

## Description

The present invention relates to a refrigerant compressor, and more particularly, to a wobble plate type compressor for use in an automotive air conditioning system.

Figure 1 illustrates a general construction of a wobble plate type refrigerant compressor with a variable displacement mechanism for use in an automotive air conditioning system. With reference to Figure 1, compressor 10 includes cylindrical housing assembly 20 including cylinder block 21, front end plate 23 at one end of cylinder block 21, crank chamber 22 formed between cylinder block 21 and front end plate 23, and rear end plate 24 attached to the other end of cylinder block 21. Front end plate 23 is mounted on cylinder block 21 forward (to the left in Figure 1) of crank chamber 22 by a plurality of bolts 101. Rear end plate 24 is mounted on cylinder block 21 at its opposite end by a plurality of bolts 102. Valve plate 25 is located between rear end plate 24 and cylinder block 21. Opening 231 is centrally formed in front end plate 23 for supporting drive shaft 26 by bearing 30 disposed in the opening. The inner end portion of drive shaft 26 is rotatably supported by bearing 31 disposed within central bore 210 of cylinder block 21. Bore 210 extends to a rearward end surface of cylinder block 21 to dispose valve control mechanism 19 which comprises crank pressure responsive bellows 193 and discharge pressure responsive rod 195. Valve control mechanism 19 controls the opening and closing of communication path 150, which is formed in cylinder block 21 and later-mentioned valve plate assembly 200 in order to provide communication between crank chamber 22 and suction chamber 241. Further details of valve control mechanism 19 and the component parts associated therewith are described in US-A- 4 960 367 to Terauchi so that an explanation thereof is omitted.

Cam rotor 40 is fixed on drive shaft 26 by pin member 261 and rotates with drive shaft 26. Thrust needle bearing 32 is disposed between the inner end surface of front end plate 23 and the adjacent axial end surface of cam rotor 40. Cam rotor 40 includes arm 41 having pin member 42 extruding therefrom. Slant plate 50 is adjacent cam rotor 40 and includes opening 53 through which passes drive shaft 26. Slant plate 50 includes arm 51 having slot 52. Cam rotor 40 and slant plate 50 are connected by pin member 42, which is inserted in slot 52 to create a hinged joint. Pin member 42 is slidable within slot 52 to allow adjustment of the angular position of slant plate 50 with respect to the longitudinal axis of drive shaft 26.

Wobble plate 60 is rotatably mounted on slant plate 50 through bearings 61 and 62. Rotation preventing device 610 includes fork-shaped slider 611 attached to the outer peripheral end of wobble plate 60 and sliding rail 612 held between front end plate

23 and cylinder block 21. Fork-shaped slider 611 is slidably mounted on sliding rail 612. Rotation preventing device 610 allows wobble plate 60 to nutate while cam rotor 40 rotates. Further details of rotation preventing device 610 are described in US-A- 4 875 834 to Higuchi et al. so that an explanation thereof is omitted.

Cylinder block 21 is provided with a plurality of (for example, seven) identical axial cylinders 70 formed therein, within identical pistons 71 are slidably and closely fitted. Each piston 71 is connected to wobble plate 60 through piston rod 72. Ball 72a at one end of rod 72 is firmly received in socket 711 of piston 71 by caulking an edge of socket 711, and ball 72b at the other end of rod 72 is firmly received in socket 601 of wobble plate 60 by caulking an edge of socket 601. But, balls 72a and 72b are slidable along an inner spherical surface of sockets 711 and 601, respectively. The center of the ball-and-socket joint of piston 71 is located on the longitudinal axis of cylinder 70. It should be understood that, although only one ball-and-socket joint is illustrated in the drawing, there are a plurality of sockets arranged peripherally around wobble plate 60 to receive the ball of various rods 72, and that each piston 71 is formed with a socket for receiving the other ball of rods 72.

Rear end plate 24 includes peripherally located annular suction chamber 241 and centrally located discharge chamber 251. Valve plate 25 is located between cylinder block 21 and rear end plate 24 and includes a plurality of valved suction ports 242 linking suction chamber 241 with respective cylinders 70. Valve plate 25 also includes a plurality of valved discharge ports 252 linking discharge chambers 251 with respective cylinders 70. Suction ports 242 and discharge ports 252 are provided with suitable reed valves as described in US-A- 4 011 029 to Shimizu.

