CPC COOPERATIVE PATENT CLASSIFICATION

F04C ROTARY-PISTON, OR OSCILLATING-PISTON, POSITIVE-DISPLACEMENT MACHINES FOR LIQUIDS (engines F03C); ROTARY-PISTON, OR OSCILLATING-PISTON, POSITIVE-DISPLACEMENT PUMPS

NOTE

Attention is drawn to the notes preceding class F01 especially as regards the definitions of "machines", "pumps", "positive displacement", "rotary-piston machines", "oscillating-piston machines", "rotary piston", "co-operating members", "movement of co-operating members", "teeth or tooth-equivalents" and "internal axis".

2/00 **Rotary-piston machines or pumps** (with non-parallel axes of co-operating members F04C 3/00; with the working-chamber walls at least partly resiliently deformable F04C 5/00; with fluid ring or the like F04C 7/00; rotary-piston pumps specially adapted for elastic fluids F04C 18/00; rotary-piston machines or pumps in which the working-fluid is exclusively displaced by, or exclusively displaces, one or more reciprocating pistons F04B)

NOTE

Group F04C 2/30 takes precedence over groups F04C 2/02 - F04C 2/28

2/02 . of arcuate-engagement type, i.e. with circular translatory movement of co-operating members, each member having the same number of teeth or tooth-equivalents

2/025 . . {the moving and the stationary member having co-operating elements in spiral form}

2/04 . . of internal axis type

2/045 . . . {having a C-shaped piston}

2/06 . . of other than internal-axis type (F04C 2/063 takes precedence)

2/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them

2/067 . . . having cam-and-follower type drive

2/07 . . . having crankshaft-and-connecting-rod type drive

2/073 . . . having pawl-and-ratchet type drive

2/077 . . . having toothed-gearing type drive

2/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing

2/082 . . {Details specially related to intermeshing engagement type machines or pumps}

2/084 . . . {Toothed wheels}

2/086 . . . {Carter}

2/088 . . . {Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement}

2/10 . . of internal-axis type with the outer member having more teeth or tooth-equivalents, e.g. rollers, than the inner member

2/101 . . . {with a crescent-shaped filler element, located between the inner and outer intermeshing members}

2/102 . . . {the two members rotating simultaneously around their respective axes}

2/103 . . . {one member having simultaneously a rotational movement about its own axis and an orbital movement}

2/104 . . . . {having an articulated driving shaft}

2/105 . . . . {Details concerning timing or distribution valves}

2/106 . . . . . {Spool type distribution valves}

2/107 . . . with helical teeth

2/1071 . . . . {the inner and outer member having a different number of threads and one of the two being made of elastic materials, e.g. Moineau type}

2/1073 . . . . . {where one member is stationary while the other member rotates and orbits}

2/1075 . . . . . {Construction of the stationary member}

2/1076 . . . . . {where one member orbits or wobbles relative to the other member which rotates around a fixed axis}

2/1078 . . . . . {where one member rotates and both members are allowed to orbit or wobble}

2/113 . . . the inner member carrying rollers intermeshing with the outer member

2/12 . . of other than internal-axis type

2/123 . . . {with radially or approximately radially from the rotor body extending tooth-like elements, co-operating with recesses in the other rotor, e.g. one tooth}

2/126 . . . {with radially from the rotor body extending elements, not necessarily co-operating with corresponding recesses in the other rotor, e.g. lobes, Roots type}

2/14 . . . with toothed rotary pistons

2/16 . . . . with helical teeth, e.g. chevron-shaped, screw type {(for non-parallel axes of movement F04C 3/00)}

2/165 . . . . . {having more than two rotary pistons with parallel axes}

2/18 . . . . with similar tooth forms (F04C 2/16 takes precedence)

2/20 . . . . with dissimilar tooth forms (F04C 2/16 takes precedence)

2/22 . of internal-axis type with equidirectional movement of co-operating members at the points of engagement, or with one of the co-operating members being stationary, the inner member having more teeth or tooth-equivalents than the outer member

