MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

ENGINES OR PUMPS

F04 POSITIVE - DISPLACEMENT MACHINES FOR LIQUIDS; PUMPS FOR LIQUIDS OR ELASTIC FLUIDS

NOTE omitted

F04D NON-POSITIVE-DISPLACEMENT PUMPS (engine fuel-injection pumps F02M; ion pumps H01J 41/12; electrodynamic pumps H02K 44/02)

NOTES
1. This subclass covers non-positive-displacement pumps for liquids, for elastic fluids, or for liquids and elastic fluids whether rotary or not having pure rotation.
2. This subclass does not cover combinations of non-positive-displacement pumps with other pumps, which are covered by subclass F04B, except that the use of such other pumps for priming or boosting non-positive-displacement is covered by this subclass.
3. Attention is drawn to the Notes preceding class F01, especially as regards the definition of "pump".

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.

Pumping liquids, or liquids and elastic fluids, by rotary pumps
(pumping liquids and elastic fluids at the same time F04D 31/00)

F04D 1/00 Radial-flow pumps, e.g. centrifugal pumps; Helico-centrifugal pumps (adapted for pumping specific fluids F04D 7/00; priming or boosting F04D 9/00)

1/03 . . . {Having contrarotating parts}
1/06 . . . {double suction pumps}
1/02 . . . {comprising axial and radial stages}
1/04 . . . Helico-centrifugal pumps
1/06 . . . Multi-stage pumps (F04D 1/02, F04D 13/10 take precedence)
1/063 . . . {of the vertically split casing type}
1/066 . . . . . . {the casing consisting of a plurality of annuli bolted together}
1/08 . . . the stages being situated concentrically
1/10 . . . with means for changing the flow-path through the stages, e.g. series-parallel, e.g. side loads
1/12 . . . Pumps with scoops or like paring members protruding in the fluid circulating in a bowl
1/14 . . . Pumps raising fluids by centrifugal force within a conical rotary bowl with vertical axis

F04D 3/00 Axial-flow pumps (priming or boosting F04D 9/00)

3/005 . . . {with a conventional single stage rotor}
3/02 . . . of screw type

F04D 5/00 Pumps with circumferential or transverse flow
{control thereof F04D 15/005}

5/001 . . . {Shear force pumps}
5/002 . . . {Regenerative pumps (for elastic fluids F04D 23/008)}
5/003 . . . . . . {of multistage type}
5/005 . . . . . . {the stages being radially offset}

5/006 . . . . . . {the stages being axially offset}
5/007 . . . . . . {Details of the inlet or outlet}
5/008 . . . . . . {Details of the stator, e.g. channel shape}
7/00 Pumps adapted for handling specific fluids, e.g. by selection of specific materials for pumps or pump parts (F04D 11/005, F04D 29/22 take precedence)

7/02 . . . . . . . {of centrifugal type}
7/04 . . . . . . . {the fluids being viscous or non-homogenous}
7/045 . . . . . . . . . . . . {with means for comminuting, mixing stirring or otherwise treating}
7/06 . . . . . . . {the fluids being hot or corrosive, e.g. liquid metals
7/065 . . . . . . . . . . . . {for liquid metal}
7/08 . . . . . . . {the fluids being radioactive}

9/00 Priming; Preventing vapour lock

9/001 . . . {Preventing vapour lock (F04D 9/041 takes precedence)}
9/002 . . . {by means in the very pump (F04D 9/041 takes precedence)}
9/003 . . . {Separating and removing the vapour}
9/004 . . . {Priming of not self-priming pumps}
9/005 . . . {by adducting or recycling liquid (F04D 9/006 takes precedence)}
9/006 . . . {by venting gas or using gas valves}
9/007 . . . {Preventing loss of prime, siphon breakers (stopping of pumps F04D 15/002)}
9/008 . . . {by means in the suction mouth, e.g. foot valves}
9/02 . . . {Self-priming pumps}
9/04 . . . using priming pumps; using booster pumps to prevent vapour-lock
9/041 . . . {the priming pump having evacuating action (F04D 9/043 and F04D 9/06 take precedence)}
Pumping liquids, or liquids and elastic fluids, by rotary pumps

