

**CPC****COOPERATIVE PATENT CLASSIFICATION****F02F****CYLINDERS, PISTONS OR CASINGS, FOR COMBUSTION ENGINES; ARRANGEMENTS OF SEALINGS IN COMBUSTION ENGINES**

(specially adapted for rotary-piston or oscillating-piston internal-combustion engines [F02B](#); specially adapted for gas-turbine plants [F02C](#); specially adapted for jet-propulsion plants [F02K](#))

**NOTES**

1. Attention is drawn to the notes preceding class [F01](#).
2. In considering the relationship between class [F16](#) and subclass [F02F](#), class [F16](#) will take precedence unless the subject-matter is specific to combustion engines.

**F02F 1/00****Cylinders; Cylinder heads (in general [F16J](#))**[F02F 1/002](#)

. {Integrally formed cylinders and cylinder heads}

[F02F 1/004](#). {Cylinder liners ([F02F 1/08](#), [F02F 1/16](#) take precedence)}[F02F 2001/006](#)

. {having a ring at the inside of a liner or cylinder for preventing the deposit of carbon oil particles, e.g. oil scrapers}

[F02F 2001/008](#)

. {Stress problems, especially related to thermal stress}

[F02F 1/02](#). having cooling means ([cylinder heads F02F 1/26](#))[F02F 1/04](#)

. . for air cooling

[F02F 1/045](#)

. . . {Attachment of cylinders to crankcase}

[F02F 1/06](#)

. . . Shape or arrangement of cooling fins; Finned cylinders

[F02F 1/065](#)

. . . . {with means for directing or distributing cooling medium}

[F02F 1/08](#)

. . . . running-liner and cooling-part of cylinder being different parts or of different material

[F02F 1/10](#)

. . for liquid cooling

[F02F 1/102](#)

. . . {Attachment of cylinders to crankcase}

[F02F 2001/104](#)

. . . {using an open deck, i.e. the water jacket is open at the block top face}

[F02F 2001/106](#)

. . . {using a closed deck, i.e. the water jacket is not open at the block top face}

[F02F 1/108](#)

. . . {Siamese-type cylinders, i.e. cylinders cast together}

[F02F 1/12](#)

. . . Preventing corrosion of liquid-swept surfaces

[F02F 1/14](#)

. . . Cylinders with means for directing, guiding or distributing liquid stream

[F02F 1/16](#)

. . . Cylinder liners of wet type

[F02F 1/163](#)

. . . . {the liner being midsupported}

[F02F 1/166](#)

. . . . {Spacer decks}

[F02F 1/18](#)

. Other cylinders

[F02F 1/183](#)

. . {Oval or square cylinders}

[F02F 1/186](#). . {for use in engines with two or more pistons reciprocating within same cylinder ([such engines per se F02B 75/28](#))}[F02F 1/20](#)

. . characterised by constructional features providing for lubrication

- F02F 1/22 . . characterised by having ports in cylinder wall for scavenging or charging
- F02F 1/24 . Cylinder heads
- F02F 2001/241 . . {specially adapted to pent roof shape of the combustion chamber}
- F02F 1/242 . . {Arrangement of spark plugs or injectors}
- F02F 1/243 . . {Cylinder heads and inlet or exhaust manifolds integrally cast together}
- F02F 2001/244 . . {Arrangement of valve stems in cylinder heads}
- F02F 2001/245 . . . {the valve stems being orientated at an angle with the cylinder axis}
- F02F 2001/246 . . . . {and orientated radially from the combustion chamber surface}
- F02F 2001/247 . . . {the valve stems being orientated in parallel with the cylinder axis}
- F02F 2001/248 . . {Methods for avoiding thermal stress-induced cracks in the zone between valve seat openings}
- F02F 2001/249 . . {with flame plate, e.g. insert in the cylinder head used as a thermal insulation between cylinder head and combustion chamber}
- F02F 1/26 . . having cooling means
- F02F 1/28 . . . for air cooling
- F02F 1/30 . . . . Finned cylinder heads
- F02F 1/305 . . . . . {the cylinder heads being of side valve type}
- F02F 1/32 . . . . . the cylinder heads being of overhead valve type
- F02F 1/34 . . . . . with means for directing or distributing cooling medium ([F02F 1/32 takes precedence](#))
- F02F 1/36 . . . for liquid cooling
- F02F 1/365 . . . . {the cylinder heads being of side valve type}
- F02F 1/38 . . . . the cylinder heads being of overhead valve type
- F02F 1/40 . . . . . Cylinder heads with means for directing, guiding, or distributing liquid stream ([F02F 1/38 takes precedence](#))
- F02F 1/42 . . Shape or arrangement of intake or exhaust channels in cylinder heads
- F02F 2001/4207 . . . {Arrangements with one conduit connected with two valves; Arrangements connecting one valve with two conduits}
- F02F 1/4214 . . . {specially adapted for four or more valves per cylinder}
- F02F 1/4221 . . . . {particularly for three or more inlet valves (mechanisms for driving such valves [F01L 1/265](#))}
- F02F 1/4228 . . . {Helically-shaped channels ([F02B 31/00 takes precedence](#))}
- F02F 1/4235 . . . {of intake channels}
- F02F 1/4242 . . . . {with a partition wall inside the channel}
- F02F 1/425 . . . . {with a separate deviation element inside the channel}
- F02F 1/4257 . . . . {with an intake liner}
- F02F 1/4264 . . . . {of exhaust channels}
- F02F 1/4271 . . . . {with an exhaust liner}
- F02F 2001/4278 . . . . {Exhaust collectors}
- F02F 1/4285 . . . {of both intake and exhaust channel}
- F02F 1/4292 . . . . {with liners ([F02F 1/4257](#), [F02F 1/4271 take precedence](#))}