2/24 . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions

2/26 . . of internal-axis type
2/28 . . of other than internal-axis type
2/30 . having the characteristics covered by two or more groups F04C 2/02, F04C 2/08, F04C 2/22, F04C 2/24 or having the characteristics covered by one of these groups together with some other type of movement between co-operating members
2/32 . . having both the movement defined in groups F04C 2/02 and relative reciprocation between co-operating members
2/321 . . . {with vanes hinged to the inner member and reciprocating with respect to the inner member}
2/322 . . . {with vanes hinged to the outer member and reciprocating with respect to the outer member}
2/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
2/328 . . . . and hinged to the outer member
2/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
2/336 . . . . and hinged to the inner member
2/34 . . having the movement defined in groups F04C 2/08 or F04C 2/22 and relative reciprocation between the co-operating members
2/344 . . . with vanes reciprocating with respect to the inner member
2/3441 . . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}
2/3442 . . . . . {the surfaces of the inner and outer member, forming the working space, being surfaces of revolution}
2/3443 . . . . . {with a separation element located between the inlet and outlet opening}
2/3445 . . . . . {the vanes having the form of rollers, slippers or the like}
2/3446 . . . . {the inner and outer member being in contact along more than one line or surface}
2/3447 . . . . . {the vanes having the form of rollers, slippers or the like}
2/3448 . . . . {with axially movable vanes}
2/348 . . . . the vanes positively engaging, with circumferential play, an outer rotatable member
2/352 . . . . the vanes being pivoted on the axis of the outer member
2/356 . . . with vanes reciprocating with respect to the outer member
2/3562 . . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}
2/3564 . . . . . {the surfaces of the inner and outer member, forming the working space, being surfaces of revolution}
2/3566 . . . . {the inner and outer member being in contact along more than one line or surface}
2/3568 . . . . {with axially movable vanes}
2/36 . . having both the movements defined in groups F04C 2/22 and F04C 2/24
2/38 . . having the movement defined in group F04C 2/02 and having a hinged member (F04C 2/32 takes precedence)
2/39 . . . with vanes hinged to the inner as well as to the outer member
2/40 . . having the movement defined in group F04C 2/08 or F04C 2/22 and having a hinged member
2/44 . . . with vanes hinged to the inner member
2/46 . . . with vanes hinged to the outer member

3/00 **Rotary-piston machines or pumps, with non-parallel axes of movement of co-operating members, e.g. of screw type** (with the working-chamber walls at least partly resiliently deformable F04C 5/00; rotary-piston pumps with non-parallel axes of movement of co-operating members specially adapted for elastic fluids F04C 18/48)
3/02 . the axes being arranged at an angle of 90 degrees
3/04 . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
3/06 . the axes being arranged otherwise than at an angle of 90 degrees
3/08 . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
3/085 . . . {the axes of cooperating members being on the same plane}

5/00 **Rotary-piston machines or pumps with the working-chamber walls at least partly resiliently deformable** (such pumps specially adapted for elastic fluids F04C 18/00)

7/00 **Rotary-piston machines or pumps with fluid ring or the like** (such pumps specially adapted for elastic fluids F04C 19/00)

9/00 **Oscillating-piston machines or pumps** (such pumps specially adapted for elastic fluids F04C 21/00)
9/002 . {the piston oscillating around a fixed axis}
9/005 . {the piston oscillating in the space, e.g. around a fixed point (rotary-piston machines or pumps with non-parallel axes of movement between co-operating members F04C 3/00)}
9/007 . {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}

11/00 **Combinations of two or more machines or pumps, each being of rotary-piston or oscillating-piston type** (combinations of such pumps specially adapted for elastic fluids F04C 23/00)**; Pumping installations** (F04C 13/00 takes precedence; specially adapted for elastic fluids F04C 23/00; fluid gearing F16H)

NOTE

Multi-stage engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function

11/001 . {of similar working principle}
11/003 . . {having complementary function}
11/005 . {of dissimilar working principle}
11/006 . . {having complementary function}
11/008 . {Enclosed motor pump units}

