Accordingly, it would be desirable to have a motor that addresses some of the issues described above.

BRIEF SUMMARY OF THE INVENTION

[0003a] According to a first aspect of the present invention, there is provided a rotary motor, comprising: a plurality of vanes to generate torque for the rotary motor; an inner rotary member housing the plurality of vanes projecting from a central rotation axis of the inner rotary member; a multi lobe member surrounding, at least in part, the inner rotary member and the plurality of vanes, wherein the multi lobe member comprises at least two lobes wherein each of the lobes comprises an inlet and an outlet; a plurality of chambers wherein each of the chambers is surrounded, at least in part, by an inner surface of the multi lobe member and an outer surface of the inner rotary member; and an outer port member, wherein the outer port member surrounds, at least in part, the multi lobe member, wherein the outer port member comprises an inlet port and an outlet port, wherein the multi lobe member comprises an inlet groove and an outlet groove on an outer circumferential surface of the multi lobe member.

[0003b] According to a second aspect of the present invention, there is provided a method for manufacturing a rotary motor, comprising: placing a plurality of vanes in an outer circumferential surface of an inner rotary member; configuring a plurality of lobes each of which comprises an inlet and an outlet; circumferentially arranging the lobes in an inner circumferential surface of a multi lobe member; forming a plurality of chambers wherein each chamber is placed between two adjacent lobes and is surrounded, at least in part, by the inner circumferential surface of the multi lobe member and the outer circumferential surface of the inner rotary member; surrounding, at least in part, the multi lobe member with an outer port member comprising an inlet port and an outlet port; forming an inlet groove and an outlet groove on an

outer surface of the multi lobe member; aligning the inlet with the inlet groove and further aligning the inlet groove with the inlet port; and aligning the outlet with the outlet groove and further aligning the outlet groove with the outlet port.

[0003c] According to a third aspect of the present invention, there is provided an apparatus for use in a hydraulic torque system, comprising: rotating means for housing a plurality of torque generating means; multi lobe means for supplying a working fluid to act on the torque generating means wherein the multi lobe means comprises two or more contacting portions, wherein each of the contacting portions comprises an inlet and an outlet for the working fluid, and wherein at least one of the contacting portions is in contact with at least one of an inner circumferential surface of the rotating means; a plurality of chamber means for holding the working fluid wherein each of the plurality of the chamber means is surrounded, at least in part, by an inner surface of the multi lobe means and an outer surface of the rotating means, wherein at least one of the plurality of the chamber means is placed between two contacting portions, and wherein each of the plurality of chamber means is configured to maintain a substantially equal volume during rotation of the rotating means; outer port means for surrounding, at least in part, the multi lobe means; and means for covering and sealing the means for supplying the working fluid and the rotating means, wherein the outer port means comprises an inlet port and an outlet port, wherein the multi lobe means comprises an inlet groove and an outlet groove on an outer circumferential surface of the multi lobe means.

[0004] ~~In one aspect, there~~ There is provided a rotary motor, the rotary motor including: a plurality of vanes; an inner rotary member housing the plurality of vanes projecting from a central rotation axis of the inner rotor; a multi lobe member encompassing the inner rotary member and the plurality of vanes, wherein the multi lobe member includes at least two lobes

wherein each of the lobes includes an inlet and an outlet for a working medium; and a plurality of chambers, wherein each of the chambers is encompassed by an inner surface of the multi lobe member and an outer surface of the inner rotary member.

[0005] ~~In another aspect, there~~ There is provided a rotary motor, the rotary motor including: an inner rotary member; a plurality of end plates; a multi lobe member including 2 or more lobes wherein each of the lobes includes an inlet and an outlet for a working medium, wherein the working medium comprises a gas, air, fluid or a combination thereof, wherein the working medium entering the inlet port of the outer port member is pressurized, and wherein a compression ratio of the working medium is adjustable; and a plurality of vanes wherein a number of the vanes is larger than a number of the lobes.

[0006] ~~In another aspect, there~~ There is provided a method for manufacturing a rotary motor, the method including: placing a plurality of vanes in an outer circumferential surface of an inner rotary member; forming a plurality of lobes each of which includes an inlet and an outlet; circumferentially arranging the lobes in an inner circumferential surface of a multi lobe member; configuring the lobes to form a contact with the outer circumferential surface of the inner rotary

member; encompassing the plurality of vanes and the inner rotary member with the multi lobe member including an inlet groove and an outlet groove on an outer surface of the multi lobe member; forming a plurality of chambers wherein each chamber is placed between two adjacent lobes and is encompassed by the inner circumferential surface of the multi lobe member and the outer circumferential surface of the inner rotary member; encompassing the multi lobe member with an outer port member including an inlet port and an outlet port; and covering and sealing sides of the outer port member, the multi lobe member, the inner rotary member and the chambers with a plurality of end plates.

