

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-, 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 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