13/00 **Adaptations of machines or pumps for special use, e.g. for extremely high pressures** (of pumps specially adapted for elastic fluids F04C 25/00)
13/001 . {Pumps for particular liquids}
13/002 . . {for homogeneous viscous liquids}

13/004 . . . {with means for fluidising or diluting the material being pumped}
13/005 . {Removing contaminants, deposits or scale from the pump; Cleaning}
13/007 . {Venting; Gas and vapour separation during pumping (preventing vapour lock in fuel pumps F02M 37/20, in centrifugal pumps F04D 9/00)}
13/008 . {Pumps for submersible use, i.e. down-hole pumping}

14/00 Control of, monitoring of, or safety arrangements for, machines, pumps or pumping installations (of pumps or pumping installations specially adapted for elastic fluids F04C 28/00)

14/02 . specially adapted for several machines or pumps connected in series or in parallel
14/04 . specially adapted for reversible machines or pumps
14/06 . specially adapted for stopping, starting, idling or no-load operation
14/065 . . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}
14/08 . characterised by varying the rotational speed
14/10 . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
14/12 . . using sliding valves
14/14 . . using rotating valves
14/16 . . using lift valves
14/18 . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C 14/10)
14/185 . . {by varying the useful pumping length of the cooperating members in the axial direction}
14/20 . . by changing the form of the inner or outer contour of the working chamber
14/22 . . by changing the eccentricity between cooperating members
14/223 . . . {using a movable cam}
14/226 . . . . {by pivoting the cam around an eccentric axis}
14/24 . characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} (F04C 14/10 takes precedence)
14/26 . . using bypass channels
14/265 . . . {being obtained by displacing a lateral sealing face}
14/28 . Safety arrangements; Monitoring

15/00 Component parts, details or accessories of machines, pumps or pumping installations, not provided for in groups F04C 2/00 - F04C 14/00 (of pumps specially adapted for elastic fluids F04C 18/00 - F04C 29/00)

15/0003 . {Sealing arrangements in rotary-piston machines or pumps (sealing in general F16J)}
15/0007 . . {Radial sealings for working fluid}
15/0011 . . . {of rigid material}
15/0015 . . . {of resilient material}
15/0019 . . . {Radial sealing elements specially adapted for intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}
15/0023 . . {Axial sealings for working fluid}
15/0026 . . . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}
15/003 . . {Sealings for working fluid between radially and axially moving parts}
15/0034 . . {for other than the working fluid, i.e. the sealing arrangements are not between working chambers of the machine}
15/0038 . . . {Shaft sealings specially adapted for rotary-piston machines or pumps}
15/0042 . {Systems for the equilibration of forces acting on the machines or pump (interstice adjustment other than by fluid pressure F01C 21/102)}
15/0046 . . {Internal leakage control}
15/0049 . . {Equalization of pressure pulses (silencing for compressors F04C 29/06)}
15/0053 . {Venting means for starting}
15/0057 . {Driving elements, brakes, couplings, transmission specially adapted for machines or pumps (brakes, couplings, transmissions per se F16, B60)}
15/0061 . . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}
15/0065 . . . {for eccentric movement}
15/0069 . . . {Magnetic couplings}
15/0073 . . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft}
15/0076 . . {Fixing rotors on shafts, e.g. by clamping together hub and shaft}
15/008 . . {Prime movers}
15/0084 . . {Brakes, braking assemblies}
15/0088 . {Lubrication (of machines or engines in general F01M)}
15/0092 . . {Control systems for the circulation of the lubricant}
15/0096 . {Heating; Cooling (of machines or engines in general F01P)}
15/06 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
15/062 . . {Arrangements for supercharging the working space (similar arrangements for internal combustion engines F02B 33/00, F02B 37/00)}
15/064 . . {with inlet and outlet valves specially adapted for rotary or oscillating piston machines or pumps}
15/066 . . . {of the non-return type}
15/068 . . . . {of the elastic type, e.g. reed valves}

18/00 Rotary-piston pumps specially adapted for elastic fluids (with fluid ring or the like F04C 19/00; rotary-piston pumps in which the working-fluid is exclusively displaced by one or more reciprocating pistons F04B)

NOTE

Group F04C 18/30 takes precedence over groups F04C 18/02 - F04C 18/28 and F04C 18/48 - F04C 18/56.