13/12  .  Combinations of two or more pumps (combinations with priming pumps or booster pumps to counteract vapour-lock (F04D 9/04))
13/14  .  .  the pumps being all of centrifugal type
13/16  .  .  with storage reservoirs

15/00 Control, e.g., regulation, of pumps, pumping installations or systems

15/005 .  .  by using valves
15/0011 .  .  (pass valves)
15/0016 .  .  [mixing-reversing- or deviation valves]
15/0022 .  .  [throttling valves or valves varying the pump inlet opening or the outlet opening]
15/0027 .  .  [Varying behaviour or the very pump (F04D 15/0055 and F04D 29/46 take precedence)]
15/0033 .  .  [By-passing by increasing clearance between impeller and its casing]
15/0038 .  .  [by varying the effective cross-sectional area of flow through the rotor]
15/0044 .  .  [by introducing a gas]
15/005 .  .  [the pumps being of the circumferential flow type]
15/0055 .  .  [Rotors with adjustable blades]
15/0061 .  .  (responsive to temperature]
15/0066 .  .  [by changing the speed, e.g. of the driving engine]
15/0072 .  .  [Installation or systems with two or more pumps, wherein the flow path through the stages can be changed, e.g. series-parallel]
15/0077 .  .  [Safety measures (F04D 15/02 takes precedence)]
15/0083 .  .  [Protection against sudden pressure change, e.g. check valves]
15/0088 .  .  [Testing machines]
15/0094 .  .  [Indicators of rotational movement]
15/02 .  .  Stopping of pumps, or operating valves, on occurrence of unwanted conditions
15/0209 .  .  [responsive to a condition of the working fluid (F04D 15/029 takes precedence)]
15/0218 .  .  [the condition being a liquid level or a lack of liquid supply]
15/0227 .  .  .  [Lack of liquid level being detected using a flow transducer]
15/0236 .  .  .  [Lack of liquid level being detected by analysing the parameters of the electric drive, e.g. current or power consumption]
15/0245 .  .  [responsive to a condition of the pump]
15/0254 .  .  [the condition being speed or load]
15/0263 .  .  [the condition being temperature, ingress of humidity or leakage]
15/0272 .  .  [the condition being wear or a position]
15/0281 .  .  [responsive to a condition not otherwise provided for]
15/029 .  .  .  (for pumps operating in parallel)

Pumping elastic fluids by rotary pumps

17/00 Radial-flow pumps, e.g. centrifugal pumps; Helico-centrifugal pumps (F04D 21/00 takes precedence)
17/02 .  .  having non-centrifugal stages, e.g. centrifugal
17/025 .  .  (comprising axial flow and radial flow stages)
17/04 .  .  .  of transverse-flow type
17/06 .  .  .  Helico-centrifugal pumps
17/08 .  .  Centrifugal pumps
17/10 .  .  .  (for compressing or evacuating
Pumping elastic fluids by rotary pumps

17/105 . . . [with double suction]
17/12 . . . Multi-stage pumps
17/122 . . . . [the individual rotor discs being, one for each stage, on a common shaft and axially spaced, e.g. conventional centrifugal multi-stage compressors]
17/125 . . . . . [the casing being vertically split]
17/127 . . . . . [with radially spaced stages, e.g. for contrarotating type]
17/14 . . . with means for changing the flow-path through the stages, e.g. series-parallel, e.g. side-loads, (surge control F04D 27/02)
17/16 . . . for displacing without appreciable compression
17/161 . . . [Shear force pumps]
17/162 . . . . [Double suction pumps]
17/164 . . . . [Multi-stage fans, e.g. for vacuum cleaners]
17/165 . . . [Axial entry and discharge]
17/167 . . . . [Operating by means of fibrous or porous elements (suction filters F04D 29/701), e.g. with sponge rotors]
17/168 . . . . [Pumps specially adapted to produce a vacuum]
17/18 . . . characterised by use of centrifugal force of liquids entrained in pumps (e.g. by means of an auxiliary liquid; fluid ring compressors F04C 19/00)