Suction chamber 241 includes inlet portion 241a which is connected to an evaporator (not shown) of an external cooling circuit. Discharge chamber 251 is provided with outlet portion 251a connected to a condenser (not shown) of the cooling circuit. Gaskets 27 and 28 are located between cylinder block 21 and the inner surface of valve plate 25 and rear end plate 24 respectively, to seal the mating surface of cylinder block 21, valve plate 25 and rear end plate 24. Gaskets 27, 28 and valve plate 25 form valve plate assembly 200.

Figure 2 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with one prior art. In the drawing, a positional relation between the ball-and-socket joints provided at wobble plate 60 and the ball-and-socket joint provided at each of respective pistons 71 is specifically illustrated. Furthermore, the same numerals are used to denote the corresponding elements shown in Figure 1 so that an explanation thereof is omitted.

With reference to Figure 2, points P'1-P'7 represent the center of the ball-and-socket joint of identical seven pistons 71 respectively, and points W'1-W'7 represent the center of the ball-and-socket joints of wobble plate 60 respectively.

A plurality of (for example, seven) cylinders 70 are peripherally located about the longitudinal axis of drive shaft 26, i.e., cam rotor 40 with an equiangular interval. Therefore, points P'1-P'7 are peripherally located about the longitudinal axis of drive shaft 26 with an equiangular interval. Furthermore, points W'1-W'7 are peripherally located about the longitudinal axis of wobble plate 60 with an equiangular interval. Points W'1-W'7 are located on first circle C1, and points P'1-P'7 are located on second circle C'2.

Figure 2 specifically illustrates a situation in which a plane surface including first circle C1 is positioned so as to be parallel with a plane surface including second circle C'2. Therefore, first and second circles C1 and C'2 are concentric with respect to point "O" through which the longitudinal axis of both drive shaft 26, i.e., cam rotor 40 and wobble plate 60 pass. A radius of circle C1 is greater than a radius of circle C'2.

In an assembling process of the compressor, points W'1-W'7 are positioned so as to radially synchronize with points P'1-P'7 respectively when fork-shaped slider 611 is mounted on sliding rail 612.

In general, when an ideal rotation preventing device is used in the compressor, the wobble plate nutates with uniform angular velocity about the longitudinal axis thereof while a cam rotor rotates. Therefore, every location of the wobble plate traces both a similar axially elongated "8" viewed in the radial direction and a similar circle viewed in the axial direction simultaneously while a cam rotor rotates.

However, when the compressor illustrated in Figure 2 operates, wobble plate 60 nutates with change in angular velocity about the longitudinal axis thereof while cam rotor 40 rotates because that rotation preventing device 610 can not allow wobble plate 60 to nutate with uniform angular velocity about the longitudinal axis thereof while cam rotor 40 rotates. Therefore, wobble plate 60 nutates with receiving angular acceleration about the longitudinal axis thereof while cam rotor 40 rotates. Accordingly, wobble plate 60 receives torque  $\tau$  (tau) which is a product of the angular acceleration and moment of inertia of wobble plate 60 while cam rotor 40 rotates. A value of torque  $\tau$  varies in accordance with rotation of cam rotor 40. As a result, wobble plate 60 tends to rotate in the rotational direction "A" of cam rotor 40 and in the rotational direction opposite to the rotational direction "A" alternately within a backlash created between slider 611 and rail 612 in accordance with the rotation of cam rotor 40. Therefore, a collision between one inner plane side surface 611a of slider 611 and one outer plane side surface 612a of rail 612, and the other inner

plane side surface 611b of slider 611 and the other outer plane side surface 612b of rail 612 are cyclically repeated while cam rotor 40 rotates. This cyclic collision impacts upon wobble plate 60 and rotation preventing device 610, thereby causing damage thereto. Furthermore, the cyclic collision generates a cyclic contact noise, which is conducted to a passenger compartment of an automobile as an offensive noise.

