COOPERATIVE PATENT CLASSIFICATION

MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

ENGINES OR PUMPS

POSITIVE - DISPLACEMENT MACHINES FOR LIQUIDS; PUMPS FOR LIQUIDS OR ELASTIC FLUIDS

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.

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

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]

2/22 . . . 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

2/356 . . . 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]

2/38 . . . having the movement defined in group F04C 2/02 and having a hinged member (F04C 2/32 takes precedence)

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]
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]
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

18/08 . . . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing

18/081 . . . [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 corresponding recesses in the other rotor, e.g. lobes, Roots type]

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
Specially adapted for elastic fluids

Rotary-piston pumps with fluid ring or the like,

...[General arrangements, plants, flowsheets]
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, B06))

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 . . C₂H₆O₇
2210/1027 . . CO₂
2210/1033 . . Concrete
2210/1038 . . Cooking oil
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
2240/53 · Hydrostatic or hydrodynamic bearing assemblies specially adapted for rotary positive displacement pumps or compressors
2240/56 · Bearing bushes or details thereof
2240/60 · Shafts
2240/601 · Shaft flexion
2240/603 · with internal channels for fluid distribution, e.g. hollow shaft
F04C

2270/00 Control; Monitoring or safety arrangements

2270/01 . Shaft sleeves or details thereof

2270/02 . Use of multiplicity of similar components; Modular construction

2270/03 . Other components

2270/04 . Wear plates

2270/05 . Electric connectors or cables; Fittings therefor

2270/06 . Accumulators for refrigerant circuits

2270/07 . Fastening means, e.g. bolts

2270/08 . Pipes for fluids; Fittings therefor

2270/09 . Balance weight, counterweight

2270/10 . Electronic circuits (e.g. inverters) installed inside the machine

2270/11 . Lubricant sump

2270/12 . Sensor, e.g. electronic sensor for control or monitoring

2270/13 . Actuator for control, e.g. pneumatic, hydraulic, electric

2270/14 . of the inlet or outlet

2270/15 . of the inlet

2270/16 . of the outlet

2270/17 . of the rotor

2270/18 . conical shape

2270/19 . of the stator

2270/20 . compression chamber profile defined by a mathematical expression or by parameters

2270/21 . Load

2270/22 . Power

2270/23 . Torque

2270/24 . Force

2270/25 . Controlled or regulated

2270/26 . radial

2270/27 . Controlled or regulated

2270/28 . centrifugal

2270/29 . Controlled or regulated

2270/30 . axial

2270/31 . Controlled or regulated

2270/32 . Speed

2270/33 . Controlled or regulated

2270/34 . angular

2270/35 . Controlled or regulated

2270/36 . linear

2270/37 . Controlled or regulated

2270/38 . Acceleration

2270/39 . Controlled or regulated

2270/40 . Electric current

2270/41 . Controlled or regulated

2270/42 . Amplitude of electric current

2270/43 . Controlled or regulated

2270/44 . Electric current frequency

2270/45 . Controlled or regulated

2270/46 . Voltage

2270/47 . Controlled or regulated

2270/48 . Magnetic flux

2270/49 . Controlled or regulated

2270/50 . Controlled or regulated

2270/51 . Number of pump/machine units in operation

2270/52 . Valve parameters

2270/53 . Conditions across a pump or machine

2270/54 . Conditions at the inlet of a pump or machine

2270/55 . Conditions at the outlet of a pump or machine

2270/56 . Conditions in the working chamber

2270/57 . Conditions of a reservoir linked to a pump or machine

2270/58 . Conditions before a throttle

2270/59 . Conditions after a throttle

2270/60 . Conditions in a control cylinder/piston unit

2270/61 . Number of pump/machine units in operation

2270/62 . Valve parameters

2270/63 . Conditions across a pump or machine

2270/64 . Conditions at the inlet of a pump or machine

2270/65 . Conditions at the outlet of a pump or machine

2270/66 . Conditions in the working chamber

2270/67 . Conditions of a reservoir linked to a pump or machine

2270/68 . Conditions before a throttle

2270/69 . Conditions after a throttle

2270/70 . Conditions in a control cylinder/piston unit

2270/71 . Number of pump/machine units in operation

2270/72 . Valve parameters

2270/73 . Conditions across a pump or machine

2270/74 . Conditions at the inlet of a pump or machine

2270/75 . Conditions at the outlet of a pump or machine

2270/76 . Conditions in the working chamber

2270/77 . Conditions of a reservoir linked to a pump or machine

2270/78 . Safety, emergency conditions or requirements

2270/79 . Cold start

2270/80 . preventing reverse rotation

2270/81 . Warnings

2270/82 . Sound

2270/83 . Light

2270/84 . Diagnostics

2270/85 . Detection

2270/86 . 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

2280/01 . Preventing solid deposits in pumps, e.g. in vacuum pumps with chemical vapour deposition [CVD] processes

2280/02 . Preventing corrosion