19/00 Axial-flow pumps (F04D 21/00) takes precedence; (pump comprising axial flow and radial flow stages F04D 17/025)
19/002 . . . . [Axial flow fans]
19/005 . . . . [reversible fans]
19/007 . . . [multistage fans]
19/02 . . . Multi-stage pumps
19/022 . . . . [with concentric rows of vanes;]
19/024 . . . . [with contrarotating parts]
19/026 . . . . [with a plurality of shafts rotating at different speeds (F04D 19/022 takes precedence)]
19/028 . . . [Layout of fluid flow through the stages]
19/04 . . . specially adapted to the production of a high vacuum, e.g. molecular pumps
19/042 . . . . [Turbomolecular vacuum pumps]
19/044 . . . . [Holweck-type pumps]
19/046 . . . . [Combinations of two or more different types of pumps]
19/048 . . . [comprising magnetic bearings]

21/00 Pump involving supersonic speed of pumped fluids
23/00 Other rotary non-positive-displacement pumps (pumping installations or systems F04D 25/00)
23/001 . . . [Pumps adapted for conveying materials or for handling specific elastic fluids]
23/003 . . . . [of radial-flow type]
23/005 . . . . [of axial-flow type]
23/006 . . . [Creating a pulsating flow]
23/008 . . . [Regenerative pumps (for liquids or for liquids and elastic fluids F04D 5/002)]

25/00 Pumping installations or systems (controlling F04D 27/00)
25/02 . . . Units comprising pumps and their driving means (predominant aspect of the driving means, see the relevant classes for such means)
25/022 . . . [comprising a yielding coupling, e.g. magnetic coupling F04D 25/026]
25/024 . . . [the driving means being assisted by a power recovery turbine]
25/026 . . . [with a magnetic coupling]
25/028 . . . [the driving means being a planetary gear]
25/04 . . . . [the pump being fluid-driven (pumps driven by exhaust gases F02B 37/00; F02B 39/00; turbochargers F02C 6/12)]
25/045 . . . . [the pump wheel carrying the fluid driving means, e.g. turbine blades]
25/06 . . . . . [the pump being electrically driven (F04D 25/08 takes precedence)]
25/0606 . . . . . [the electric motor being specially adapted for integration in the pump]
25/0613 . . . . . [the electric motor being of the inside-out type, i.e. the rotor is arranged radially outside a central stator]
25/062 . . . . . [Details of the bearings]
25/0626 . . . . . [Details of the lubrication]
25/0633 . . . . . [Details of the magnetic circuit]
25/064 . . . . . [Details of the rotor]
25/0646 . . . . . [Details of the stator]
25/0653 . . . . . [the motor having a plane air gap, e.g. disc-type]
25/066 . . . . . [Linear Motors]
25/0666 . . . . . [a sensor is integrated into the pump/motor design]
25/0673 . . . . . [Battery powered]
25/068 . . . . . [Mechanical details of the pump control unit (pump control details F04D 27/00)]
25/0686 . . . . . [specially adapted for submerged use]
25/0693 . . . . . [Details or arrangements of the wiring]
25/08 . . . . . the working fluid being air, e.g. for ventilation
25/082 . . . . . . [the unit having provision for cooling the motor]
25/084 . . . . . [hand fans]
25/086 . . . . . . [hand operated]
25/088 . . . . . . [Ceiling fans]
25/10 . . . . . the unit having provisions for automatically changing direction of output air
25/105 . . . . . . [by changing rotor axis direction, e.g. oscillating fans (interconnecting rotary motion and oscillating motion F16H)]
25/12 . . . . . . the unit being adapted for mounting in apertures
25/14 . . . . . and having shutters, e.g. automatically closed when not in use
25/16 . . . . . Combinations of two or more pumps [Producing two or more separate gas flows]
25/163 . . . . . [driven by a common gearing arrangement]
25/166 . . . . . . [using fans]
27/00 Control, e.g. regulation, of pumps, pumping installations or systems
27/001 . . . . . [Testing thereof; Determination or simulation of flow characteristics; Stall or surge detection, e.g. condition monitoring]
27/002 . . . . . [by varying geometry within the pumps, e.g. by adjusting vanes]
27/003 . . . . . . [by throttling (F04D 27/002 takes precedence)]
27/004 . . . . . . [by varying driving speed]
Pumping elastic fluids by rotary pumps