Figure 3 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with another prior art. In the drawing, a positional relation between the ball-and-socket joints provided at wobble plate 60 and the ball-and-socket joint provided at each of respective pistons 71 is specifically illustrated. Furthermore, the same numerals are used to denote the corresponding elements shown in Figure 1 so that an explanation thereof is omitted.

In this prior art, a plurality of (for example, seven) identical axial cylinders 701-707 are peripherally located about the longitudinal axis of drive shaft 26, i.e., cam rotor 40. The longitudinal axis of respective cylinders 701-707 are represented by points P'11-P'17 which are located at the center of the ball-and-socket joint of identical seven pistons 711-717, respectively. Points W'11-W'17 are peripherally located about the longitudinal axis of wobble plate 60 with an equiangular interval as well as one prior art. Points W'11-W'17 are located at the center of the respective ball-and-socket joints of wobble plate 60, and are located on first circle C1. Points P'11-P'17 are located on second circle C'2. Points P'14 and P'15 and point "O" through which the longitudinal axis of cam rotor 40 passes define a small sector and a remained large sector. The large sector is equally divided into identical six sectors having arcs P'11 and P'12, P'12 and P'13, P'13 and P'14, P'15 and P'16, P'16 and P'17, and P'17 and P'11, respectively. An angular of the small sector is designed to be slightly greater than an angular of each of identical six sectors in order to provide sliding rail 612 of rotation preventing device 610 between pistons 714 and 715.

Figure 3 specifically illustrates a situation in which a plane surface including first circle C1 is positioned so as to be parallel with a plane surface including second circle C'2 as well as Figure 2. Therefore, first and second circles C1 and C'2 are concentric with respect to point "O" through which the longitudinal axis of both cam rotor 40 and wobble plate 60 pass. A radius of circle C1 is greater than a radius of circle C'2.

In an assembling process of the compressor, point W'11 is positioned so as to radially synchronize with points P'11 when fork-shaped slider 611 is mounted on sliding rail 612. Accordingly, points P'12-P'14 are symmetrical with points P'17-P'15 respectively with respect to the line which passes points "O", P'11 and W'11. Therefore, angular position of points

W'12-W'14 about point "O" are shifted toward the rotational direction "A" of cam rotor 40 from points P'12-P'14 respectively, and angular position of points W'17-W'15 about point "O" are shifted toward the opposite rotational direction of cam rotor 40 from P'17-P'15 respectively. An amount of the angular shift of respective points W'12-W'14 about point "O" from respective points P'12-P'14 toward the rotational direction "A" of cam rotor 40 are gradually increased from W'12 to W'14. An amount of the angular shift of respective points W'17-W'15 about "O" from respective points P'17-P'15 toward the opposite rotational direction of cam rotor 40 are gradually increased from W'17 to W'15.

When the compressor illustrated in Figure 3 operates, wobble plate 60 behaves in the same manner as described in one prior art, thereby causing same defects as described in one prior art.

Accordingly, it is an object of the present invention is to provide a wobble plate type compressor in which rotation of a wobble plate is prevented without generating a cyclic collision between a fork-shaped slider and a sliding rail of a device for preventing rotation of the wobble plate.

A wobble plate type compressor according to the invention comprises a housing having a cylinder block provided with a plurality of cylinders and a crank chamber adjacent the cylinder block, a piston slidable fitted within each of the cylinders, a drive shaft rotatable supported in the housing, a rotor fixed on the drive shaft and further connected to an inclined plate, such as a slant plate, a wobble plate being adjacent the inclined plate, a plurality of coupling members, such as connecting rods, for coupling the wobble plate with each of the plurality of pistons, each coupling member having one end which is coupled with the wobble plate and the other end which is coupled with one of the plurality of pistons, rotational motion of the inclined plate being converted into nutational motion of the wobble plate, and rotation preventing means for preventing rotations of the wobble plate, the rotation preventing means including a guide member axially extending within the crank chamber and a fork-shaped member slidably mounted on the guide member, the fork-shaped member attached to an outer peripheral end of the wobble plate, characterised in that the one end of the coupling members are radially shifted toward the rotational direction of the rotor from the other end of the coupling members with a predetermined angle.

In the accompanying drawings:-

Figure 1 illustrates a general construction of a wobble plate type refrigerant compressor with a variable displacement mechanism in a vertical longitudinal sectional view thereof.

