

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 regulating pressure or flow rate, e.g. discharge valves, {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}		Multi-stage pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
18/3566	. . . . {the inner and outer member being in contact along more than line or surface}	23/001	. {of similar working principle}
18/3568	. . . . {with axially movable vanes}	23/003	. . {having complementary function}
18/36	. . having both the movement defined in groups F04C 18/22 and F04C 18/24	23/005	. {of dissimilar working principle}
18/38	. . having the movement defined in group F04C 18/02 and having a hinged member (F04C 18/32 takes precedence)	23/006	. . {having complementary function}
18/39	. . . with vanes hinged to the inner as well as to the outer member	23/008	. {Hermetic pumps}
18/40	. . having the movement defined in group F04C 18/08 or F04C 18/22 and having a hinged member		NOTE
18/44	. . . with vanes hinged to the inner member		Multi-stage steam engines, motors, pumps or compressors with stages connected in series or in parallel are not considered as having complementary function
18/46	. . . with vanes hinged to the outer member	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)
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	25/00	Adaptations of pumps for special use of pumps for elastic fluids
18/52	. . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing	25/02	. for producing high vacuum (sealing arrangements F04C 27/00 ; silencing F04C 29/06)
18/54	. . the axes being arranged otherwise than at an angle of 90 degrees	27/00	Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids
18/56	. . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing	27/001	. {Radial sealings for working fluid}
18/565	. . . . {the axes of cooperating members being on the same plane}	27/002	. . {of rigid material}
		27/003	. . {of resilient material}
19/00	Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids	27/004	. . {Radial sealing elements specially adapted for intermeshing-engagement type pumps, e.g. gear pumps}
19/001	. {General arrangements, plants, flowsheets}	27/005	. {Axial sealings for working fluid}
19/002	. {with rotating outer members}	27/006	. . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type pumps, e.g. gear pumps}
19/004	. {Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply}	27/007	. {Sealings for working fluid between radially and axially moving parts}
19/005	. {Details concerning the admission or discharge}	27/008	. {for other than working fluid, i.e. the sealing arrangements are not between working chambers of the machine}
19/007	. . {Port members in the form of side plates}	27/009	. . {Shaft sealings specially adapted for pumps}
19/008	. . {Port members in the form of conical or cylindrical pieces situated in the centre of the impeller}	27/02	. Liquid sealing for high-vacuum pumps {or for compressors}
21/00	Oscillating-piston pumps specially adapted for elastic fluids	28/00	Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids
21/002	. {the piston oscillating around a fixed axis}	28/02	. specially adapted for several pumps connected in series or in parallel
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)}	28/04	. specially adapted for reversible pumps
21/007	. {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}	28/06	. specially adapted for stopping, starting, idling or no-load operation
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)	28/065	. . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable}
	NOTE	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	29/042	. . {by injecting a fluid (injection of fluid for sealing, cooling or lubrication F04C 29/0007)}
28/18	. characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C 28/10)	29/045	. . {of the electric motor in hermetic pumps}
28/185	. . {by varying the useful pumping length of the cooperating members in the axial direction}	29/047	. . {Cooling of electronic devices installed inside the pump housing, e.g. inverters}
28/20	. . by changing the form of the inner or outer contour of the working chamber	29/06	. Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general F01N)
28/22	. . by changing the eccentricity between cooperating members	29/061	. . {Silencers using overlapping frequencies, e.g. Helmholtz resonators}
28/24	. characterised by using valves regulating pressure or flow rate, e.g. discharge valves {unloading valves} (F04C 28/10 takes precedence)	29/063	. . {Sound absorbing materials}