27/005  . . . . (by changing flow path between different stages or between a plurality of compressors; Load distribution between compressors)
27/006  . . . . (by influencing fluid temperatures)
27/007  . . . . (Conjoint control of two or more different functions)
27/008  . . . . (Stop safety or alarm devices, e.g. stop-and-go control; Disposition of check-valves)
27/009  . . . . (by bleeding, by passing or recycling fluid)
27/02  . . . . (Surge control (surge detection F04D 27/001))
27/0207 . . . . (by bleeding, bypassing or recycling fluids (influencing the boundary layer by an uncontrolled bleeding of the working fluid F04D 29/681))
27/0215 . . . . [Arrangements therefor, e.g. bleed or by-pass valves]
27/0223 . . . . [Control schemes therefor]
27/023  . . . . [Details or means for fluid extraction]
27/0238 . . . . [Details or means for fluid reinjection]
27/0246 . . . . (by varying geometry within the pumps, e.g. by adjusting vanes)
27/0253 . . . . (by throttling (F04D 27/0246 takes precedence))
27/0261 . . . . (by varying driving speed)
27/0269 . . . . (by changing flow path between different stages or between a plurality of compressors; load distribution between compressors)
27/0276 . . . . [by influencing fluid temperature]
27/0284 . . . . [Conjoint control of two or more different functions]
27/0292 . . . . [Stop safety or alarm devices, e.g. stop-and-go control; Disposition of check-valves]

29/00  Details, component parts, or accessories (machine elements in general F16)
29/002  . . . . [especially adapted for elastic fluid pumps]
29/005  . . . . [Decorative aspects, i.e. features which have no effect on the functioning of the pump]
29/007  . . . . [especially adapted for liquid pumps]
29/008  . . . . [Selection of particular materials (for handling specific liquids F04D 27/00)]
29/023  . . . . [especially adapted for elastic fluid pumps]
29/026  . . . . [especially adapted for liquid pumps]
29/04  . . . . [Shafts or bearings, or assemblies thereof (especially adapted for elastic fluid pumps F04D 29/05)]
29/0405 . . . . [joining shafts, e.g. rigid couplings, quill shafts]

**WARNING**
The group F04D 29/0405 is no longer used for the classification of new documents as from July 1st, 2007. The backlog of this group is being continuously reclassified to F04D 29/044 and F04D 29/054.

29/041  . . . . Axial thrust balancing
29/0413 . . . . [hydrostatic; hydrodynamic thrust bearings]
29/0416 . . . . [balancing pistons]
29/042  . . . . Axially shiftable rotors (F04D 29/041 takes precedence (; control by creating a by-pass F04D 15/0027))
29/043  . . . . Shafts
29/044  . . . . Arrangements for joining or assembling shafts
29/046  . . . . Bearings
29/0462 . . . . [Bearing cartridges]
29/0465 . . . . [Ceramic bearing designs]