[0007] ~~In still another aspect, there~~ There is provided an apparatus for use in a hydraulic torque system, the apparatus including: rotating means for housing a plurality of torque generating means; means for supplying a working medium to act on the torque generating means wherein the means for supplying the working medium includes two or more contacting portions, wherein each of the contacting portions includes an inlet and an outlet for the working medium, and wherein each of the contacting portions is in contact with at least one of an inner circumferential surface of the rotating means and the torque generating means; a plurality of means for holding the working medium, wherein each of the plurality of the means for holding the working medium is encompassed by an inner surface of the means for supplying the working medium and an outer surface of the rotating means, wherein the means for holding the working medium is placed between two contacting portions, and wherein each of the plurality of means for holding the working medium is configured to maintain an equal volume during rotation of the rotating means; means for enclosing the means for supplying the working medium; and means for covering and sealing the means for supplying the working medium and the rotating means.

CLAIMS

We Claim:

1. A rotary motor, comprising:

a plurality of vanes to generate torque for the rotary motor;

an inner rotary member housing the plurality of vanes projecting from a central rotation axis of the inner rotary member;

a multi lobe member surrounding, at least in part, the inner rotary member and the plurality of vanes, wherein the multi lobe member comprises at least two lobes wherein each of the lobes comprises an inlet and an outlet; and

a plurality of chambers wherein each of the chambers is surrounded, at least in part, by an inner surface of the multi lobe member and an outer surface of the inner rotary member.

2. The rotary motor according to Claim 1, wherein a number of the vanes is larger than a number of the lobes.

3. The rotary motor according to Claim 1 or 2, wherein a number of the lobes is at least two.

4. The rotary motor according to any of the preceding claims, further comprising:

an outer port member, wherein the outer port member surrounds, at least in part, the multi lobe member, wherein the outer port member comprises an inlet port and an outlet port, and

wherein the multi lobe member comprises an inlet groove and an outlet groove on an outer circumferential surface of the multi lobe member.

5. The rotary motor according to Claim 4, wherein the inlet port is aligned with the inlet groove; the outlet port is aligned with the outlet groove.

6. The rotary motor according to Claim 4 or 5, wherein the inlet groove is configured to receive a working fluid entering the multi lobe member by way of the inlet port; the outlet groove is configured to discharge the working fluid by way of the outlet port.

7. The rotary motor according to any of claims 4 to 6, wherein the inlets of the lobes are aligned with the inlet groove; the outlets of the lobes are aligned with the outlet groove.

8. The rotary motor according to any of the preceding claims, further comprising:

one or more end plates, wherein the chambers are covered, at least in part, by the end plates; each of the chambers is located between two adjacent lobes.

9. The rotary motor according to any of the preceding claims, wherein each of the chambers is configured to maintain a substantially equal volume with respect to each other during rotation of the inner rotary member.

10. The rotary motor according to any of the preceding claims, wherein each of the lobes is located in a convex portion of the inner surface of the multi lobe member.

11. The rotary motor according to any of the preceding claims, wherein a rotation axis of the inner rotary member is configured to remain stationary during rotation of the inner rotary member.

12. The rotary motor according to any of the preceding claims, wherein each of the chambers is configured to receive a working fluid by way of an inlet located in a nearest neighboring lobe of each of the chambers and to discharge the working fluid by way of an outlet located in another nearest neighboring lobe of each of the chambers in a rotation direction of the inner rotary member.

13. The rotary motor according to any of the preceding claims, wherein the rotary motor is configured to process a working fluid.

14. The rotary motor according to any of the preceding claims, wherein the rotary motor is configured to pressurize a working fluid.

15. The rotary motor according to Claim 14, wherein a compression ratio of the working fluid is adjustable.

16. A method for manufacturing a rotary motor, comprising:

placing a plurality of vanes in an outer circumferential surface of an inner rotary member;

forming a plurality of lobes each of which comprises an inlet and an outlet;

circumferentially arranging the lobes in an inner circumferential surface of a multi lobe member;

forming a plurality of chambers wherein each chamber is placed between two adjacent lobes and is surrounded, at least in part, by the inner circumferential surface of the multi lobe member and the outer circumferential surface of the inner rotary member; and

surrounding, at least in part, the multi lobe member with an outer port member comprising an inlet port and an outlet port.