Figure 2 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with one prior art. In

the drawing, a positional relation between the ball-and-socket joints provided at a wobble plate and the ball-and-socket joint provided at each of the respective pistons is specifically illustrated.

Figure 3 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with another prior art. In the drawing, a positional relation between the ball-and-socket joints provided at a wobble plate and the ball-and-socket joint provided at each of the respective pistons is specifically illustrated.

Figure 4 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with a first embodiment of the present invention. In the drawing, a positional relation between the ball-and-socket joints provided at a wobble plate and the ball-and-socket joint provided at each of the respective pistons is specifically illustrated.

Figure 5 illustrates a schematic dynamical illustration with respect to the first embodiment of the present invention.

Figure 6 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with a second embodiment of the present invention. In the drawing, a positional relation between the ball-and-socket joints provided at a wobble plate and the ball-and-socket joint provided at each of the respective pistons is specifically illustrated.

In Figures 4 and 6, the same numerals are used to denote the corresponding elements shown in Figure 1-3 so that an explanation thereof is omitted.

With reference to Figure 4, points P1-P7 represent the center of the ball-and-socket joint of identical seven pistons 71 respectively, and points W1-W7 represent the center of the ball-and-socket joints of wobble plate 60 respectively.

A plurality of (for example, seven) cylinders 70 are peripherally located about the longitudinal axis of drive shaft 26 with an equiangular interval as well as the manner of one prior art. Therefore, points P1-P7 are peripherally located about the longitudinal axis of drive shaft 26 with an equiangular interval. Furthermore, points W1-W7 are peripherally located about the longitudinal axis of wobble plate 60 with an equiangular interval as well as the manner of one prior art. Points W1-W7 are located on first circle C1, and points P1-P7 are located on second circle C2.

Figure 4 specifically illustrates a situation in which a plane surface including first circle C1 is positioned so as to be parallel with a plane surface including second circle C2 as well as Figure 2.

In the first embodiment of the present invention, sliding rail 612 is positioned so as to be radially shifted toward the rotational direction "A" of cam rotor 40 from the location at which sliding rail 612 of one prior art is positioned with angle  $\beta$ . Therefore, in an assem-

bling process of the compressor, points W1-W7 are radially shifted toward the rotational direction "A" of cam rotor 40 from points P1-P7 respectively with angle  $\beta$ , for example,  $\pi/60$  when fork-shaped slider 611 is mounted on sliding rail 612. As a result, when the compressor operates, a torque which tends to rotate wobble plate 60 in rotational direction "A" of cam rotor 40 is generated.

A dynamic analysis with respect to the first embodiment of the present invention is described below. With reference to Figure 5, force  $F_t$  is a component force of gas pressure reaction force  $F_p$  which acts on piston 71. Component force  $F_t$  shown by equation (1) acts on point W1 along the tangent at point W1 on first circle C1.

$$F_t = F_p \cdot \tan \alpha \quad (1)$$

In equation (1),  $\alpha$  is the angle between the line including points P1 and W1 and the line including points Pi and Wi. Since  $\alpha$  is small,  $\tan \alpha$  is approximately substituted for  $R_1 \cdot \beta / L$ . In this term, " $R_1$ " is the radius of first circle C1.  $\beta$  is the angle between the line including points "O" through which the longitudinal axis of wobble plate 60 passes and W1 and the line including points "O" and Wi. " $L$ " is the distance between points Pi and Wi, that is, P1 and W1. Therefore, equation (1) is transformed into equation (2).

$$F_t = F_p \cdot R_1^2 \cdot \beta / L \quad (2)$$

Accordingly, torque  $\tau$  which tends to rotate wobble plate 60 in rotational direction "A" of cam rotor 40 is shown by equation (3).

$$\tau = F_t \cdot R_1 \quad (3)$$

By using equation (2), equation (3) is transformed into equation (4).

$$\tau = F_p \cdot R_1^3 \cdot \beta / L \quad (4)$$

In this embodiment, the scalar of torque  $\tau$  is designed to exceeds the scalar of torque  $\tau'$ , which tends to rotate wobble plate 60 in the opposite rotational direction of cam rotor 40 in the nutational motion of wobble plate 60, by appropriately designing angle  $\beta$ . Accordingly, one inner plane side surface 611a of slider 611 is maintained to contact with one outer plane side surface 612a of rail 612 while cam rotor 40 rotates. Therefore, cyclic collision between slider 611 and rail 612 can be eliminated, thereby preventing damage of wobble plate 60 and rotation preventing device 610 and eliminating the cyclic contact noise between slider 611 and rail 612.