29/0467 . . . . [Spherical bearings]
29/047  . . . . hydrostatic; hydrodynamic
29/0473 . . . . [for radial pumps]
29/0476 . . . . [for axial pumps]
29/048  . . . . magnetic; electromagnetic
29/049  . . . . Roller bearings
29/05  . . . . Shafts or bearings, or assemblies thereof, specially adapted for elastic fluid pumps
29/051  . . . . Axial thrust balancing
29/0513 . . . . [hydrostatic; hydrodynamic thrust bearings]
29/0516 . . . . [balancing pistons]
29/052  . . . . Axially shiftable rotors (F04D 29/051 takes precedence (; control by creating a by-pass F04D 27/0246))
29/053  . . . . Shafts
29/054  . . . . Arrangements for joining or assembling shafts
29/056  . . . . Bearings
29/0563 . . . . [Bearings cartridges]
29/0566 . . . . [Ceramic bearing designs]
29/057  . . . . hydrostatic; hydrodynamic
29/058  . . . . magnetic; electromagnetic
29/059  . . . . Roller bearings
29/06  . . . . Lubrication ([F04D 13/0606, F04D 13/0646, F04D 13/0653 take precedence])
29/061  . . . . [especially adapted for liquid pumps]
29/063  . . . . specially adapted for elastic fluid pumps
29/08  . . . . Seals
29/083  . . . . [especially adapted for elastic fluid pumps]
29/086  . . . . [especially adapted for liquid pumps]
29/10  . . . . Shaft sealings
29/102  . . . . [especially adapted for elastic fluid pumps]
29/104  . . . . [the sealing fluid being other than the working fluid or being the working fluid treated]
29/106  . . . . [especially adapted for liquid pumps]
29/108  . . . . [the sealing fluid being other than the working liquid or being the working liquid treated]
29/12  . . . . using sealing-rings
29/122  . . . . [especially adapted for elastic fluid pumps]
29/124  . . . . [with special means for adducting cooling or sealing fluid]
29/126  . . . . [especially adapted for liquid pumps]
29/128  . . . . [with special means for adducting cooling or sealing fluid]
29/14  . . . . operative only when pump is inoperative
29/143  . . . . [especially adapted for elastic fluid pumps]
29/146  . . . . [especially adapted for liquid pumps]
29/16  . . . . between pressure and suction sides
29/161  . . . . [especially adapted for elastic fluid pumps]
29/162  . . . . [of a centrifugal flow wheel]
29/164  . . . . [of an axial flow wheel]
29/165  . . . . [especially adapted for liquid pumps]
29/167  . . . . [of a centrifugal flow wheel]
29/168  . . . . [of an axial flow wheel]
29/18  . . . . Rotors (especially for elastic fluids F04D 29/26)
29/181  . . . . [Axial flow rotors (F04D 29/185 takes precedence)]
29/183  . . . . [Semi axial flow rotors]
29/185  . . . . [Rotors consisting of a plurality of wheels]
29/186  . . . . [Shaftless rotors (F04D 13/024 takes precedence)]
Pumping elastic fluids by rotary pumps