**F02F 3/00****Pistons (in general [F16J](#))**

- F02F 2003/0007 . {Monolithic pistons; One piece constructions; Casting of pistons}
- F02F 3/0015 . {Multi-part pistons}
- F02F 3/0023 . . {the parts being bolted or screwed together}
- F02F 3/003 . . {the parts being connected by casting, brazing, welding or clamping}
- F02F 2003/0038 . . . {by brazing}
- F02F 2003/0046 . . . {by crimping}
- F02F 2003/0053 . . . {by soldering}
- F02F 2003/0061 . . . {by welding}
- F02F 3/0069 . . {the crown and skirt being interconnected by the gudgeon pin}
- F02F 3/0076 . {the inside of the pistons being provided with ribs or fins}
- F02F 3/0084 . {the pistons being constructed from specific materials}
- F02F 3/0092 . . {the material being steel-plate}
- F02F 3/02 . having means for accomodating or controlling heat expansion
- F02F 3/022 . . {the pistons having an oval circumference or non-cylindrical shaped skirts, e.g. oval ([F02F 3/025](#), [F02F 3/027](#) take precedence)}
- F02F 3/025 . . {having circumferentially slotted piston skirts, e.g. T-slots}
- F02F 3/027 . . {the skirt wall having cavities}
- F02F 3/04 . . having expansion-controlling inserts
- F02F 3/042 . . . {the inserts consisting of reinforcements in the skirt interconnecting separate wall parts, e.g. rods or strips}
- F02F 3/045 . . . {the inserts being located in the crown}
- F02F 3/047 . . . {the inserts being located around the gudgeon pin bearings}
- F02F 3/06 . . . the inserts having bimetallic effect
- F02F 3/08 . . . the inserts being ring-shaped
- F02F 3/10 . having surface coverings ([F02F 3/02](#) takes precedence)
- F02F 3/105 . . {the coverings forming a double skirt}
- F02F 3/12 . . on piston heads
- F02F 3/14 . . . within combustion chambers
- F02F 3/16 . having cooling means
- F02F 3/18 . . the means being a liquid or solid coolant, e.g. sodium, in a closed chamber in piston
- F02F 3/20 . . the means being a fluid flowing through or along piston
- F02F 3/22 . . . the fluid being liquid
- F02F 3/225 . . . . {the liquid being directed into blind holes}
- F02F 3/24 . having means for guiding gases in cylinders, e.g. for guiding scavenging charge in two-stroke engines
- F02F 3/26 . having combustion chamber in piston head ([the surface thereof being covered \[F02F 3/14\]\(#\)](#))
- F02F 3/28 . Other pistons with specially-shaped head

