

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](#))

NOTE

Attention is drawn to the notes preceding class [F01](#) .

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 . . { the head being provided with an insert located in or on the combustion-gas-swept surface }
- F02F 5/00** **Piston rings, e.g. associated with piston crown** { not used see [F16J 9/00](#) }
- F02F 7/00** **Casings, e.g. crankcases** (engine casings in general [F16M](#)) { or frames }
- 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-, deldic, 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 [F01M 11/0004](#))}
- 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 [F02B 77/13](#))}
- F02F 7/0082 . { Mounting of engine casings }
- F02F 7/0085 . { Materials for constructing engines or their parts }
- F02F 7/0087 . . { Ceramic materials }
- F02F 2007/009 . . { Hypereutectic aluminum, e.g. aluminum alloys with high SI content }
- F02F 2007/0092 . . { Transparent materials }
- F02F 7/0095 . { Constructing engine casings (welded casings [F02F 7/0034](#))}
- F02F 2007/0097 . { for large diesel engines }
- F02F 11/00** **Arrangements of sealings in combustion engines (piston rings [F02F 5/00](#) { not used, see [F16J 9/00](#) } ; sealings per se [F16J](#))**
- F02F 11/002 . { involving cylinder heads }
- F02F 11/005 . { involving cylinder liners }
- F02F 11/007 . { involving rotary applications }
- F02F 2200/00** **Manufacturing**
- F02F 2200/02 . Riveting
- F02F 2200/04 . Forging of engine parts
- F02F 2200/06 . Casting (casting of pistons [F02F 2003/0007](#))
- F02F 2200/08 . . using a lost model, e.g. foam casting

F02F 2200/11 . using wrought materials, e.g. wrought steels

F02F 2547/00