Figure 6 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with a second embodiment of the present invention. In the drawing, a positional relation between the ball-and-socket joints provided at wobble plate 60 and the ball-and-socket joint provided at each of respective pistons 711-717 is specifically illustrated.

In a positional relation between the ball-and-socket joints provided at wobble plate 60 and the ball-

and-socket joint provided at each of respective pistons 711-717, this embodiment is similar to the other prior art other than the following matter.

Sliding rail 612 is positioned so as to be radially shifted toward the rotational direction "A" of cam rotor 40 from the location at which sliding rail 612 of the other prior art is positioned with angle  $\beta$  as well as the first embodiment. Therefore, in an assembling process of the compressor, points W11-W17 are radially shifted toward the rotational direction "A" of cam rotor 40 from points P11-P17 respectively with angle  $\beta$ , for example,  $\pi/60$  when fork-shaped slider 611 is mounted on sliding rail 612. An effect of this embodiment is similar to the effect of the first embodiment so that an explanation thereof is omitted.

In the first and second embodiments, sliding rail 612 is positioned so as to be radially shifted toward the rotational direction "A" of cam rotor 40 from the location at which sliding rail 612 of the prior arts is positioned. However, an effect similar to the effect of the first and second embodiments can be obtained by shifting slider 611 toward the opposite rotational direction of cam rotor 40 while a position of sliding rail 612 is maintained at the location of the prior arts.

Furthermore, an effect similar to the effect of the first and second embodiments can be also obtained by radially shifting the ball-and-socket joints of wobble plate 60 toward the rotational direction "A" of cam rotor 40. In this embodiment, it is not required to radially shift all of the ball-and-socket joints of wobble plate 60 toward the rotational direction "A" of cam rotor 40. Otherwise, only some numbers of the ball-and-socket joints of wobble plate 60 are radially shifted toward the rotational direction "A" of cam rotor 40 so as to generate torque  $\tau$  of which scalar exceeds the scalar of torque  $\tau'$  which is generated in the nutational motion of wobble plate 60, and tends to rotate wobble plate 60 in the opposite rotational direction of cam rotor 40.

Still furthermore, though figure 1 illustrates a variable capacity wobble plate type compressor, this invention is applicable to not only the variable capacity wobble plate type compressor but also a fixed capacity wobble plate type compressor.

## Claims

1. A wobble plate type compressor (10) comprising a compressor housing (20) having a cylinder block (21) provided with a plurality of cylinders (70) and a crank chamber (22) adjacent said cylinder block (21), a piston (71) slidably fitted within each of said cylinders (70), a drive shaft (26) rotatably supported in said housing (20), a rotor (40) fixed on said drive shaft (26) and further connected to an inclined plate (50), a wobble plate (60) being adjacent said inclined plate (50),



bling process of the compressor, points W1-W7 are radially shifted toward the rotational direction "A" of cam rotor 40 from points P1-P7 respectively with angle  $\beta$ , for example,  $\pi/60$  when fork-shaped slider 611 is mounted on sliding rail 612. As a result, when the compressor operates, a torque which tends to rotate wobble plate 60 in rotational direction "A" of cam rotor 40 is generated.