18/02 . of arcuate-engagement type, i.e. with circular translatory movement of co-operating members, each member having the same number of teeth or tooth-equivalents

18/0207 . . {both members having co-operating elements in spiral form}
18/0215 . . . {where only one member is moving}
18/0223 . . . . {with symmetrical double wraps}
18/023 . . . {where both members are moving}
18/0238 . . . . {with symmetrical double wraps}
18/0246 . . . {Details concerning the involute wraps or their base, e.g. geometry}
18/0253 . . . . {Details concerning the base}
18/0261 . . . . . {Details of the ports, e.g. location, number, geometry}
18/0269 . . . . {Details concerning the involute wraps}
18/0276 . . . . . {Different wall heights}
18/0284 . . . . . {Details of the wrap tips}
18/0292 . . . . . {Ports or channels located in the wrap}
18/04 . . of internal-axis type
18/045 . . . {having a C-shaped piston}
18/06 . . of other than internal-axis type
18/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them
18/067 . . . having cam-and-follower type drive
18/07 . . . having crankshaft-and-connecting-rod type drive
18/073 . . . having pawl-and-ratchet type drive
18/077 . . . having toothed-gearing type drive
18/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
18/082 . . {Details specially related to intermeshing engagement type pumps}
18/084 . . . {Toothed wheels}
18/086 . . . {Carter}
18/088 . . . {Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement}
18/10 . . of internal-axis type with the outer member having more teeth or tooth equivalents, e.g. rollers, than the inner member
18/103 . . . {with a crescent shaped filler element, located between the inner and outer intermeshing elements}
18/107 . . . with helical teeth
18/1075 . . . . {the inner and outer member having a different number of threads and one of the two being made of elastic material, e.g. Moineau type}
18/113 . . . the inner member carrying rollers intermeshing with the outer member
18/12 . . of other than internal-axis type
18/123 . . . {with radially or approximately radially from the rotor body extending tooth-like elements, co-operating with recesses in the other rotor, e.g. one tooth}
18/126 . . . {with radially from the rotor body extending elements, not necessarily co-operating with corresponding recesses in the other rotor, e.g. lobes, Roots type}
18/14 . . . with toothed rotary pistons
18/16 . . . . with helical teeth, e.g. chevron-shaped, screw type {(for non-parallel axes of movement F04C 18/48)}
18/165 . . . . . {having more than two rotary pistons with parallel axes}
18/18 . . . . with similar tooth forms (F04C 18/16 takes precedence)
18/20 . . . . with dissimilar tooth forms (F04C 18/16 takes precedence)
18/22 . of internal-axis type with equidirectional movement of co-operating members at the points of engagement, or with one of the co-operating members being stationary, the inner member having more teeth or tooth equivalents than the outer member
18/24 . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions
18/26 . . of internal-axis type
18/28 . . of other than internal-axis type
18/30 . having the characteristics covered by two or more of groups F04C 18/02, F04C 18/08, F04C 18/22, F04C 18/24, F04C 18/48, or having the characteristics covered by one of these groups together with some other type of movement between co-operating members
18/32 . . having both the movement defined in group F04C 18/02 and relative reciprocation between the co-operating members
18/321 . . . {with vanes hinged to the inner member and reciprocating with respect to the inner member}
18/322 . . . {with vanes hinged to the outer member and reciprocating with respect to the outer member}
18/324 . . . with vanes hinged to the inner member and reciprocating with respect to the outer member
18/328 . . . . and hinged to the outer member
18/332 . . . with vanes hinged to the outer member and reciprocating with respect to the inner member
18/336 . . . . and hinged to the inner member
18/34 . . having the movement defined in group F04C 18/08 or F04C 18/22 and relative reciprocation between the co-operating members
18/344 . . . with vanes reciprocating with respect to the inner member
18/3441 . . . . {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation}
18/3442 . . . . . {the surfaces of the inner and outer member, forming the inlet and outlet opening}
18/3443 . . . . . {with a separation element located between the inlet and outlet opening}
18/3445 . . . . . {the vanes having the form of rollers, slippers or the like}
18/3446 . . . . {the inner and outer member being in contact along more than one line or surface}
18/3447 . . . . . {the vanes having the form of rollers, slippers or the like}
18/3448 . . . . {with axially movable vanes}
18/348 . . . . the vanes positively engaging, with circumferential play, an outer rotatable member
18/352 . . . . the vanes being pivoted on the axis of the outer member
18/356 . . . with vanes reciprocating with respect to the outer member
18/3562 . . . . {the inner and outer member being in contact along one line or continuous surfaces substantially parallel to the axis of rotation}

