

CPC COOPERATIVE PATENT CLASSIFICATION

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

ENGINES OR PUMPS

F02 COMBUSTION ENGINES (cyclically operating valves therefor, lubricating, exhausting, or silencing engines [F01](#)); HOT-GAS OR COMBUSTION-PRODUCT ENGINE PLANTS

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.

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.

1/00	Cylinders; Cylinder heads (in general F16J)	1/186	. . {for use in engines with two or more pistons reciprocating within same cylinder (such engines per se F02B 75/28)}
1/002	. {Integrally formed cylinders and cylinder heads}		
1/004	. {Cylinder liners (F02F 1/08 , F02F 1/16 take precedence)}	1/20	. . characterised by constructional features providing for lubrication
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}	1/22	. . characterised by having ports in cylinder wall for scavenging or charging
2001/008	. {Stress problems, especially related to thermal stress}	1/24	. Cylinder heads
1/02	. having cooling means (cylinder heads F02F 1/26)	2001/241	. . {specially adapted to pent roof shape of the combustion chamber}
1/04	. . for air cooling	1/242	. . {Arrangement of spark plugs or injectors}
1/045	. . . {Attachment of cylinders to crankcase}	1/243	. . {Cylinder heads and inlet or exhaust manifolds integrally cast together}
1/06	. . . Shape or arrangement of cooling fins; Finned cylinders	2001/244	. . {Arrangement of valve stems in cylinder heads}
1/065	. . . . {with means for directing or distributing cooling medium}	2001/245	. . . {the valve stems being orientated at an angle with the cylinder axis}
1/08	. . . . running-liner and cooling-part of cylinder being different parts or of different material	2001/246	. . . . {and orientated radially from the combustion chamber surface}
1/10	. . for liquid cooling	2001/247	. . . {the valve stems being orientated in parallel with the cylinder axis}
1/102	. . . {Attachment of cylinders to crankcase}	2001/248	. . {Methods for avoiding thermal stress-induced cracks in the zone between valve seat openings}
2001/104	. . . {using an open deck, i.e. the water jacket is open at the block top face}	2001/249	. . {with flame plate, e.g. insert in the cylinder head used as a thermal insulation between cylinder head and combustion chamber}
2001/106	. . . {using a closed deck, i.e. the water jacket is not open at the block top face}		
1/108	. . . {Siamese-type cylinders, i.e. cylinders cast together}	1/26	. . having cooling means
1/12	. . . Preventing corrosion of liquid-swept surfaces	1/28	. . . for air cooling
1/14	. . . Cylinders with means for directing, guiding or distributing liquid stream	1/30	. . . . Finned cylinder heads
1/16	. . . Cylinder liners of wet type	1/305	. . . . . {the cylinder heads being of side valve type}
1/163	. . . . {the liner being midsupported}	1/32	. . . . . the cylinder heads being of overhead valve type
1/166	. . . . {Spacer decks}	1/34	. . . . . with means for directing or distributing cooling medium (F02F 1/32 takes precedence)
1/18	. Other cylinders		
1/183	. . {Oval or square cylinders}		