29/188 . . . {specially for regenerative pumps}
29/20 . . . Mounting rotors on shafts
29/22 . . . specially for centrifugal pumps
29/2205 . . . {Conventional flow pattern (F04D 29/18 takes precedence)}
29/2211 . . . . {More than one set of flow passages}
29/2216 . . . . {Shape, geometry (F04D 29/2211 takes precedence)}
29/2222 . . . . {Construction and assembly (F04D 29/2211 takes precedence)}
29/2227 . . . . {for special materials}
29/2233 . . . . {entirely open or stamped from one sheet}
29/2238 . . . . {Special flow patterns (F04D 11/005 takes precedence)}
29/2244 . . . . {Free vortex}
29/225 . . . . . {Channel wheels, e.g. one blade or one flow channel}
29/2255 . . . {flow-channels with a special cross-section contour, e.g. ejecting, throttling or diffusing effect}
29/2261 . . . . {with special measures}
29/2266 . . . . {for scaling or thrust balance (F04D 29/04 and F04D 29/16 take precedence)}
29/2272 . . . . {for influencing flow or boundary layer}
29/2277 . . . . {for increasing NPSH or dealing with liquids near boiling-point}
29/2283 . . . . {for reverse pumping action}
29/2288 . . . . {for comminuting, mixing or separating}
29/2294 . . . . . {for protection, e.g. against abrasion}
29/24 . . . Vanes
29/242 . . . {Geometry, shape}
29/245 . . . . . {for special effects}
29/247 . . . . . . {elastic or self-adjusting}
29/26 . . . Rotor specially for elastic fluids
29/263 . . . {mounting fan or blower rotors on shafts}
29/266 . . . {mounting compressor rotors on shafts}
29/28 . . . for centrifugal or helico-centrifugal pumps {for radial-flow or helico-centrifugal pumps}
29/281 . . . . . {for fans or blowers}
29/282 . . . . . . {the leading edge of each vane being substantially parallel to the rotation axis}
29/283 . . . . . . {rotors of the squirrel-cage type}
29/284 . . . . . {for compressors}
29/285 . . . . . . {the compressor wheel comprising a pair of rotatable bladed hub portions axially aligned and clamped together}
29/286 . . . . . . {multi-stage rotors}
29/287 . . . . . . {with adjusting means}
29/288 . . . . . . {Part of the wheel having an ejecting effect, e.g. being bladeless diffuser}
29/289 . . . . . . {having provision against erosion or for dust-separation}
29/30 . . . Vanes
29/305 . . . . . {Flexible vanes}
29/32 . . . for axial flow pumps
29/321 . . . . . {for axial flow compressors}
29/322 . . . . . . {Blade mountings}
29/323 . . . . . . {adjustable}
29/324 . . . . . . {Blades}
29/325 . . . . . . {for axial flow fans (blade mountings F04D 29/34, blades F04D 29/38)}
29/326 . . . . . . {comprising a rotating shroud}
29/327 . . . . . . {with non identical blades}
29/328 . . . . . . {with unequal distribution of blades around the hub}
29/329 . . . . . . {Details of the hub}
29/34 . . . Blade mountings {for axial flow compressors (F04D 29/322)}
29/36 . . . . . . {adjustable} {flexible blades F04D 29/382}
29/362 . . . . . . {during rotation}
29/364 . . . . . . {The blades having only a predetermined number of possible positions}
29/366 . . . . . . {Adjustment by interaction of inertia and lift}
29/368 . . . . . . {Adjustment by interaction of differences of temperature}
29/38 . . . Blades {for axial flow compressors F04D 29/324}
29/382 . . . . . . {Flexible blades}
29/384 . . . . . . {characterised by form}
29/386 . . . . . . {Skewed blades}
29/388 . . . . . . {especially adapted for elastic fluid pumps}
29/390 . . . . . . Casings; Connections of working fluid {bleed or by-pass valves F04D 15/0011, F04D 27/0215}
29/403 . . . . . . {especially adapted for elastic fluid pumps}
29/406 . . . . . . {especially adapted for liquid pumps}
29/42 . . . for radial or helico-centrifugal pumps
29/4206 . . . . . . {especially adapted for elastic fluid pumps}
29/4213 . . . . . . {suction ports}
29/422 . . . . . . {Discharge tongues (F04D 17/04 takes precedence)}
29/4226 . . . . . . {Fan casings}
29/4233 . . . . . . {with volutes extending mainly in axial or radially inward direction}
29/424 . . . . . . {Double entry casings}
29/4246 . . . . . . {comprising more than one outlet}
29/4253 . . . . . . {with axial entry and discharge}
29/426 . . . . . . {especially adapted for liquid pumps}
29/4266 . . . . . . {made of sheet metal}
29/4273 . . . . . . {suction eyes}
29/428 . . . . . . {Discharge tongues (F04D 17/04 takes precedence)}
29/4286 . . . . . . {inside lining, e.g. rubber}
29/4293 . . . . . . {Details of fluid inlet or outlet}
29/44 . . . Fluid-guiding means, e.g. diffusers
29/441 . . . . . . {especially adapted for elastic fluid pumps}
29/442 . . . . . . {rotating diffusers}
29/444 . . . . . . {Bladed diffusers}
29/445 . . . . . . {especially adapted for liquid pumps}
29/447 . . . . . . {rotating diffusers}
29/448 . . . . . . {bladed diffusers}
29/46 . . . . . . {adjustable}
29/462 . . . . . . {especially adapted for elastic fluid pumps}
29/464 . . . . . . {adjusting flow cross-section, otherwise than by using adjustable stator blades}
29/466 . . . . . . {especially adapted for liquid fluid pumps}
29/468 . . . . . . {adjusting flow cross-section, otherwise than by using adjustable stator blades}
29/48 . . . . . . for unidirectional fluid flow in reversible pumps {rotors for reverse action F04D 29/2283}
29/483 . . . . . . {especially adapted for elastic fluid pumps}
Pumping elastic fluids by rotary pumps