18/3564 . . . . . {the surfaces of the inner and outer member, forming the working space, being surfaces of revolution}
18/3566 . . . . {the inner and outer member being in contact along more than line or surface}
18/3568 . . . . {with axially movable vanes}
18/36 . . having both the movement defined in groups F04C 18/22 and F04C 18/24
18/38 . . having the movement defined in group F04C 18/02 and having a hinged member (F04C 18/32 takes precedence)
18/39 . . . with vanes hinged to the inner as well as to the outer member
18/40 . . having the movement defined in group F04C 18/08 or F04C 18/22 and having a hinged member
18/44 . . . with vanes hinged to the inner member
18/46 . . . with vanes hinged to the outer member
18/48 . Rotary-piston pumps with non-parallel axes of movement of co-operating members
18/50 . . the axes being arranged at an angle of 90 degrees
18/52 . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
18/54 . . the axes being arranged otherwise than at an angle of 90 degrees
18/56 . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing
18/565 . . . . {the axes of cooperating members being on the same plane}

19/00 Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids

19/001 . {General arrangements, plants, flowsheets}
19/002 . {with rotating outer members}
19/004 . {Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply}
19/005 . {Details concerning the admission or discharge}
19/007 . . {Port members in the form of side plates}
19/008 . . {Port members in the form of conical or cylindrical pieces situated in the centre of the impeller}

21/00 Oscillating-piston pumps specially adapted for elastic fluids

21/002 . {the piston oscillating around a fixed axis}
21/005 . {the piston oscillating in the space, e.g. around a fixed point (rotary-piston pumps with non-parallel axes of rotation between co-operating members F04C 18/48)}
21/007 . {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}

23/00 Combinations of two or more pumps, each being of rotary-piston or oscillating-piston type, specially adapted for elastic fluids; Pumping installations specially adapted for elastic fluids; Multi-stage pumps specially adapted for elastic fluids (F04C 25/00 takes precedence)

NOTE

Multi-stage pumps or compressors with stages connected in series or in parallel are not considered as having complementary function

23/001 . {of similar working principle}
23/003 . . {having complementary function}
23/005 . {of dissimilar working principle}
23/006 . . {having complementary function}
23/008 . {Hermetic pumps}

NOTE

Multi-stage steam engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function

23/02 . Pumps characterised by combination with or adaptation to specific driving engines or motors (predominant aspects of the engines or motors, see the relevant classes)

25/00 Adaptations of pumps for special use of pumps for elastic fluids

25/02 . for producing high vacuum (sealing arrangements F04C 27/00; silencing F04C 29/06)

27/00 Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids

27/001 . {Radial sealings for working fluid}
27/002 . . {of rigid material}
27/003 . . {of resilient material}
27/004 . . {Radial sealing elements specially adapted for intermeshing-engagement type pumps, e.g. gear pumps}
27/005 . {Axial sealings for working fluid}
27/006 . . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type pumps, e.g. gear pumps}
27/007 . {Sealings for working fluid between radially and axially moving parts}
27/008 . {for other than working fluid, i.e. the sealing arrangements are not between working chambers of the machine}
27/009 . . {Shaft sealings specially adapted for pumps}
27/02 . Liquid sealing for high-vacuum pumps {or for compressors}