F02F 3/285	<ul style="list-style-type: none"> <li>. . {the head being provided with an insert located in or on the combustion-gas-swept surface}</li> </ul>
<b>F02F 5/00</b>	<b>Piston rings, e.g. associated with piston crown {(not used see <a href="#">F16J 9/00</a>)}</b>
<b>F02F 7/00</b>	<b>Casings, e.g. crankcases (engine casings in general <a href="#">F16M</a> ) {or frames}</b>
F02F 7/0002	. {Cylinder arrangements}
F02F 7/0004	. . {Crankcases of one-cylinder engines}
F02F 7/0007	. . {Crankcases of engines with cylinders in line}
F02F 7/0009	. . {Crankcases of opposed piston engines}
F02F 7/0012	. . {Crankcases of V-engines}
F02F 7/0014	. . {Crankcases of W-, deltic, or quadratic engines, or the like}
F02F 7/0017	. . {Crankcases of radial engines}
F02F 7/0019	. . {Cylinders and crankshaft not in one plane (deaxation)}
F02F 7/0021	. {Construction}
F02F 7/0024	. . {Casings for larger engines}
F02F 7/0026	. . . {Casings for horizontal engines}
F02F 7/0029	. . {Space-frames}
F02F 7/0031	. . {Construction kit principle (modular engines)}
F02F 7/0034	. . {Built from sheet material and welded casings}
F02F 7/0036	. . {Casings for two-stroke engines with scavenging conduits}
F02F 7/0039	. . {Casings for small engines, especially with crankcase pumps}
F02F 2007/0041	. . {Fixing Bolts}
F02F 7/0043	. {Arrangements of mechanical drive elements}
F02F 7/0046	. . {Shape of casings adapted to facilitate fitting or dismantling of engine parts}
F02F 7/0048	. . {Tunnel-type frames}
F02F 7/0051	. . {Crankcase pump engines}
F02F 7/0053	. . {Crankshaft bearings fitted in the crankcase}
F02F 2007/0056	. . . {using bearing beams, i.e. bearings interconnected by a beam or multiple beams}
F02F 7/0058	. . {Longitudinally or transversely separable crankcases}
F02F 7/006	. {Camshaft or pushrod housings (oil sumps <a href="#">F01M 11/0004</a> )}
F02F 2007/0063	. . {Head bolts; Arrangements of cylinder head bolts}
F02F 7/0065	. {Shape of casings for other machine parts and purposes, e.g. utilisation purposes, safety}
F02F 7/0068	. . {Adaptations for other accessories}
F02F 7/007	. . {Adaptations for cooling}
F02F 7/0073	. . {Adaptations for fitting the engine, e.g. front-plates or bell-housings}
F02F 2007/0075	. . . {Front covers}
F02F 2007/0078	. . . {Covers for belt transmissions}
F02F 7/008	. . {Sound insulation (see also <a href="#">F02B 77/13</a> )}
F02F 7/0082	. {Mounting of engine casings}

F02F 7/0085	<ul style="list-style-type: none"> <li>• {Materials for constructing engines or their parts}</li> </ul>
F02F 7/0087	<ul style="list-style-type: none"> <li>• • {Ceramic materials}</li> </ul>
F02F 2007/009	<ul style="list-style-type: none"> <li>• • {Hypereutectic aluminum, e.g. aluminum alloys with high Si content}</li> </ul>
F02F 2007/0092	<ul style="list-style-type: none"> <li>• • {Transparent materials}</li> </ul>
F02F 7/0095	<ul style="list-style-type: none"> <li>• {Constructing engine casings (welded casings <a href="#">F02F 7/0034</a>)}</li> </ul>
F02F 2007/0097	<ul style="list-style-type: none"> <li>• {for large diesel engines}</li> </ul>
<b>F02F 11/00</b>	<b>Arrangements of sealings in combustion engines</b> (piston rings <a href="#">F02F 5/00</a> {not used, see <a href="#">F16J 9/00</a> } ; sealings per se <a href="#">F16J</a> )
F02F 11/002	<ul style="list-style-type: none"> <li>• {involving cylinder heads}</li> </ul>
F02F 11/005	<ul style="list-style-type: none"> <li>• {involving cylinder liners}</li> </ul>
F02F 11/007	<ul style="list-style-type: none"> <li>• {involving rotary applications}</li> </ul>
<b>F02F 2200/00</b>	<b>Manufacturing</b>
F02F 2200/02	<ul style="list-style-type: none"> <li>• Riveting</li> </ul>
F02F 2200/04	<ul style="list-style-type: none"> <li>• Forging of engine parts</li> </ul>
F02F 2200/06	<ul style="list-style-type: none"> <li>• Casting (<a href="#">casting of pistons F02F 2003/0007</a>)</li> </ul>
F02F 2200/08	<ul style="list-style-type: none"> <li>• • using a lost model, e.g. foam casting</li> </ul>
F02F 2200/11	<ul style="list-style-type: none"> <li>• using wrought materials, e.g. wrought steels</li> </ul>
<b>F02F 2547/00</b>	