

CPC COOPERATIVE PATENT CLASSIFICATION

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

ENGINES OR PUMPS

F04 POSITIVE - DISPLACEMENT MACHINES FOR LIQUIDS; PUMPS FOR LIQUIDS OR ELASTIC FLUIDS (NOTE omitted)

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".

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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| <p>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)</p> <p>NOTE</p> <p>Group F04C 2/30 takes precedence over groups F04C 2/02 - F04C 2/28</p> | <p>2/082 . . {Details specially related to intermeshing engagement type machines or pumps}</p> <p>2/084 . . . {Toothed wheels}</p> <p>2/086 . . . {Carter}</p> <p>2/088 . . . {Elements in the toothed wheels or the carter for relieving the pressure of fluid imprisoned in the zones of engagement}</p> <p>2/10 . . of internal-axis type with the outer member having more teeth or tooth-equivalents, e.g. rollers, than the inner member</p> <p>2/101 . . . {with a crescent-shaped filler element, located between the inner and outer intermeshing members}</p> <p>2/102 . . . {the two members rotating simultaneously around their respective axes}</p> <p>2/103 . . . {one member having simultaneously a rotational movement about its own axis and an orbital movement}</p> <p>2/104 {having an articulated driving shaft}</p> <p>2/105 {Details concerning timing or distribution valves}</p> <p>2/106 {Spool type distribution valves}</p> <p>2/107 . . . with helical teeth</p> <p>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}</p> <p>2/1073 {where one member is stationary while the other member rotates and orbits}</p> <p>2/1075 {Construction of the stationary member}</p> <p>2/1076 {where one member orbits or wobbles relative to the other member which rotates around a fixed axis}</p> <p>2/1078 {where one member rotates and both members are allowed to orbit or wobble}</p> |
| <p>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</p> <p>2/025 . . {the moving and the stationary member having co-operating elements in spiral form}</p> <p>2/04 . . of internal axis type</p> <p>2/045 . . . {having a C-shaped piston}</p> <p>2/06 . . of other than internal-axis type (F04C 2/063 takes precedence)</p> <p>2/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them</p> <p>2/067 . . . having cam-and-follower type drive</p> <p>2/07 . . . having crankshaft-and-connecting-rod type drive</p> <p>2/073 . . . having pawl-and-ratchet type drive</p> <p>2/077 . . . having toothed-gearing type drive</p> <p>2/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing</p> | |

- 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

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| 18/34 | . . having the movement defined in group F04C 18/08 or F04C 18/22 and relative reciprocation between the co-operating members | 19/002 | . {with rotating outer members} |
| 18/344 | . . . with vanes reciprocating with respect to the inner member | 19/004 | . {Details concerning the operating liquid, e.g. nature, separation, cooling, cleaning, control of the supply} |
| 18/3441 | {the inner and outer member being in contact along one line or continuous surface substantially parallel to the axis of rotation} | 19/005 | . {Details concerning the admission or discharge} |
| 18/3442 | {the surfaces of the inner and outer member, forming the inlet and outlet opening} | 19/007 | . . {Port members in the form of side plates} |
| 18/3443 | {with a separation element located between the inlet and outlet opening} | 19/008 | . . {Port members in the form of conical or cylindrical pieces situated in the centre of the impeller} |
| 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} | 21/00 | Oscillating-piston pumps specially adapted for elastic fluids |
| 18/3447 | {the vanes having the form of rollers, slippers or the like} | 21/002 | . {the piston oscillating around a fixed axis} |
| 18/3448 | {with axially movable vanes} | 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)} |
| 18/348 | the vanes positively engaging, with circumferential play, an outer rotatable member | 21/007 | . {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element} |
| 18/352 | the vanes being pivoted on the axis of the outer member | | |
| 18/356 | . . . with vanes reciprocating with respect to the outer member | 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) |
| 18/3562 | {the inner and outer member being in contact along one line or continuous surfaces substantially parallel to the axis of rotation} | | NOTE |
| 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 one 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 movements 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 | 25/00 | Adaptations of pumps for special use of pumps for elastic fluids |
| 18/50 | . . the axes being arranged at an angle of 90 degrees | 25/02 | . for producing high vacuum (sealing arrangements F04C 27/00 ; silencing F04C 29/06) |
| 18/52 | . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing | 27/00 | Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids |
| 18/54 | . . the axes being arranged otherwise than at an angle of 90 degrees | 27/001 | . {Radial sealings for working fluid} |
| 18/56 | . . . of intermeshing engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing | 27/002 | . . {of rigid material} |
| 18/565 | {the axes of cooperating members being on the same plane} | 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} |
| | | 27/006 | . . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type pumps, e.g. gear pumps} |