- 1/36 . . . for liquid cooling
- 1/365 {the cylinder heads being of side valve type}
- 1/38 the cylinder heads being of overhead valve type
- 1/40 cylinder heads with means for directing, guiding, or distributing liquid stream ([F02F 1/38](#) takes precedence)
- 1/42 . . Shape or arrangement of intake or exhaust channels in cylinder heads
- 2001/4207 . . . {Arrangements with one conduit connected with two valves; Arrangements connecting one valve with two conduits}
- 1/4214 . . . {specially adapted for four or more valves per cylinder}
- 1/4221 {particularly for three or more inlet valves (mechanisms for driving such valves [F01L 1/265](#))}
- 1/4228 . . . {Helically-shaped channels ([F02B 31/00](#) takes precedence)}
- 1/4235 . . . {of intake channels}
- 1/4242 {with a partition wall inside the channel}
- 1/425 {with a separate deviation element inside the channel}
- 1/4257 {with an intake liner}
- 1/4264 . . . {of exhaust channels}
- 1/4271 {with an exhaust liner}
- 2001/4278 {Exhaust collectors}
- 1/4285 . . . {of both intake and exhaust channel}
- 1/4292 {with liners ([F02F 1/4257](#), [F02F 1/4271](#) take precedence)}
- 3/00** **Pistons (in general [F16J](#))**
- 2003/0007 . . {Monolithic pistons; One piece constructions; Casting of pistons}
- 3/0015 . . {Multi-part pistons}
- 3/0023 . . {the parts being bolted or screwed together}
- 3/003 . . {the parts being connected by casting, brazing, welding or clamping}
- 2003/0038 . . . {by brazing}
- 2003/0046 . . . {by crimping}
- 2003/0053 . . . {by soldering}
- 2003/0061 . . . {by welding}
- 3/0069 . . {the crown and skirt being interconnected by the gudgeon pin}
- 3/0076 . . {the inside of the pistons being provided with ribs or fins}
- 3/0084 . . {the pistons being constructed from specific materials}
- 3/0092 . . {the material being steel-plate}
- 3/02 . . having means for accommodating or controlling heat expansion
- 3/022 . . {the pistons having an oval circumference or non-cylindrical shaped skirts, e.g. oval ([F02F 3/025](#), [F02F 3/027](#) take precedence)}
- 3/025 . . {having circumferentially slotted piston skirts, e.g. T-slots}
- 3/027 . . {the skirt wall having cavities}
- 3/04 . . having expansion-controlling inserts
- 3/042 . . . {the inserts consisting of reinforcements in the skirt interconnecting separate wall parts, e.g. rods or strips}
- 3/045 . . . {the inserts being located in the crown}
- 3/047 . . . {the inserts being located around the gudgeon pin bearings}
- 3/06 . . . the inserts having bimetallic effect
- 3/08 . . . the inserts being ring-shaped
- 3/10 . . having surface coverings ([F02F 3/02](#) takes precedence)
- 3/105 . . {the coverings forming a double skirt}
- 3/12 . . on piston heads
- 3/14 . . . within combustion chambers
- 3/16 . . having cooling means
- 3/18 . . the means being a liquid or solid coolant, e.g. sodium, in a closed chamber in piston
- 3/20 . . the means being a fluid flowing through or along piston
- 3/22 . . . the fluid being liquid
- 3/225 {the liquid being directed into blind holes}
- 3/24 . . having means for guiding gases in cylinders, e.g. for guiding scavenging charge in two-stroke engines
- 3/26 . . having combustion chamber in piston head (the surface thereof being covered [F02F 3/14](#))
- 3/28 . . Other pistons with specially-shaped head
- 3/285 . . {the head being provided with an insert located in or on the combustion-gas-swept surface}
- 5/00** **Piston rings, e.g. associated with piston crown ((not used see [F16J 9/00](#))}**
- 7/00** **Casings, e.g. crankcases (engine casings in general [F16M](#)) {or frames}**
- 7/0002 . . {Cylinder arrangements}
- 7/0004 . . {Crankcases of one-cylinder engines}
- 7/0007 . . {Crankcases of engines with cylinders in line}
- 7/0009 . . {Crankcases of opposed piston engines}
- 7/0012 . . {Crankcases of V-engines}
- 7/0014 . . {Crankcases of W-, deldic, or quadratic engines, or the like}
- 7/0017 . . {Crankcases of radial engines}
- 7/0019 . . {Cylinders and crankshaft not in one plane (deaxation)}
- 7/0021 . . {Construction}
- 7/0024 . . {Casings for larger engines}
- 7/0026 . . . {Casings for horizontal engines}
- 7/0029 . . {Space-frames}
- 7/0031 . . {Construction kit principle (modular engines)}
- 7/0034 . . {Built from sheet material and welded casings}
- 7/0036 . . {Casings for two-stroke engines with scavenging conduits}
- 7/0039 . . {Casings for small engines, especially with crankcase pumps}
- 2007/0041 . . {Fixing Bolts}
- 7/0043 . . {Arrangements of mechanical drive elements}
- 7/0046 . . {Shape of casings adapted to facilitate fitting or dismantling of engine parts}
- 7/0048 . . {Tunnel-type frames}
- 7/0051 . . {Crankcase pump engines}
- 7/0053 . . {Crankshaft bearings fitted in the crankcase}
- 2007/0056 . . . {using bearing beams, i.e. bearings interconnected by a beam or multiple beams}
- 7/0058 . . {Longitudinally or transversely separable crankcases}
- 7/006 . . {Camshaft or pushrod housings (oil sumps [F01M 11/0004](#))}
- 2007/0063 . . {Head bolts; Arrangements of cylinder head bolts}
- 7/0065 . . {Shape of casings for other machine parts and purposes, e.g. utilisation purposes, safety}

F02F

- 7/0068 . . {Adaptations for other accessories}
- 7/007 . . {Adaptations for cooling}
- 7/0073 . . {Adaptations for fitting the engine, e.g. front-plates or bell-housings}
- 2007/0075 . . . {Front covers}
- 2007/0078 . . . {Covers for belt transmissions}
- 7/008 . . {Sound insulation ([see also F02B 77/13](#))}
- 7/0082 . {Mounting of engine casings}
- 7/0085 . {Materials for constructing engines or their parts}
- 7/0087 . . {Ceramic materials}
- 2007/009 . . {Hypereutectic aluminum, e.g. aluminum alloys with high SI content}
- 2007/0092 . . {Transparent materials}
- 7/0095 . {Constructing engine casings ([welded casings F02F 7/0034](#))}
- 2007/0097 . {for large diesel engines}

- 11/00 Arrangements of sealings in combustion engines**
(piston rings [F02F 5/00](#) {not used, [see F16J 9/00](#)}; sealings [per se F16J](#))
- 11/002 . {involving cylinder heads}
- 11/005 . {involving cylinder liners}
- 11/007 . {involving rotary applications}

- 2200/00 Manufacturing**
- 2200/02 . Riveting
- 2200/04 . Forging of engine parts
- 2200/06 . Casting ([casting of pistons F02F 2003/0007](#))
- 2200/08 . . using a lost model, e.g. foam casting
- 2200/11 . using wrought materials, e.g. wrought steels