17. The method for manufacturing a rotary motor according to Claim 16, further comprising:

configuring the lobes to form a contact with the outer circumferential surface of the inner rotary member;

covering and sealing sides of the outer port member, the multi lobe member, the inner rotary member and the chambers with a plurality of end plates; and

configuring the vanes to form a seal between the vanes and the end plates.

18. The method for manufacturing a rotary motor according to Claim 16 or 17, further comprising:

forming an inlet groove and an outlet groove on an outer surface of the multi lobe member;

aligning the inlet with the inlet groove and further aligning the inlet groove with the inlet port; and

aligning the outlet with the outlet groove and further aligning the outlet groove with the outlet port.

19. The method for manufacturing a rotary motor according to any of claims 16 to 18, further comprising:

configuring each of the chambers to maintain a substantially equal volume with respect to each other during rotation of the inner rotary member;

forming a concave portion in each chamber; and

configuring each of the chambers to receive a working fluid by way of the inlet located in a nearest neighboring lobe of each of the chambers and to discharge the working fluid by way of the outlet located in another nearest neighboring lobe of each of the chambers in a rotation direction of the inner rotary member.

20. An apparatus for use in a hydraulic torque system, comprising:

rotating means for housing a plurality of torque generating means;

means for supplying a working fluid to act on the torque generating means wherein the means for supplying the working fluid comprises two or more contacting portions, wherein each of the contacting portions comprises an inlet and an outlet for the working fluid, and wherein at least one of the contacting portions is in contact with at least one of an inner circumferential surface of the rotating means;

a plurality of means for holding the working fluid wherein each of the plurality of the means for holding the working fluid is surrounded, at least in part, by an inner surface of the means for supplying the working fluid and an outer surface of the rotating means, wherein the

means for holding the working fluid is placed between two contacting portions, and wherein each of the plurality of means for holding the working fluid is configured to maintain a substantially equal volume during rotation of the rotating means;

means for surrounding, at least in part, the means for supplying the working fluid; and

means for covering and sealing the means for supplying the working fluid and the rotating means.

21. The rotary motor according to any of claims 1 to 15, further comprising:

a drive passing through a central axis of the inner rotary member.

22. The rotary motor according to any of claims 1 to 15, 21, wherein the inner rotary member is configured to generate fluid pressure on the vanes during rotation of the inner rotary member.

23. The rotary motor according to any of claims 1 to 15, 21 to 22, further comprising:

a sealing ridge on a side of the inner rotary member.

24. The rotary motor according to any of claims 1 to 15, 21 to 23, wherein the rotary motor is configured to feed a working fluid into all of the inlets and the outlets through the lobes without requiring multiple external connections.

25. The rotary motor according to any of claims 1 to 15, 21 to 24, where the rotary motor is configured to allow rotation of the inner rotary member reversible without repositioning the rotary motor.

26. The rotary motor according to any of claims 1 to 15, 21 to 25, wherein each of the chambers is configured to produce a substantially equal amount torque acting on the vanes.

27. The rotary motor according to any of claims 1 to 15, 21 to 26, wherein the rotary motor has no side load.

28. The rotary motor according to any of claims 1 to 15, 21 to 27, wherein the rotary motor has no secondary nut runner.

29. The rotary motor according to any of claims 1 to 15, 21 to 28, wherein the lobes are periodically spaced at a substantially equal distance along an inner circumferential surface of the multi lobe member.

30. The rotary motor according to any of claims 3 to 15, 21 to 26, wherein a number of lobes is at least eight.

31. The method for manufacturing a rotary motor according to any of claims 16 to 19, further comprising:

configuring a drive to pass through a central axis of the inner rotary member.

32. The method for manufacturing a rotary motor according to any of claims 16 to 19, 31 further comprising:

configuring the inner rotary member to generate fluid pressure on the vanes during rotation of the inner rotary member.

33. The method for manufacturing a rotary motor according to any of claims 16 to 19, 31 to 32, further comprising:

configuring the rotary motor to feed a working fluid into all of the inlets and the outlets through the lobes without requiring multiple external connections.

