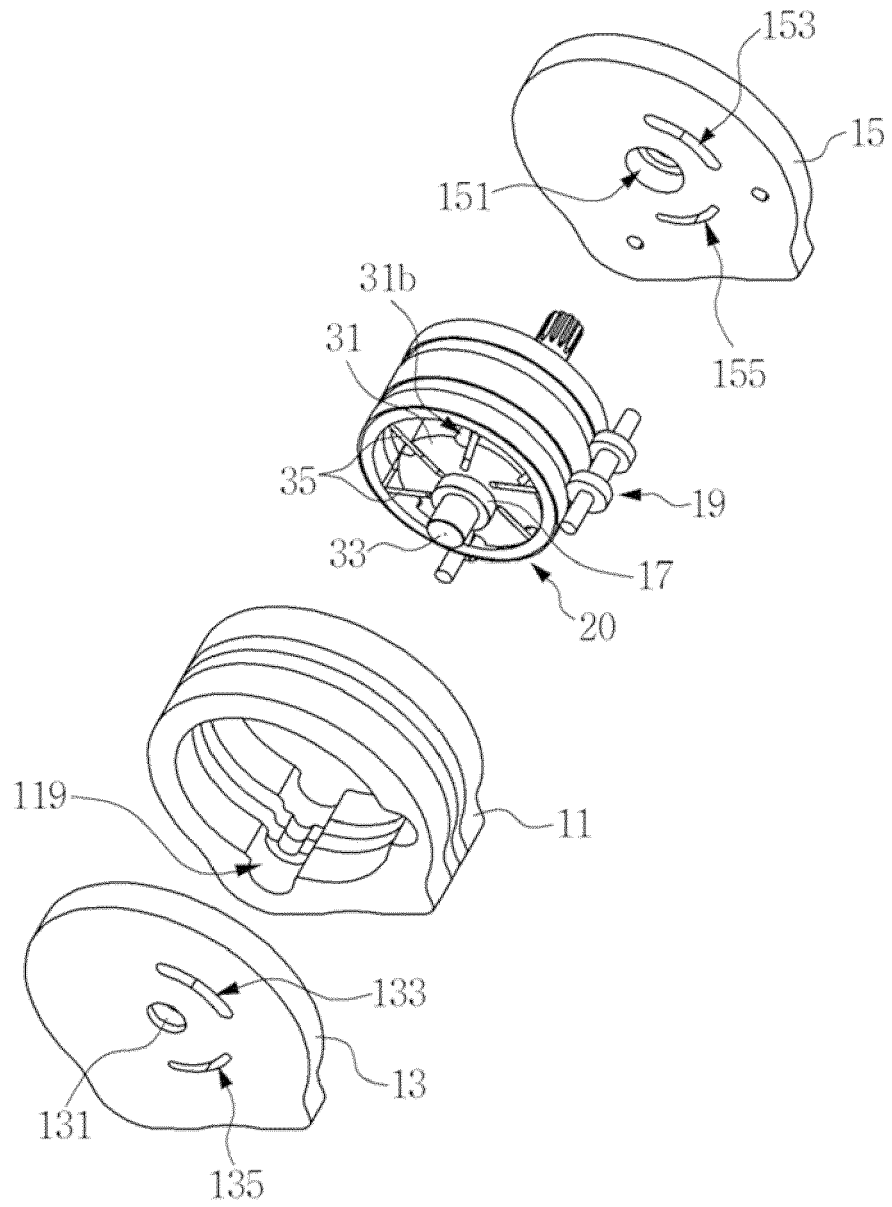
[Fig. 3]



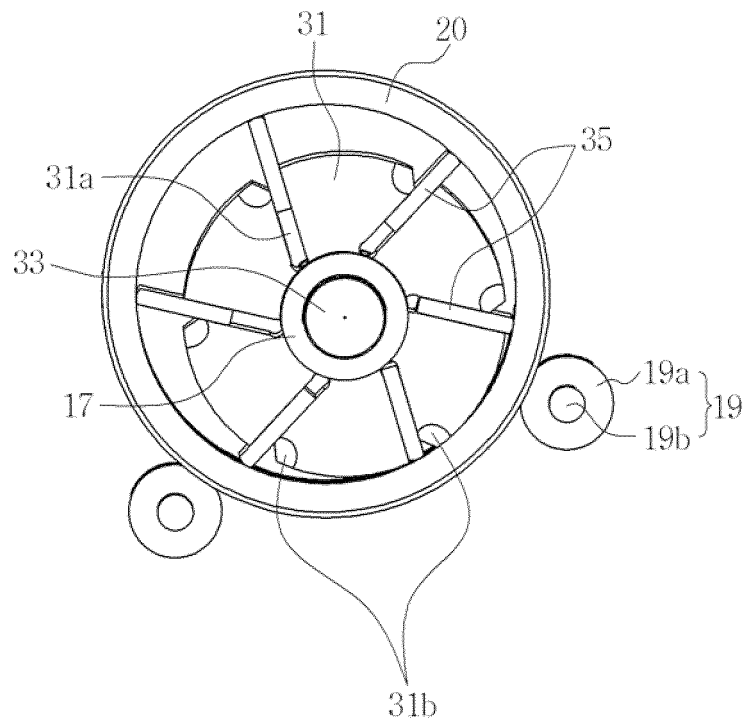
[Fig. 4]



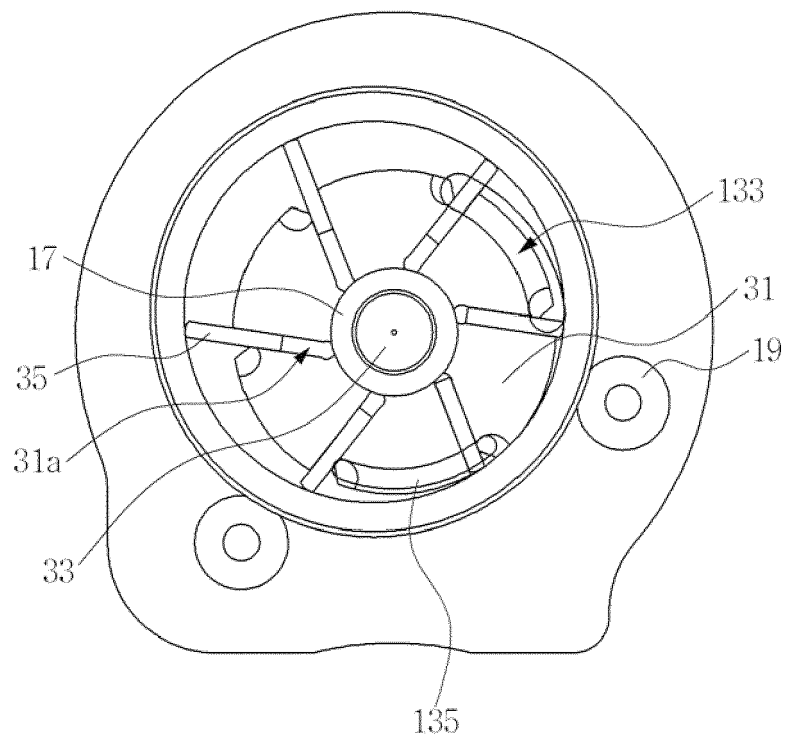
[Fig. 5]



[Fig. 6]



[Fig. 7]





EUROPEAN SEARCH REPORT

Application Number  
EP 20 02 0103

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			F01C F04C
The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>13 July 2020</b>	Examiner <b>Grilli, Muzio</b>
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons	
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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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