28/26	. . using bypass channels	29/065	. . {Noise dampening volumes, e.g. muffler chambers}
28/265	. . . {being obtained by displacing a lateral sealing face}	29/066	. . . {with means to enclose the source of noise}
28/28	. Safety arrangements; Monitoring	29/068	. . {the silencing means being arranged inside the pump housing}
29/00	Component parts, details or accessories of pumps or pumping installations, not provided for in groups F04C 18/00 - F04C 28/00	29/12	. Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet
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)}	29/122	. . {Arrangements for supercharging the working space (similar arrangements for internal combustion engines F02B 33/00, F02B 37/00)}
29/0014	. . {with control systems for the injection of the fluid}	29/124	. . {with inlet and outlet valves specially adapted for rotary or oscillating piston pumps}
29/0021	. {Systems for the equilibration of forces acting on the pump (interstice adjustment other than by fluid pressure F01C 21/102)}	29/126	. . . {of the non-return type}
29/0028	. . {Internal leakage control}	29/128	. . . . {of the elastic type, e.g. reed valves}
29/0035	. . {Equalization of pressure pulses (silencing F04C 29/06)}	2210/00	Fluid
29/0042	. {Driving elements, brakes, couplings, transmissions specially adapted for pumps (brakes, couplings, transmissions per se F16, B60)}	2210/10	. working
29/005	. . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}	2210/1005	. . Air
29/0057	. . . {for eccentric movement}	2210/1011	. . Amine
29/0064	. . . {Magnetic couplings}	2210/1016	. . Blood
29/0071	. . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft}	2210/1022	. . C ₃ H _m F _n
29/0078	. . {Fixing rotors on shafts, e.g. by clamping together hub and shaft}	2210/1027	. . CO ₂
29/0085	. . {Prime movers}	2210/1033	. . Concrete
29/0092	. {Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning}	2210/1038	. . Cooking oil
29/02	. Lubrication (of machines or engines in general F01M); Lubricant separation (separation in general B01D)	2210/1044	. . Fuel
29/021	. . {Control systems for the circulation of the lubricant}	2210/105	. . Helium (He)
29/023	. . {Lubricant distribution through a hollow driving shaft (F04C 29/025 takes precedence)}	2210/1055	. . Hydrogen (H ₂)
29/025	. . {using a lubricant pump}	2210/1061	. . LPG
29/026	. . {Lubricant separation}	2210/1066	. . Nitrogen (N ₂)
29/028	. . {Means for improving or restricting lubricant flow}	2210/1072	. . Oxygen (O ₂)
29/04	. Heating; Cooling (of machines or engines in general F01P); Heat insulation (heat insulation in general F16L 59/00)	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 (CO₂)
- 2210/224 . . Hydrogen (H₂)
- 2210/225 . . Nitrogen (N₂)
- 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 (CO₂)
- 2210/263 . . HFO1234YF
- 2210/265 . . Ammoniac (NH₃)
- 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	2270/48	. Conditions of a reservoir linked to a pump or machine
2270/015	. . Controlled or regulated	2270/50	. Conditions before a throttle
2270/02	. Power	2270/52	. Conditions after a throttle
2270/025	. . Controlled or regulated	2270/54	. Conditions in a control cylinder/piston unit
2270/03	. Torque	2270/56	. Number of pump/machine units in operation
2270/035	. . Controlled or regulated	2270/58	. Valve parameters
2270/04	. Force	2270/585	. . Controlled or regulated
2270/041	. . Controlled or regulated	2270/60	. Prime mover parameters
2270/042	. . radial	2270/605	. . Controlled or regulated
2270/0421	. . . Controlled or regulated	2270/70	. Safety, emergency conditions or requirements
2270/0422	. . . centrifugal	2270/701	. . Cold start
2270/04225	. . . . Controlled or regulated	2270/72	. . preventing reverse rotation
2270/044	. . axial	2270/78	. Warnings
2270/0445	. . . Controlled or regulated	2270/782	. . Sound
2270/05	. Speed	2270/784	. . Light
2270/051	. . Controlled or regulated	2270/80	. Diagnostics
2270/052	. . angular	2270/86	. Detection
2270/0525	. . . Controlled or regulated	2270/90	. Remote control, e.g. wireless, via LAN, by radio, or by a wired connection from a central computer
2270/054	. . linear		
2270/0545	. . . Controlled or regulated	2280/00	Arrangements for preventing or removing deposits or corrosion
2270/06	. Acceleration	2280/02	. Preventing solid deposits in pumps, e.g. in vacuum pumps with chemical vapour deposition [CVD] processes
2270/065	. . Controlled or regulated	2280/04	. Preventing corrosion
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		