

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 (portable fire-extinguishers with manually-operated pumps [A62C 11/00](#), with power-driven pumps [A62C 25/00](#); charging or scavenging combustion engines by pumps [F02B](#); engines fuel-injection pumps [F02M](#); ion pumps [H01J 41/00](#); electro-dynamic pumps [H02K 44/02](#))
(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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| 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) | 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 |
| 2/02 | . 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 | 2/101 | . . . {with a crescent-shaped filler element, located between the inner and outer intermeshing members} |
| 2/025 | . . {the moving and the stationary member having co-operating elements in spiral form} | 2/102 | . . . {the two members rotating simultaneously around their respective axes} |
| 2/04 | . . of internal axis type | 2/103 | . . . {one member having simultaneously a rotational movement about its own axis and an orbital movement} |
| 2/045 | . . . {having a C-shaped piston} | 2/104 | {having an articulated driving shaft} |
| 2/06 | . . of other than internal-axis type (F04C 2/063 takes precedence) | 2/105 | {Details concerning timing or distribution valves} |
| 2/063 | . . with coaxially-mounted members having continuously-changing circumferential spacing between them | 2/106 | {Spool type distribution valves} |
| 2/067 | . . . having cam-and-follower type drive | 2/107 | . . . with helical teeth |
| 2/07 | . . . having crankshaft-and-connecting-rod type drive | 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} |
| 2/073 | . . . having pawl-and-ratchet type drive | 2/1073 | {where one member is stationary while the other member rotates and orbits} |
| 2/077 | . . . having toothed-gearing type drive | | |

- 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)	14/10	<ul style="list-style-type: none"> . characterised by changing the positions of the inlet or outlet openings with respect to the working chamber
7/00	Rotary-piston machines or pumps with fluid ring or the like (such pumps specially adapted for elastic fluids F04C 19/00)	14/12 14/14 14/16 14/18	<ul style="list-style-type: none"> . . using sliding valves . . using rotating valves . . using lift valves . characterised by varying the volume of the working chamber (by changing the positions of inlet or outlet openings F04C 14/10)
9/00	Oscillating-piston machines or pumps (such pumps specially adapted for elastic fluids F04C 21/00)	14/185	<ul style="list-style-type: none"> . . {by varying the useful pumping length of the cooperating members in the axial direction}
9/002	. {the piston oscillating around a fixed axis}	14/20	<ul style="list-style-type: none"> . . by changing the form of the inner or outer contour of the working chamber
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 cooperating members F04C 3/00)}	14/22	<ul style="list-style-type: none"> . . by changing the eccentricity between cooperating members
9/007	. {the points of the moving element describing approximately an alternating movement in axial direction with respect to the other element}	14/223 14/226	<ul style="list-style-type: none"> . . . {using a movable cam} {by pivoting the cam around an eccentric axis}
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)	14/24 14/26 14/265 14/28	<ul style="list-style-type: none"> . characterised by using valves controlling pressure or flow rate, e.g. discharge valves {or unloading valves} (F04C 14/10 takes precedence) . . using bypass channels . . . {being obtained by displacing a lateral sealing face} . Safety arrangements; Monitoring
	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}	15/0003	<ul style="list-style-type: none"> . {Sealing arrangements in rotary-piston machines or pumps (sealing in general F16J)}
11/003	. . {having complementary function}	15/0007	<ul style="list-style-type: none"> . . {Radial sealings for working fluid}
11/005	. {of dissimilar working principle}	15/0011	<ul style="list-style-type: none"> . . . {of rigid material}
11/006	. . {having complementary function}	15/0015	<ul style="list-style-type: none"> . . . {of resilient material}
11/008	. {Enclosed motor pump units}	15/0019	<ul style="list-style-type: none"> . . . {Radial sealing elements specially adapted for intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}
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)	15/0023 15/0026	<ul style="list-style-type: none"> . . {Axial sealings for working fluid} . . . {Elements specially adapted for sealing of the lateral faces of intermeshing-engagement type machines or pumps, e.g. gear machines or pumps}
13/001	. {Pumps for particular liquids}	15/003	<ul style="list-style-type: none"> . . {Sealings for working fluid between radially and axially moving parts}
13/002	. . {for homogeneous viscous liquids}	15/0034	<ul style="list-style-type: none"> . . {for other than the working fluid, i.e. the sealing arrangements are not between working chambers of the machine}
13/004	. . . {with means for fluidising or diluting the material being pumped}	15/0038	<ul style="list-style-type: none"> . . . {Shaft sealings specially adapted for rotary-piston machines or pumps}
13/005	. {Removing contaminants, deposits or scale from the pump; Cleaning}	15/0042	<ul style="list-style-type: none"> . {Systems for the equilibration of forces acting on the machines or pump (interstice adjustment other than by fluid pressure F01C 21/102)}
13/007	. {Venting; Gas and vapour separation during pumping (preventing vapour lock in fuel pumps F02M 37/20 , in centrifugal pumps F04D 9/00)}	15/0046 15/0049	<ul style="list-style-type: none"> . . {Internal leakage control} . . {Equalization of pressure pulses (silencing for compressors F04C 29/06)}
13/008	. {Pumps for submersible use, i.e. down-hole pumping}	15/0053 15/0057	<ul style="list-style-type: none"> . {Venting means for starting} . {Driving elements, brakes, couplings, transmission specially adapted for machines or pumps (brakes, couplings, transmissions per se F16, B60)}
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)	15/0061	<ul style="list-style-type: none"> . . {Means for transmitting movement from the prime mover to driven parts of the pump, e.g. clutches, couplings, transmissions}
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		

- 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 movements 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 . . C₃H_mF_n
- 2210/1027 . . CO₂
- 2210/1033 . . Concrete
- 2210/1038 . . Cooking oil
- 2210/1044 . . Fuel
- 2210/105 . . Helium (He)
- 2210/1055 . . Hydrogen (H₂)
- 2210/1061 . . LPG
- 2210/1066 . . Nitrogen (N₂)
- 2210/1072 . . Oxygen (O₂)
- 2210/1077 . . Steam
- 2210/1083 . . Urea
- 2210/1088 . . Vegetable oil
- 2210/1094 . . Water
- 2210/12 . auxiliary
- 2210/122 . . Nitrogen (N₂)
- 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
- 2270/015 . . . 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