34. The method for manufacturing a rotary motor according to any of claims 16 to 19, 31 to 33,

further comprising:

configuring the rotary motor to allow rotation of the inner rotary member reversible without repositioning the rotary motor.

35. The method for manufacturing a rotary motor according to claims 16 to 19, 31 to 34,

further comprising:

configuring each of the chambers to produce a substantially equal amount torque acting on the vanes.

36. The method for manufacturing a rotary motor according to claims 16 to 19, 31 to 35,

further comprising:

periodically spacing the lobes at a substantially equal distance along an inner circumferential surface of the multi lobe member.

37 The apparatus according to Claim 20, further comprising:

a drive to pass through a central axis of the rotating means.

38. The apparatus according to Claim 20 or 37, wherein the rotating means is configured to generate fluid pressure on the torque generating means during rotation of the rotating means.

39. The apparatus according to claims 20, 37 to 38, wherein each of the means for holding the working fluid is configured to produce a substantially equal amount of torque acting on the torque generating means.

40. The apparatus according to claims 20, 37 to 39, wherein the contacting portions are periodically spaced at a substantially equal distance along an inner circumferential surface of the means for supplying a working fluid.

CLAIMS

1. A rotary motor, comprising:

a plurality of vanes to generate torque for the rotary motor;

an inner rotary member housing the plurality of vanes projecting from a central rotation axis of the inner rotary member;

a multi lobe member surrounding, at least in part, the inner rotary member and the plurality of vanes, wherein the multi lobe member comprises at least two lobes wherein each of the lobes comprises an inlet and an outlet;

a plurality of chambers wherein each of the chambers is surrounded, at least in part, by an inner surface of the multi lobe member and an outer surface of the inner rotary member; and

an outer port member,

wherein the outer port member surrounds, at least in part, the multi lobe member,

wherein the outer port member comprises an inlet port and an outlet port,

wherein the multi lobe member comprises an inlet groove and an outlet groove on an outer circumferential surface of the multi lobe member.

2. The rotary motor according to claim 1, wherein a number of the vanes is larger than a number of the lobes.

3. The rotary motor according to claim 1, wherein a number of the lobes is more than two.

4. The rotary motor according to claim 3, wherein a number of lobes is at least eight.

5. The rotary motor according to claim 1, wherein the net port is aligned with the inlet groove; the outlet port is aligned with the outlet groove.

6. The rotary motor according to claim 1, wherein the inlet groove is configured to receive a working fluid entering the multi lobe member by way of the inlet port; the outlet groove is configured to discharge the working fluid by way of the outlet port.

7. The rotary motor according to claim 1, wherein the inlets of the lobes are aligned with the inlet groove; the outlets of the lobes are aligned with the outlet groove.

8. The rotary motor according to claim 1, further comprising:

one or more end plates, wherein the chambers are covered, at least in part, by the end plates; each of the chambers is located between two adjacent lobes.

9. The rotary motor according to claim 1, wherein each of the chambers is configured to maintain a substantially equal volume with respect to each other during rotation of the inner rotary member.

10. The rotary motor according to claim 1, wherein each of the lobes is located in a convex portion of the inner surface of the multi lobe member.

11. The rotary motor according to claim 1, wherein a rotation axis of the inner rotary member is configured to remain stationary during rotation of the inner rotary member.

12. The rotary motor according to claim 1, wherein each of the chambers is configured to receive a working fluid by way of an inlet located in a nearest neighboring lobe of the each of the chambers and to discharge the working fluid by way of an outlet located in another nearest neighboring lobe of the each of the chambers in a rotation direction of the inner rotary member.

13. The rotary motor according to claim 1, wherein the rotary motor is configured to process a working fluid.

14. The rotary motor according to claim 13, wherein the the plurality of vanes are configured to receive the working fluid via the multi lobe member.

15. The rotary motor according to claim 14, wherein a speed of the rotary motor depends on a compression ratio of the working fluid.

16. The rotary motor according to claim 1, further comprising:

a drive passing through a central axis of the inner rotary member.

17. The rotary motor according to claim 1, at least one of the plurality of vanes is configured to maintain at least in part a contact with at least one of the plurality of chambers during rotation of the inner rotary member.

18. The rotary motor according to claim 1, further comprising:

a sealing ridge on a side of the inner rotary member.

19. The rotary motor according to claim 1, wherein the rotary motor is configured to feed a working fluid into all of the inlets and the outlets through the lobes without requiring multiple external connections.