28/00 Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids

28/02 . specially adapted for several pumps connected in series or in parallel
28/04 . specially adapted for reversible pumps
28/06 . specially adapted for stopping, starting, idling or no-load operation
28/065 . . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}
28/08 . characterised by varying the rotational speed

28/10 . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
28/12 . . using sliding valves
28/125 . . . {with sliding valves controlled by the use of fluid other than the working fluid}
28/14 . . using rotating valves
28/16 . . using lift valves
28/18 . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C 28/10)
28/185 . . {by varying the useful pumping length of the cooperating members in the axial direction}
28/20 . . by changing the form of the inner or outer contour of the working chamber
28/22 . . by changing the eccentricity between cooperating members
28/24 . characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} (F04C 28/10 takes precedence)
28/26 . . using bypass channels
28/265 . . . {being obtained by displacing a lateral sealing face}
28/28 . Safety arrangements; Monitoring

29/00 Component parts, details or accessories of pumps or pumping installations, not provided for in groups F04C 18/00 - F04C 28/00

29/0007 . {Injection of a fluid in the working chamber for sealing, cooling and lubricating (sealing only F04C 27/00; lubrication only F04C 29/02; cooling F02B 47/02, F02D 21/00, F02M 25/00)}
29/0014 . . {with control systems for the injection of the fluid}
29/0021 . {Systems for the equilibration of forces acting on the pump (interstice adjustment other than by fluid pressure F01C 21/102)}
29/0028 . . {Internal leakage control}
29/0035 . . {Equalization of pressure pulses (silencing F04C 29/06)}
29/0042 . {Driving elements, brakes, couplings, transmissions specially adapted for pumps (brakes, couplings, transmissions per se F16, B60)}
29/005 . . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}
29/0057 . . . {for eccentric movement}
29/0064 . . . {Magnetic couplings}
29/0071 . . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft}
29/0078 . . {Fixing rotors on shafts, e.g. by clamping together hub and shaft}
29/0085 . . {Prime movers}
29/0092 . {Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning}
29/02 . Lubrication (of machines or engines in general F01M); Lubricant separation (separation in general B01D)
29/021 . . {Control systems for the circulation of the lubricant}
29/023 . . {Lubricant distribution through a hollow driving shaft (F04C 29/025 takes precedence)}
29/025 . . {using a lubricant pump}
29/026 . . {Lubricant separation}
29/028 . . {Means for improving or restricting lubricant flow}
29/04 . Heating; Cooling (of machines or engines in general F01P); Heat insulation (heat insulation in general F16L 59/00)
29/042 . . {by injecting a fluid (injection of fluid for sealing, cooling or lubrication F04C 29/0007)}
29/045 . . {of the electric motor in hermetic pumps}
29/047 . . {Cooling of electronic devices installed inside the pump housing, e.g. inverters}
29/06 . Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general F01N)
29/061 . . {Silencers using overlapping frequencies, e.g. Helmholtz resonators}
29/063 . . {Sound absorbing materials}
29/065 . . {Noise dampening volumes, e.g. muffler chambers}
29/066 . . . {with means to enclose the source of noise}
29/068 . . {the silencing means being arranged inside the pump housing}
29/12 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
29/122 . . {Arrangements for supercharging the working space (similar arrangements for internal combustion engines F02B 33/00, F02B 37/00)}
29/124 . . {with inlet and outlet valves specially adapted for rotary or oscillating piston pumps}
29/126 . . . {of the non-return type}
29/128 . . . . {of the elastic type, e.g. reed valves}

2210/00 Fluid

2210/10 . working
2210/1005 . . Air
2210/1011 . . Amine
2210/1016 . . Blood
2210/1022 . . $C_3H_mF_n$
2210/1027 . . CO_2
2210/1033 . . Concrete
2210/1038 . . Cooking oil
2210/1044 . . Fuel
2210/105 . . Helium (He)
2210/1055 . . Hydrogen (H_2)
2210/1061 . . LPG
2210/1066 . . Nitrogen (N_2)
2210/1072 . . Oxygen (O_2)
2210/1077 . . Steam
2210/1083 . . Urea
2210/1088 . . Vegetable oil
2210/1094 . . Water
2210/12 . auxiliary
2210/122 . . Nitrogen (N_2)
2210/124 . . Sodium (Na)
2210/126 . . Tin
2210/128 . . Water
2210/14 . Lubricant
2210/142 . . Ester
2210/145 . . PAG
2210/147 . . Water
2210/20 . liquid, i.e. incompressible
2210/201 . . DME