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| 27/007 | . {Sealings for working fluid between radially and axially moving parts} | 29/005 | . . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions} |
| 27/008 | . {for other than working fluid, i.e. the sealing arrangements are not between working chambers of the machine} | 29/0057 | . . . {for eccentric movement} |
| 27/009 | . . {Shaft sealings specially adapted for pumps} | 29/0064 | . . . {Magnetic couplings} |
| 27/02 | . Liquid sealing for high-vacuum pumps {or for compressors} | 29/0071 | . . . {Couplings between rotors and input or output shafts acting by interengaging or mating parts, i.e. positive coupling of rotor and shaft} |
| 28/00 | Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids | 29/0078 | . . {Fixing rotors on shafts, e.g. by clamping together hub and shaft} |
| 28/02 | . specially adapted for several pumps connected in series or in parallel | 29/0085 | . . {Prime movers} |
| 28/04 | . specially adapted for reversible pumps | 29/0092 | . {Removing solid or liquid contaminants from the gas under pumping, e.g. by filtering or deposition; Purging; Scrubbing; Cleaning} |
| 28/06 | . specially adapted for stopping, starting, idling or no-load operation | 29/02 | . Lubrication (of machines or engines in general F01M); Lubricant separation (separation in general B01D) |
| 28/065 | . . {Capacity control using a multiplicity of units or pumping capacities, e.g. multiple chambers, individually switchable or controllable} | 29/021 | . . {Control systems for the circulation of the lubricant} |
| 28/08 | . characterised by varying the rotational speed | 29/023 | . . {Lubricant distribution through a hollow driving shaft (F04C 29/025 takes precedence)} |
| 28/10 | . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber | 29/025 | . . {using a lubricant pump} |
| 28/12 | . . using sliding valves | 29/026 | . . {Lubricant separation} |
| 28/125 | . . . {with sliding valves controlled by the use of fluid other than the working fluid} | 29/028 | . . {Means for improving or restricting lubricant flow} |
| 28/14 | . . using rotating valves | 29/04 | . Heating; Cooling (of machines or engines in general F01P); Heat insulation (heat insulation in general F16L 59/00) |
| 28/16 | . . using lift valves | 29/042 | . . {by injecting a fluid (injection of fluid for sealing, cooling or lubrication F04C 29/007)} |
| 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 controlling pressure or flow rate, e.g. discharge valves {or 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 |
| | | 2210/1005 | . . Air |
| | | 2210/1011 | . . Amine |
| | | 2210/1016 | . . Blood |
| | | 2210/1022 | . . C ₃ H _m F _n |
| | | 2210/1027 | . . CO ₂ |
| | | 2210/1033 | . . Concrete |
| | | 2210/1038 | . . Cooking oil |
| | | 2210/1044 | . . Fuel |