20. The rotary motor according to claim 1, where the rotary motor is configured to allow rotation of the inner rotary member reversible without repositioning the rotary motor.

21. The rotary motor according to claim 1, wherein each of the chambers is configured to produce a substantially equal amount torque acting on the vanes.

22. The rotary motor according to claim 1, wherein the rotary motor has no side load.

23. The rotary motor according to claim 1, wherein the rotary motor has no secondary nut runner.

24. The rotary motor according to claim 1, wherein the lobes are periodically spaced at a substantially equal distance along an inner circumferential surface of the multi lobe member.

25. A method for manufacturing a rotary motor, comprising:

placing a plurality of vanes in an outer circumferential surface of an inner rotary member;

configuring a plurality of lobes each of which comprises an inlet and an outlet;

circumferentially arranging the lobes in an inner circumferential surface of a multi lobe member;

forming a plurality of chambers wherein each chamber is placed between two adjacent lobes and is surrounded, at least in part, by the inner circumferential surface of the multi lobe member and the outer circumferential surface of the inner rotary member;

surrounding, at least in part, the multi lobe member with an outer port member comprising an inlet port and an outlet port;

forming an inlet groove and an outlet groove on an outer surface of the multi lobe member;

aligning the inlet with the inlet groove and further aligning the inlet groove with the inlet port; and

aligning the outlet with the outlet groove and further aligning the outlet groove with the outlet port.

26. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring the lobes to form a contact with the outer circumferential surface of the inner rotary member;

covering and sealing sides of the outer port member, the multi lobe member, the inner rotary member and the chambers with a plurality of end plates; and

configuring the vanes to form a seal between the vanes and the end plates.

27. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring each of the chambers to maintain a substantially equal volume with respect to each other during rotation of the inner rotary member;

forming a concave portion in each chamber; and

configuring each of the chambers to receive a working fluid by way of the inlet located in a nearest neighboring lobe of each of the chambers and to discharge the working fluid by way of the outlet located in another nearest neighboring lobe of each of the chambers in a rotation direction of the inner rotary member.

28. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring a drive to pass through a central axis of the inner rotary member.

29. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring the vanes to receive a working fluid via the multi lobe member during rotation of the inner rotary member.

30. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring the rotary motor to feed a working fluid into all of the inlets and the outlets through the lobes without requiring multiple external connections.

31. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring the rotary motor to allow rotation of the inner rotary member reversible without repositioning the rotary motor.

32. The method for manufacturing a rotary motor according to claim 25, further comprising:

configuring each of the chambers to produce a substantially equal amount torque acting on the vanes.

33. The method for manufacturing a rotary motor according to claim 25, further comprising:

periodically spacing the lobes at a substantially equal distance along an inner circumferential surface of the multi lobe member.

34. An apparatus for use in a hydraulic torque system, comprising:

rotating means for housing a plurality of torque generating means;

multi lobe means for supplying a working fluid to act on the torque generating means wherein the multi lobe means comprises two or more contacting portions, wherein each of the contacting portions comprises an inlet and an outlet for the working fluid, and wherein at least one of the contacting portions is in contact with at least one of an inner circumferential surface of the rotating means;

a plurality of chamber means for holding the working fluid wherein each of the plurality of the chamber means is surrounded, at least in part, by an inner surface of the multi lobe means and an outer surface of the rotating means, wherein at least one of the plurality of the chamber means is placed between two contacting portions, and wherein each of the plurality of chamber means is configured to maintain a substantially equal volume during rotation of the rotating means;

outer port means for surrounding, at least in part, the multi lobe means; and

means for covering and sealing the means for supplying the working fluid and the rotating means,

wherein the outer port means comprises an inlet port and an outlet port,

wherein the multi lobe means comprises an inlet groove and an outlet groove on an outer circumferential surface of the multi lobe means.

35. The apparatus according to claim 34, further comprising:

a drive to pass through a central axis of the rotating means.

36. The apparatus according to claim 34, wherein the torque generating means are configured to receive the working fluid via on the multi lobe means during rotation of the rotating means.

37. The apparatus according to claim 34, wherein each of the chamber means is configured to produce a substantially equal amount of torque acting on the torque generating means.

38. The apparatus according to claim 34, wherein the contacting portions are periodically spaced at a substantially equal distance along an inner circumferential surface of the multi lobe means.