A dynamic analysis with respect to the first embodiment of the present invention is described below. With reference to Figure 5, force  $F_t$  is a component force of gas pressure reaction force  $F_p$  which acts on piston 71. Component force  $F_t$  shown by equation (1) acts on point  $W_i$  along the tangent at point  $W_i$  on first circle C1.

$$F_t = F_p \cdot \tan \alpha \quad (1)$$

In equation (1),  $\alpha$  is the angle between the line including points  $P'_i$  and  $W'_i$  and the line including points  $P_i$  and  $W_i$ . Since  $\alpha$  is small,  $\tan \alpha$  is approximately substituted for  $R_1 \cdot \beta / L$ . In this term, " $R_1$ " is the radius of first circle C1.  $\beta$  is the angle between the line including points "O" through which the longitudinal axis of wobble plate 60 passes and  $W'_i$  and the line including points "O" and  $W_i$ . " $L$ " is the distance between points  $P_i$  and  $W_i$ , that is,  $P'_i$  and  $W'_i$ . Therefore, equation (1) is transformed into equation (2).

$$F_t = F_p \cdot R_1 \cdot \beta / L \quad (2)$$

Accordingly, torque  $\tau$  which tends to rotate wobble plate 60 in rotational direction "A" of cam rotor 40 is shown by equation (3).

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By using equation (2), equation (3) is transformed into equation (4).

$$\tau = F_p \cdot R_1^2 \cdot \beta / L \quad (4)$$

In this embodiment, the scalar of torque  $\tau$  is designed to exceeds the scalar of torque  $\tau'$ , which tends to rotate wobble plate 60 in the opposite rotational direction of cam rotor 40 in the nutational motion of wobble plate 60, by appropriately designing angle  $\beta$ . Accordingly, one inner plane side surface 611a of slider 611 is maintained to contact with one outer plane side surface 612a of rail 612 while cam rotor 40 rotates. Therefore, cyclic collision between slider 611 and rail 612 can be eliminated, thereby preventing damage of wobble plate 60 and rotation preventing device 610 and eliminating the cyclic contact noise between slider 611 and rail 612.

Figure 6 schematically illustrates a vertical latitudinal sectional view of a wobble plate type refrigerant compressor in accordance with a second embodiment of the present invention. In the drawing, a positional relation between the ball-and-socket joints provided at wobble plate 60 and the ball-and-socket joint provided at each of respective pistons 711-717 is specifically illustrated.

In a positional relation between the ball-and-socket joints provided at wobble plate 60 and the ball-

and-socket joint provided at each of respective pistons 711-717, this embodiment is similar to the other prior art other than the following matter.

Sliding rail 612 is positioned so as to be radially shifted toward the rotational direction "A" of cam rotor 40 from the location at which sliding rail 612 of the other prior art is positioned with angle  $\beta$  as well as the first embodiment. Therefore, in an assembling process of the compressor, points W11-W17 are radially shifted toward the rotational direction "A" of cam rotor 40 from points P11-P17 respectively with angle  $\beta$ , for example,  $\pi/60$  when fork-shaped slider 611 is mounted on sliding rail 612. An effect of this embodiment is similar to the effect of the first embodiment so that an explanation thereof is omitted.

In the first and second embodiments, sliding rail 612 is positioned so as to be radially shifted toward the rotational direction "A" of cam rotor 40 from the location at which sliding rail 612 of the prior arts is positioned. However, an effect similar to the effect of the first and second embodiments can be obtained by shifting slider 611 toward the opposite rotational direction of cam rotor 40 while a position of sliding rail 612 is maintained at the location of the prior arts.

Furthermore, an effect similar to the effect of the first and second embodiments can be also obtained by radially shifting the ball-and-socket joints of wobble plate 60 toward the rotational direction "A" of cam rotor 40. In this embodiment, it is not required to radially shift all of the ball-and-socket joints of wobble plate 60 toward the rotational direction "A" of cam rotor 40. Otherwise, only some numbers of the ball-and-socket joints of wobble plate 60 are radially shifted toward the rotational direction "A" of cam rotor 40 so as to generate torque  $\tau$  of which scalar exceeds the scalar of torque  $\tau'$  which is generated in the nutational motion of wobble plate 60, and tends to rotate wobble plate 60 in the opposite rotational direction of cam rotor 40.

Still furthermore, though figure 1 illustrates a variable capacity wobble plate type compressor, this invention is applicable to not only the variable capacity wobble plate type compressor but also a fixed capacity wobble plate type compressor.