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| 2210/105 | . . Helium (He) | 2220/50 | . Pumps with means for introducing gas under pressure for ballasting |
| 2210/1055 | . . Hydrogen (H ₂) | 2230/00 | Manufacture |
| 2210/1061 | . . LPG | | NOTE |
| 2210/1066 | . . Nitrogen (N ₂) | | Manufacture comprises also treatment, assembly or disassembly methods, repairing, handling or the like. |
| 2210/1072 | . . Oxygen (O ₂) | 2230/10 | . by removing material |
| 2210/1077 | . . Steam | 2230/101 | . . by electrochemical methods |
| 2210/1083 | . . Urea | 2230/102 | . . by spark erosion methods |
| 2210/1088 | . . Vegetable oil | 2230/103 | . . using lasers |
| 2210/1094 | . . Water | 2230/20 | . essentially without removing material |
| 2210/12 | . auxiliary | 2230/21 | . . by casting |
| 2210/122 | . . Nitrogen (N ₂) | 2230/22 | . . by sintering |
| 2210/124 | . . Sodium (Na) | 2230/23 | . . by permanently joining parts together |
| 2210/126 | . . Tin | 2230/231 | . . . by welding |
| 2210/128 | . . Water | 2230/24 | . . by extrusion |
| 2210/14 | . Lubricant | 2230/25 | . . by forging |
| 2210/142 | . . Ester | 2230/26 | . . by rolling |
| 2210/145 | . . PAG | 2230/27 | . . by hydroforming |
| 2210/147 | . . Water | 2230/40 | . Heat treatment |
| 2210/20 | . liquid, i.e. incompressible | 2230/41 | . . Hardening; Annealing |
| 2210/201 | . . DME | 2230/60 | . Assembly methods |
| 2210/203 | . . Fuel | 2230/601 | . . Adjustment |
| 2210/205 | . . Ink | 2230/602 | . . Gap; Clearance |
| 2210/206 | . . Oil | 2230/603 | . . Centering; Aligning |
| 2210/208 | . . Water | 2230/604 | . . Mounting devices for pumps or compressors |
| 2210/22 | . gaseous, i.e. compressible | 2230/605 | . . Balancing |
| 2210/221 | . . Air | 2230/70 | . Disassembly methods |
| 2210/222 | . . Carbon dioxide (CO ₂) | 2230/80 | . Repairing methods |
| 2210/224 | . . Hydrogen (H ₂) | 2230/85 | . Methods for improvement by repair or exchange of parts |
| 2210/225 | . . Nitrogen (N ₂) | 2230/90 | . Improving properties of machine parts |
| 2210/227 | . . Steam | 2230/91 | . . Coating |
| 2210/228 | . . Vapour | 2230/92 | . . Surface treatment |
| 2210/24 | . mixed, e.g. two-phase fluid | 2240/00 | Components |
| 2210/242 | . . Steam | 2240/10 | . Stators |
| 2210/245 | . . Vapour | 2240/102 | . . with means for discharging condensate or liquid separated from the gas pumped |
| 2210/247 | . . Water | 2240/20 | . Rotors |
| 2210/26 | . Refrigerants with particular properties, e.g. HFC-134a | 2240/30 | . Casings or housings |
| 2210/261 | . . Carbon dioxide (CO ₂) | 2240/40 | . Electric motor |
| 2210/263 | . . HFO1234YF | 2240/401 | . . Linear motor |
| 2210/265 | . . Ammoniac (NH ₃) | 2240/402 | . . Plurality of electronically synchronised motors |
| 2210/266 | . . Propane | 2240/403 | . . with inverter for speed control |
| 2210/268 | . . R32 | 2240/45 | . Hybrid prime mover |
| 2210/40 | . Properties | 2240/50 | . Bearings |
| 2210/42 | . . magnetic or ferromagnetic; Ferrofluids | 2240/51 | . . for cantilever assemblies |
| 2210/44 | . . Viscosity | 2240/52 | . . for assemblies with supports on both sides |
| 2210/60 | . Condition | 2240/54 | . . Hydrostatic or hydrodynamic bearing assemblies specially adapted for rotary positive displacement pumps or compressors |
| 2210/62 | . . Purity | 2240/56 | . . Bearing bushings or details thereof |
| 2220/00 | Application | 2240/60 | . Shafts |
| 2220/10 | . Vacuum | 2240/601 | . . Shaft flexion |
| 2220/12 | . . Dry running | 2240/603 | . . with internal channels for fluid distribution, e.g. hollow shaft |
| 2220/20 | . Pumps with means for separating and evacuating the gaseous phase | 2240/605 | . . Shaft sleeves or details thereof |
| 2220/22 | . for very low temperatures, i.e. cryogenic | 2240/70 | . Use of multiplicity of similar components; Modular construction |
| 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 | | |

