PNEUMATIC VANE MOTOR

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ABSTRACT

A pneumatic vane motor comprising a housing (10) with a cylinder (11), two end walls (13,14), and a rotor (18) journalled in the housing (10) and carrying one or more pairs of sliding vanes (31), and vane supporting pins (32) longitudinally movable in transverse bores (33) in the rotor (18) and forming spacers between two diametrically opposite vanes (31), and the rotor (18) having a coaxial bore (48) with a closed end (49) and an open end (50) closed by a removable plug (51), wherein the coaxial bore (48) intersects the transverse bores (33) and being filled with a lubricant for providing lubrication of the vane supporting pins (32).
PNEUMATIC VANE MOTOR

[0001] The invention relates to a pneumatic vane motor including a housing with a cylinder, a rotor rotatively journaled in the housing and carrying one or more pairs of diametrically opposite sliding vanes for sealing contact with the cylinder, and one or more vane supporting pins movably supported in a transverse bores in the rotor and forming spacer means between the vanes in each pair.

[0002] Pneumatic vane motors of the above type are typically used in applications where an output torque is guaranteed even at very low speed levels and even right from start of the motor. One example on such applications is air hoists where full torque output is required right from the start of the motor. Another example is paint stirring where there is a demand for a very low speed operation, for instance 50 rpm. At such low speed levels there are no centrifugal forces strong enough to urge the vanes into sealing contact with the cylinder. By the arrangement of vane supporting pins or spacers the vanes in diametrically opposed pairs will move each other into a continuous sealing contact with the cylinder and thereby ensure a full torque output even at very low speed levels or as soon as pressure air is supplied to the cylinder. The vane supporting pins may be combined with springs for compensating for specific geometrical shapes of the cylinder and to ensure that no play is left between the vanes and the cylinder wall in any angular position of the rotor.

[0003] A problem concerned with air motors of this type is that the vane supporting pins tend to be exposed to friction forces and mechanical wear and eventually get seized, which means that the vanes would be hindered from performing their sliding movements which is crucial for the motor operation. This problem is particularly accentuated at motors powered by oil free air where no lubrication at all is supplied to the motor.

[0004] A main object of the invention is to provide a pneumatic vane motor wherein the vane supporting pins are prevented from being exposed to undesired friction forces and mechanical wear and ensuring an extended service life of the motor.

[0005] Further objects and advantages of the invention will appear from the following specification and claims.

[0006] A preferred embodiment of the invention is described below in detail with reference to the accompanying drawing.

[0007] In the drawing

[0008] FIG. 1 shows a longitudinal section through a pneumatic vane motor according to the invention.

[0009] FIG. 2 shows a cross section along line II-II of the motor in FIG. 1.

[0010] FIG. 3 shows on a larger scale a fragmentary view of the motor in FIG. 1.

[0011] The motor illustrated in the drawing comprises a housing 10, a cylinder 11 with an inner cylindrical wall 12, a rear end wall 13, and a forward end wall 14. The end walls 13,14 are secured to the cylinder 11 by screws 15,16. A rotor 18 is rotatively journaled in the housing 10 via two bearings 19,20 supported in the end walls 13,14. The rotor 18 has a forward end 23 extending out of the housing 10 and adapted to be connected to equipments to be driven by the motor, and a rear end 24 covered by an end cover 25. The cylinder 11 comprises alternative air inlet and outlet openings 26,27 connected to non-illustrated control valves for powering the rotor in alternative directions of rotation.

[0012] The rotor 18 has six radially extending identical slots 30 each carrying a sliding vane 31. The slots 30 and vanes 31 are arranged in three pairs equally distributed along the circumference of the rotor 18, and each pair comprising two diametrically opposite vanes. Moreover, the rotor 18 is provided with three identical transverse bores 33 each connecting two opposite slots 30 and comprising a vane supporting pin 32. As being clearly illustrated in FIG. 3 each vane supporting pin 32 comprises a sleeve shaped element 34 with a closed bottom end 36 and an open end 35, a spindle shaped stud member 38 extending into the sleeve shaped element 33 via the open end 35, and a compression spring 40 located at the bottom end 34 of the sleeve shaped element 33 and arranged to exert a bias force on the stud member 38. The stud member 38 and the sleeve shaped element 34 have interacting shoulders 43,44 for limiting the inward movement of the stud member 38 relative to the sleeve shaped element 34.