## Claims

1. A wobble plate type compressor (10) comprising a compressor housing (20) having a cylinder block (21) provided with a plurality of cylinders (70) and a crank chamber (22) adjacent said cylinder block (21), a piston (71) slidably fitted within each of said cylinders (70), a drive shaft (26) rotatably supported in said housing (20), a rotor (40) fixed on said drive shaft (26) and further connected to an inclined plate (50), a wobble plate (60) being adjacent said inclined plate (50),



a plurality of coupling members (72) for coupling said wobble plate (60) with each of said plurality of pistons (71), each coupling member (72) having one end (72b) which is coupled with said wobble plate (60) and the other end (72a) which is coupled with one of said plurality of pistons (71), rotational motion of said inclined plate (50) being converted into nutational motion of said wobble plate (60), and a rotation preventing means (610) for preventing rotation of said wobble plate (60), said rotation preventing means (610) including a guide member (612) axially extending within said crank chamber (22) and a fork-shaped member (611) slidably mounted on said guide member (612), said fork-shaped member (611) attached to an outer peripheral end of said wobble plate (60), characterised in that

said one ends (72b) of said coupling members (72) are radially shifted toward the rotational direction (A) of said rotor (40) from said other ends (72a) of said coupling members (72) with a predetermined angle ( $\beta$ ).

2. The compressor of claim 1 wherein said other ends (72a) of said coupling members (72) are located on the longitudinal axis of said cylinders (70), respectively.
3. The compressor of claim 1 wherein said coupling member (72) is provided with a ball portion at both said one and other ends (72b, 72a) thereof so as to form a ball-and-socket joint between said wobble plate (60) and said one end (72b) of said coupling member (72), and each of said pistons (71) and said other ends (72a) of said coupling member (72).
4. The compressor of claim 2 wherein said one ends (72b) of said coupling members (72) are peripherally located on a first circle ( $C_1$ ) about the longitudinal axis of said wobble plate (60) with an equiangular interval.
5. The compressor of claim 4 wherein said other ends (72a) of said coupling members (72) are peripherally located on a second circle ( $C_2$ ) about the longitudinal axis of said rotor (40) with an equiangular interval.
6. The compressor of claim 5 wherein the radius of said first circle ( $C_1$ ) is greater than the radius of said second circle ( $C_2$ ).

#### Patentansprüche

1. Taumelscheibenkompressor (10) mit einem Kompressorgehäuse (20) mit einem Zylinderblock

(21), der mit einer Mehrzahl von Zylindern (70) versehen ist und einer Kurbelkammer (22) benachbart zu dem Zylinderblock (21), einem verschiebbar in jedem der Zylinder (70) eingepaßten Kolben (71), einer drehbar in dem Gehäuse (20) gelagerten Antriebswelle (26), einem auf der Antriebswelle (26) befestigten Rotor (40), der weiter mit einer geneigten Platte (50) verbunden ist, wobei eine Taumelscheibe (60) benachbart zu der geneigten Platte (50) vorgesehen ist, einer Mehrzahl von Koppelteilen (72) zum Verbinden der Taumelscheibe (60) mit jedem der Mehrzahl von Kolben (71), wobei jedes Koppelteil (72) ein Ende (72b), das mit der Taumelscheibe (60) verbunden ist, und ein anderes Ende (72a), das mit einem der Mehrzahl von Kolben (71) verbunden ist, aufweist, wobei die Rotationsbewegung der geneigten Platte (50) in eine Nutationsbewegung der Taumelscheibe (60) umgewandelt wird, und einem Rotationsverhinderungsmittel (610) zum Verhindern der Rotation der Taumelscheibe (60), wobei das Rotationsverhinderungsmittel (610) ein Führungsteil (612), das sich axial in der Kurbelkammer (22) erstreckt, und ein gabelförmiges Teil (611), das verschiebbar auf dem Führungsteil (612) angebracht ist, aufweist, das gabelförmige Teil (611) an einem äußeren Umfangsende der Taumelscheibe (60) angebracht ist, dadurch gekennzeichnet, daß die einen Enden (72b) der Koppelteile (72) radial in die Rotationsrichtung (A) des Rotors (40) von den anderen Enden (72a) der Koppelteile (72) um einen vorbestimmten Winkel ( $\beta$ ) verschoben sind.