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| 2240/80 | . Other components | 2270/14 | . Pulsations |
| 2240/801 | . . Wear plates | 2270/145 | . . Controlled or regulated |
| 2240/802 | . . Liners | 2270/15 | . Resonance |
| 2240/803 | . . Electric connectors or cables; Fittings therefor | 2270/155 | . . Controlled or regulated |
| 2240/804 | . . Accumulators for refrigerant circuits | 2270/16 | . Wear |
| 2240/805 | . . Fastening means, e.g. bolts | 2270/165 | . . Controlled or regulated |
| 2240/806 | . . Pipes for fluids; Fittings therefor | 2270/17 | . Tolerance; Play; Gap |
| 2240/807 | . . Balance weight, counterweight | 2270/175 | . . Controlled or regulated |
| 2240/808 | . . Electronic circuits (e.g. inverters) installed inside the machine | 2270/18 | . Pressure |
| 2240/809 | . . Lubricant sump | 2270/185 | . . Controlled or regulated |
| 2240/81 | . . Sensor, e.g. electronic sensor for control or monitoring | 2270/19 | . Temperature |
| 2240/811 | . . Actuator for control, e.g. pneumatic, hydraulic, electric | 2270/195 | . . Controlled or regulated |
| | | 2270/20 | . Flow |
| 2250/00 | Geometry | 2270/205 | . . Controlled or regulated |
| 2250/10 | . of the inlet or outlet | 2270/21 | . Pressure difference |
| 2250/101 | . . of the inlet | 2270/215 | . . Controlled or regulated |
| 2250/102 | . . of the outlet | 2270/22 | . Temperature difference |
| 2250/20 | . of the rotor | 2270/225 | . . Controlled or regulated |
| 2250/201 | . . conical shape | 2270/23 | . Working cycle timing control |
| 2250/30 | . of the stator | 2270/24 | . Level of liquid, e.g. lubricant or cooling liquid |
| 2250/301 | . . compression chamber profile defined by a mathematical expression or by parameters | 2270/40 | . Conditions across a pump or machine |
| | | 2270/42 | . Conditions at the inlet of a pump or machine |
| 2270/00 | Control; Monitoring or safety arrangements | 2270/44 | . Conditions at the outlet of a pump or machine |
| 2270/01 | . Load | 2270/46 | . Conditions in the working chamber |
| 2270/015 | . . Controlled or regulated | 2270/48 | . Conditions of a reservoir linked to a pump or machine |
| 2270/02 | . Power | 2270/50 | . Conditions before a throttle |
| 2270/025 | . . Controlled or regulated | 2270/52 | . Conditions after a throttle |
| 2270/03 | . Torque | 2270/54 | . Conditions in a control cylinder/piston unit |
| 2270/035 | . . Controlled or regulated | 2270/56 | . Number of pump/machine units in operation |
| 2270/04 | . Force | 2270/58 | . Valve parameters |
| 2270/041 | . . Controlled or regulated | 2270/585 | . . Controlled or regulated |
| 2270/042 | . . radial | 2270/60 | . Prime mover parameters |
| 2270/0421 | . . . Controlled or regulated | 2270/605 | . . Controlled or regulated |
| 2270/0422 | . . . centrifugal | 2270/70 | . Safety, emergency conditions or requirements |
| 2270/04225 | Controlled or regulated | 2270/701 | . . Cold start |
| 2270/044 | . . axial | 2270/72 | . . preventing reverse rotation |
| 2270/0445 | . . . Controlled or regulated | 2270/78 | . Warnings |
| 2270/05 | . Speed | 2270/782 | . . Sound |
| 2270/051 | . . Controlled or regulated | 2270/784 | . . Light |
| 2270/052 | . . angular | 2270/80 | . Diagnostics |
| 2270/0525 | . . . Controlled or regulated | 2270/86 | . Detection |
| 2270/054 | . . linear | 2270/90 | . Remote control, e.g. wireless, via LAN, by radio, or by a wired connection from a central computer |
| 2270/0545 | . . . Controlled or regulated | | |
| 2270/06 | . Acceleration | 2280/00 | Arrangements for preventing or removing deposits or corrosion |
| 2270/065 | . . Controlled or regulated | 2280/02 | . Preventing solid deposits in pumps, e.g. in vacuum pumps with chemical vapour deposition [CVD] processes |
| 2270/07 | . Electric current | 2280/04 | . Preventing corrosion |
| 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 | | |