2210/203 . . Fuel
2210/205 . . Ink
2210/206 . . Oil
2210/208 . . Water
2210/22 . gaseous, i.e. compressible
2210/221 . . Air
2210/222 . . Carbon dioxide (CO_2)
2210/224 . . Hydrogen (H_2)
2210/225 . . Nitrogen (N_2)
2210/227 . . Steam
2210/228 . . Vapour
2210/24 . mixed, e.g. two-phase fluid
2210/242 . . Steam
2210/245 . . Vapour
2210/247 . . Water
2210/26 . Refrigerants with particular properties, e.g. HFC-134a
2210/261 . . Carbon dioxide (CO_2)
2210/263 . . HFO1234YF
2210/265 . . Ammoniac (NH_3)
2210/266 . . Propane
2210/268 . . R32
2210/40 . Properties
2210/42 . . magnetic or ferromagnetic; Ferrofluids
2210/44 . . Viscosity
2210/60 . Condition
2210/62 . . Purity

2220/00 Application

2220/10 . Vacuum
2220/12 . . Dry running
2220/20 . Pumps with means for separating and evacuating the gaseous phase
2220/22 . for very low temperatures, i.e. cryogenic
2220/24 . for metering throughflow
2220/26 . for step-by-step output movement
2220/28 . for pulsed fluid flow
2220/30 . Use in a chemical vapor deposition [CVD] process or in a similar process
2220/40 . Pumps with means for venting areas other than the working chamber, e.g. bearings, gear chambers, shaft seals
2220/50 . Pumps with means for introducing gas under pressure for ballasting

2230/00 Manufacture

NOTE

Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like.

2230/10 . by removing material
2230/101 . . by electrochemical methods
2230/102 . . by spark erosion methods
2230/103 . . using lasers
2230/20 . essentially without removing material
2230/21 . . by casting
2230/22 . . by sintering
2230/23 . . by permanently joining parts together
2230/231 . . . by welding
2230/24 . . by extrusion
2230/25 . . by forging
2230/26 . . by rolling
2230/27 . . by hydroforming
2230/40 . Heat treatment
2230/41 . . Hardening; Annealing
2230/60 . Assembly methods
2230/601 . . Adjustment
2230/602 . . Gap; Clearance
2230/603 . . Centering; Aligning
2230/604 . . Mounting devices for pumps or compressors
2230/605 . . Balancing
2230/70 . Disassembly methods
2230/80 . Repairing methods
2230/85 . Methods for improvement by repair or exchange of parts
2230/90 . Improving properties of machine parts
2230/91 . . Coating
2230/92 . . Surface treatment

2240/00 Components

2240/10 . Stators
2240/102 . . with means for discharging condensate or liquid separated from the gas pumped
2240/20 . Rotors
2240/30 . Casings or housings
2240/40 . Electric motor
2240/401 . . Linear motor
2240/402 . . Plurality of electronically synchronised motors
2240/403 . . with inverter for speed control
2240/45 . Hybrid prime mover
2240/50 . Bearings
2240/51 . . for cantilever assemblies
2240/52 . . for assemblies with supports on both sides
2240/54 . . Hydrostatic or hydrodynamic bearing assemblies specially adapted for rotary positive displacement pumps or compressors
2240/56 . . Bearing bushings or details thereof
2240/60 . Shafts
2240/601 . . Shaft flexion
2240/603 . . with internal channels for fluid distribution, e.g. hollow shaft
2240/605 . . Shaft sleeves or details thereof
2240/70 . Use of multiplicity of similar components; Modular construction
2240/80 . Other components
2240/801 . . Wear plates
2240/802 . . Liners
2240/803 . . Electric connectors or cables; Fittings therefor
2240/804 . . Accumulators for refrigerant circuits
2240/805 . . Fastening means, e.g. bolts
2240/806 . . Pipes for fluids; Fittings therefor
2240/807 . . Balance weight, counterweight
2240/808 . . Electronic circuits (e.g. inverters) installed inside the machine
2240/809 . . Lubricant sump
2240/81 . . Sensor, e.g. electronic sensor for control or monitoring
2240/811 . . Actuator for control, e.g. pneumatic, hydraulic, electric