[0013] In order not to overload FIG. 2 with reference numbers just one vane 31, one slot 30 and one vane supporting pin 32 are provided with reference numbers. The vanes 31, slots 30, and pins 32 are identical to each other in all three pairs.

[0014] The rotor 18 is provided with a co-axially extending bore 48. This bore 48 has a closed end 49 and an open end 50, and the open end 50 is closed by removable plug 51. The bore 48 intersects all of the transverse bores 33 and is filled with a lubricant, preferably grease, for lubricating the vane supporting pins 32. Accordingly, the bore 48 forms a reservoir for lubricant which is in constant contact with the vane supporting pins 32 to accomplish a more or less permanent lubrication of the vane supporting pins 32 in their reciprocating movements relative to the rotor bores 33. Although not illustrated in the drawing the sleeve elements 34 may be provided with lateral openings to let in some lubrication into the sleeve elements 34 to lubricate the contact surfaces between the sleeve elements 34 and the studs 38. However, the relative movements between the studs 38 and the sleeve elements 34 are very short and an initial lubrication of these parts at assembly may well be enough. The lubricant reservoir formed by the axial bore 48 may be filled and refilled via the open end 50 of the bore 48 as the plug 51 is removed.

[0015] A small amount of grease may leak past the vane supporting pins 32 into the vane slots 30, but there would be no harm to the motor. On the contrary, the sliding movements of the vanes 31 would be facilitated and the mechanical wear of the vanes 31 would be reduced.

[0016] The new lubrication arrangement for the vane supporting pins 32 results in a substantially reduced mechanical wear and a considerably extended service life and/or service intervals of the motor.

[0017] The embodiments of the invention are not limited to the described example but may be freely varied within the scope of the claims. For instance, the number of vanes is not limited to six. Other practical numbers of vanes are two or four. It is important though that they are arranged in pairs for enabling vane supporting pins to be provided.

1.6. (canceled)

7. A pneumatic vane motor comprising:
a housing with a cylinder;
a rotor rotatably journaled in the housing and carrying at least one pair of sliding vanes for sealing contact with the cylinder, wherein the vanes in each pair are disposed diametrically opposite each other; and
at least one vane supporting pin longitudinally movable in one or more transverse bores in the rotor and forming a spacer between the two diametrically opposite vanes of each pair, and
wherein the rotor has a coaxially extending bore intersecting said one or more transverse bores and forming a lubricant reservoir for continued supply of lubricant to the at least one vane supporting pin.

8. The vane motor according to claim 7, wherein:
said bore has a closed end and an open end, and said open end is closed by a removable plug.

9. The vane motor according to claim 7, wherein each vane supporting pin comprises a spring for compensating for plays between the vane supporting pin and the vanes.

10. The vane motor according to claim 8, wherein each vane supporting pin comprises a spring for compensating for plays between the vane supporting pin and the vanes.

11. The vane motor according to claim 9, wherein each vane supporting pin further comprises:
a sleeve shaped element with a closed bottom end and an open end; and
a spindle shaped stud member movably received in said sleeve shaped element through said open end, and wherein said spring comprises a compression spring located between the bottom end of said sleeve shaped element and the stud member.

12. The vane motor according to claim 10, wherein each vane supporting pin further comprises:
a sleeve shaped element with a closed bottom end and an open end; and
a spindle shaped stud member movably received in said sleeve shaped element through said open end, wherein said spring comprises a compression spring located between the bottom end of said sleeve shaped element and the stud member.

13. The vane motor according to claim 11, wherein said sleeve shaped element and said stud member comprise interacting shoulders for limiting an inward movement of said stud member relative to said sleeve shaped element.

14. The vane motor according to claim 12, wherein said sleeve shaped element and said stud member comprise interacting shoulders for limiting an inward movement of said stud member relative to said sleeve shaped element.

15. The vane motor according to claim 7, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

16. The vane motor according to claim 8, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

17. The vane motor according to claim 9, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

18. The vane motor according to claim 10, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

19. The vane motor according to claim 11, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

20. The vane motor according to claim 12, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

21. The vane motor according to claim 13, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.

22. The vane motor according to claim 14, wherein the number of transverse bores and the number of vane supporting pins are just one for each pair of vanes.