29/486 . . . . . . [especially adapted for liquid pumps]
29/50 . . . . . . for reversing fluid flow { (rotors for reverse action F04D 29/2283)
29/503 . . . . . . [especially adapted for elastic fluid pumps]
29/506 . . . . . . [especially adapted for liquid pumps]
29/52 . . for axial pumps
29/522 . . [especially adapted for elastic fluid pumps]
29/524 . . . . { shiftable members for obturating part of the flow path }
29/526 . . . . [Details of the casing section radially opposing blade tips (ducts F04D 29/545)]
29/528 . . . . [especially adapted for liquid pumps]
29/54 . . . . . . Fluid-guiding means, e.g. diffusers
29/541 . . . . [Specially adapted for elastic fluid pumps (F04D 29/56 takes precedence)]
29/542 . . . . [Bladed diffusers (fixing blades to stators F01D 9/042)]
29/544 . . . . [Blade shapes]
29/545 . . . . . . . [Ducts]
29/547 . . . . . . . . [having a special shape in order to influence fluid flow]
29/548 . . . . [Specially adapted for liquid pumps (F04D 29/56 takes precedence)]
29/56 . . . . . . adjustable
29/563 . . . . . . [specially adapted for elastic fluid pumps]
29/566 . . . . . . [specially adapted for liquid pumps]
29/58 . . Cooling {of machines or engines in general F01P; Heating; Diminishing heat transfer { (for the motor F04D 29/042) }
29/5806 . . . . [cooling the drive system]
29/5813 . . . . [cooling the control unit]
29/582 . . . . . . [specially adapted for elastic fluid pumps]
29/5826 . . . . [cooling at least part of the working fluid in a heat exchanger]
29/5833 . . . . [flow schemes and regulation thereto]
29/584 . . . . [cooling or heating the machine (F04D 29/5846, F04D 29/5853 take precedence)]
29/5846 . . . . [cooling by injection]
29/5853 . . . . [heat insulation or conduction]
29/586 . . . . . . [specially adapted for liquid pumps]
29/5866 . . . . [cooling at last part of the working fluid in a heat exchanger]
29/5873 . . . . [flow schemes and regulation thereto]
29/588 . . . . [cooling or heating the machine (F04D 29/5886, F04D 29/5893 take precedence)]
29/5886 . . . . [cooling by injection]
29/5893 . . . . [heat insulation or conduction]
29/60 . . Mounting; Assembling; Disassembling { (F04D 13/10 takes precedence) }
29/601 . . . . [specially adapted for elastic fluid pumps]
29/602 . . . . [Mounting in cavities]
29/603 . . . . . . [means for positioning from outside]
29/604 . . . . . . [means for removing without depressurising the cavity]
29/605 . . . . [specially adapted for liquid pumps]
29/606 . . . . [Mounting in cavities]
29/607 . . . . . . [means for positioning from outside]
29/608 . . . . . . [means for removing without depressurising the cavity]

Other non-positive-displacement pumps

31/00 Pumping liquids and elastic fluids at the same time
33/00 Non-positive-displacement pumps with other than pure rotation, e.g. of oscillating type (F04D 35/00 takes precedence; hand-held fans A45B)
35/00 Pumps producing waves in liquids, i.e. wave-producers (for bath tubs A47K 3/10)