2250/00 Geometry

2250/10 . of the inlet or outlet
2250/101 . . of the inlet
2250/102 . . of the outlet

2250/20 . of the rotor
2250/201 . . conical shape
2250/30 . of the stator
2250/301 . . compression chamber profile defined by a mathematical expression or by parameters

2270/00 Control; Monitoring or safety arrangements
2270/01 . Load
2270/015 . . Controlled or regulated
2270/02 . Power
2270/025 . . Controlled or regulated
2270/03 . Torque
2270/035 . . Controlled or regulated
2270/04 . Force
2270/041 . . Controlled or regulated
2270/042 . . radial
2270/0421 . . . Controlled or regulated
2270/0422 . . . centrifugal
2270/04225 . . . . Controlled or regulated
2270/044 . . axial
2270/0445 . . . Controlled or regulated
2270/05 . Speed
2270/051 . . Controlled or regulated
2270/052 . . angular
2270/0525 . . . Controlled or regulated
2270/054 . . linear
2270/0545 . . . Controlled or regulated
2270/06 . Acceleration
2270/065 . . Controlled or regulated
2270/07 . Electric current
2270/075 . . Controlled or regulated
2270/08 . Amplitude of electric current
2270/085 . . Controlled or regulated
2270/09 . Electric current frequency
2270/095 . . Controlled or regulated
2270/10 . Voltage
2270/105 . . Controlled or regulated
2270/11 . Magnetic flux
2270/115 . . Controlled or regulated
2270/12 . Vibration
2270/125 . . Controlled or regulated
2270/13 . Noise
2270/135 . . Controlled or regulated
2270/14 . Pulsations
2270/145 . . Controlled or regulated
2270/15 . Resonance
2270/155 . . Controlled or regulated
2270/16 . Wear
2270/165 . . Controlled or regulated
2270/17 . Tolerance; Play; Gap
2270/175 . . Controlled or regulated
2270/18 . Pressure
2270/185 . . Controlled or regulated
2270/19 . Temperature
2270/195 . . Controlled or regulated
2270/20 . Flow
2270/205 . . Controlled or regulated
2270/21 . Pressure difference
2270/215 . . Controlled or regulated
2270/22 . Temperature difference
2270/225 . . Controlled or regulated
2270/23 . Working cycle timing control
2270/24 . Level of liquid, e.g. lubricant or cooling liquid
2270/40 . Conditions across a pump or machine
2270/42 . Conditions at the inlet of a pump or machine
2270/44 . Conditions at the outlet of a pump or machine
2270/46 . Conditions in the working chamber
2270/48 . Conditions of a reservoir linked to a pump or machine
2270/50 . Conditions before a throttle
2270/52 . Conditions after a throttle
2270/54 . Conditions in a control cylinder/piston unit
2270/56 . Number of pump/machine units in operation
2270/58 . Valve parameters
2270/585 . . Controlled or regulated
2270/60 . Prime mover parameters
2270/605 . . Controlled or regulated
2270/70 . Safety, emergency conditions or requirements
2270/701 . . Cold start
2270/72 . . preventing reverse rotation
2270/78 . Warnings
2270/782 . . Sound
2270/784 . . Light
2270/80 . Diagnostics
2270/86 . Detection
2270/90 . Remote control, e.g. wireless, via LAN, by radio, or by a wired connection from a central computer

2280/00 Arrangements for preventing or removing deposits or corrosion
2280/02 . Preventing solid deposits in pumps, e.g. in vacuum pumps with chemical vapour deposition [CVD] processes
2280/04 . Preventing corrosion