2. Kompressor nach Anspruch 1, bei dem die anderen Enden (72a) der Koppelteile (72) auf der Längsachse der entsprechenden Zylinder (70) angeordnet sind.
3. Kompressor nach Anspruch 1, bei dem das Koppelteil (72) mit einem Kugelabschnitt sowohl an dem einen als auch an dem anderen Ende (72b, 72a) davon so versehen ist, daß eine Kugel-und-Fassungs-Verbindung zwischen der Taumelscheibe (60) und dem einen Ende (72b) des Koppelteiles (72) und jedem der Kolben (71) und den anderen Enden (72a) der Koppelteile (72) gebildet ist.
4. Kompressor nach Anspruch 2, bei dem die einen Enden (72b) der Koppelteile (72) umfangsmäßig auf einem ersten Kreis ( $C_1$ ) um die Längsachse der Taumelscheibe (60) mit gleichen Winkelabständen angeordnet sind.
5. Kompressor nach Anspruch 4, bei dem die anderen Enden (72a) der Koppelteile (72) umfangsmäßig auf einem zweiten Kreis ( $C_2$ ) um die



Längsachse des Rotors (40) mit gleichen Winkelabständen angeordnet sind.

6. Kompressor nach Anspruch 5, bei dem der Radius des ersten Kreises (C1) größer als der Radius des zweiten Kreises (C2) ist.

#### Revendications

1. Compresseur (10) du type à plaque de nutation comprenant un carter de compresseur (20) comportant un bloc de cylindres (21) muni d'une pluralité de cylindres (70) et une chambre de manivelle (22) adjacente au bloc de cylindres (21), un piston (71) monté en glissement à l'intérieur de chacun des cylindres (70), un arbre d'entraînement (26) monté en rotation dans le carter (20), un rotor (40) fixé sur l'arbre d'entraînement (26) et relié en outre à un plateau incliné (50), une plaque de nutation (60) adjacente au plateau incliné (50), une pluralité d'éléments d'accouplement (72) destinés à coupler la plaque de nutation (60) à chacun de la pluralité de pistons (71), chaque élément d'accouplement (72) comportant une extrémité (72b) couplée à la plaque de nutation (60) et l'autre extrémité (72a) couplée à l'un de la pluralité de pistons (71), le mouvement de rotation du plateau incliné (50) étant transformé en un mouvement de nutation de la plaque de nutation (60), et un dispositif anti-rotation (610) destiné à empêcher la rotation de la plaque de nutation (60), ce dispositif anti-rotation (610) comprenant un élément de guidage (612) s'étendant axialement à l'intérieur de la chambre de manivelle (22) et un élément en forme de fourchette (611) monté en glissement sur l'élément de guidage (612), cet élément en forme de fourchette (611) étant fixé à une extrémité périphérique extérieure de la plaque de nutation (60), caractérisé en ce que l'une des extrémités (72b) des éléments d'accouplement (72) est décalée radialement d'un angle prédéterminé ( $\beta$ ) dans le sens de rotation (A) du rotor (40), par rapport à l'autre des extrémités (72a) des éléments d'accouplement (72).
2. Compresseur selon la revendication 1, caractérisé en ce que les autres extrémités (72a) des éléments d'accouplement (72), sont placées respectivement sur l'axe longitudinal de cylindres (70).
3. Compresseur selon la revendication 1, caractérisé en ce que l'élément d'accouplement (72) est muni d'une partie de bille à l'une et l'autre de ses deux extrémités (72b, 72a), de manière à former un joint à rotule entre la plaque de nutation (60) et une extrémité (72b) de l'élément d'accouplement (72), et entre chacun des pistons (71) et

l'autre extrémité (72a) de l'élément d'accouplement (72).

4. Compresseur selon la revendication 2, caractérisé en ce que les unes des extrémités (72b) des éléments d'accouplement (72) sont placées périphériquement à intervalles angulaires égaux sur un premier cercle (C1) autour de l'axe longitudinal de la plaque de nutation (60).
5. Compresseur selon la revendication 4, caractérisé en ce que les autres des extrémités (72a) des éléments d'accouplement (72) sont placées périphériquement à intervalles angulaires égaux sur un second cercle (C2) autour de l'axe longitudinal du rotor (40).
6. Compresseur selon la revendication 5, caractérisé en ce que le rayon du premier cercle (C1) est supérieur au rayon du second cercle (C2).