

CPC COOPERATIVE PATENT CLASSIFICATION

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

ENGINES OR PUMPS

F01 MACHINES OR ENGINES IN GENERAL; ENGINE PLANTS IN GENERAL; STEAM ENGINES

F01B MACHINES OR ENGINES, IN GENERAL OR OF POSITIVE-DISPLACEMENT TYPE, e.g. STEAM ENGINES (of rotary-piston or oscillating-piston type [F01C](#); of non-positive-displacement type [F01D](#); internal-combustion aspects of reciprocating-piston engines [F02B 57/00](#), [F02B 59/00](#); crankshafts, crossheads, connecting-rods [F16C](#); flywheels [F16F](#); gearings for interconverting rotary motion and reciprocating motion in general [F16H](#); pistons, piston rods, cylinders, for engines in general [F16J](#))

NOTES

1. This subclass covers, with the exception of the matter provided for in subclasses [F01C](#) - [F01P](#) :
 - engines for elastic fluids, e.g. steam engines;
 - engines for liquids and elastic fluids;
 - machines for elastic fluids;
 - machines for liquids and elastic fluids.
2. Attention is drawn to the note preceding class [F01](#), especially as regards the definitions of "steam" and "special vapour".

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.

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| 1/00 | Reciprocating-piston machines or engines characterised by number or relative disposition of cylinders or by being built-up from separate cylinder-crankcase elements (F01B 3/00, F01B 5/00 take precedence) | 1/0641 | . . {Details, component parts specially adapted for such machines} |
| 1/01 | . with one single cylinder | 1/0644 | . . . {Pistons} |
| 1/02 | . with cylinders all in one line | 1/0648 | . . . {Cams} |
| 1/04 | . with cylinders in V-arrangement | 1/0651 | {consisting of several cylindrical elements, e.g. rollers} |
| 1/06 | . with cylinders in star or fan arrangement | 1/0655 | . . . {cylinders} |
| 1/0603 | . . {the connection of the pistons with an element being at the outer ends of the cylinders} | 1/0658 | . . . {Arrangements for pressing or connecting the pistons against the actuating or actuated cam} |
| 1/0606 | . . . {with cam-actuated distribution member(s)} | 1/0662 | {hydraulically} |
| 1/061 | . . . {with two or more series radial piston-cylinder units} | 1/0665 | . . . {Disconnecting the pistons from the actuating or actuated cam (in general F01B 31/24)} |
| 1/0613 | {directly located side by side} | 1/0668 | . . . {Supporting and guiding means for the piston} |
| 1/0617 | {coupling of several cylinders-barrels} | 1/0672 | . . . {Draining of the machine housing; arrangements dealing with leakage fluid} |
| 1/062 | . . {the connection of the pistons with an actuating or actuated element being at the inner ends of the cylinders} | 1/0675 | . . {Controlling} |
| 1/0624 | . . . {with cam-actuated distribution member(s)} | 1/0679 | . . . {by using a valve in a system with several pump or motor chambers, wherein the flow path through the chambers can be changed, e.g. series-parallel} |
| 1/0627 | {each machine piston being provided with channels, which are coacting with the cylinder and are used as a distribution member for another piston-cylinder unit} | 1/0682 | . . . {by changing the effective cross sectional piston working surface} |
| 1/0631 | . . . {the piston-driving or -driven cam being provided with an inlet or an outlet} | 1/0686 | . . . {by changing the effective piston stroke} |
| 1/0634 | . . . {with two or more series radial piston-cylinder units} | 1/0689 | {by changing the excentricity of one element relative to another element} |
| 1/0637 | {directly located side by side} | 1/0693 | . . . {by changing the phase relationship between two actuating or actuated cams} |
| | | 1/0696 | . . . {by changing the phase relationship between the actuating or actuated cam and the distributing means} |

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| 1/08 | • with cylinders arranged oppositely relative to main shaft and of "flat" type | 3/10 | • Control of working-fluid admission or discharge peculiar thereto (suitable for more general application F01L) |
| 1/10 | • with more than one main shaft, e.g. coupled to common output shaft (combinations of two or more machines or engines F01B 21/00) | 3/101 | • . . {for machines with stationary cylinders} |
| 1/12 | • Separate cylinder-crankcase elements coupled together to form a unit | 3/102 | • . . . {Changing the piston stroke by changing the position of the swash plate} |
| 3/00 | Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis | 3/103 | • . . {for machines with rotary cylinder block} |
| 3/0002 | • {having stationary cylinders} | 3/104 | • . . . {by turning the valve plate} |
| 3/0005 | • . . {having two or more sets of cylinders or pistons} | 3/105 | • . . . {by moving the swash plate in a direction perpendicular to the axis of rotation of the cylinder barrel} |
| 3/0008 | • . . {having self-acting distribution members, e.g. actuated by working fluid} | 3/106 | • . . . {by changing the inclination of the swash plate} |
| 3/0011 | • . . . {Cylindrical distribution members} | 3/107 | • {using wedges} |
| 3/0014 | • . . . {Conical distribution members} | 3/108 | • . . . {by turning the swash plate (with fixed inclination)} |
| 3/0017 | • . . {Component parts, details, e.g. sealings, lubrication} | 3/109 | • . . . {by changing the inclination of the axis of the cylinder barrel relative to the swash plate (F01B 3/106 takes precedence)} |
| 3/002 | • . . . {Cylinders} | 5/00 | Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis |
| 3/0023 | • . . . {Actuating or actuated elements} | 5/003 | • {the connection of the pistons with an actuated or actuating element being at the outer ends of the cylinders} |
| 3/0026 | • {Actuating or actuated element bearing means or driving or driven axis bearing means} | 5/006 | • {the connection of the pistons with an actuated or actuating element being at the inner ends of the cylinders} |
| 3/0029 | • . . . {Casings, housings} | 7/00 | Machines or engines with two or more pistons reciprocating within same cylinder or within essentially coaxial cylinders (in opposite arrangement relative to main shaft F01B 1/08) |
| 3/0032 | • {having rotary cylinder block} | 7/02 | • with oppositely reciprocating pistons |
| 3/0035 | • . . {having two or more sets of cylinders or pistons} | 7/04 | • . . acting on same main shaft |
| 3/0038 | • . . . {inclined to main shaft axis} | 7/06 | • . . . using only connecting-rods for conversion of reciprocatory into rotary motion or <i>vice versa</i> |
| 3/0041 | • . . {Arrangements for pressing the cylinder barrel against the valve plate, e.g. fluid pressure} | 7/08 | • with side rods |
| 3/0044 | • . . {Component parts, details, e.g. valves, sealings, lubrication} | 7/10 | • having piston-rod of one piston passed through other piston |
| 3/0047 | • . . . {Particularities in the contacting area between cylinder barrel and valve plate} | 7/12 | • . . . using rockers and connecting-rods |
| 3/005 | • {Bearing arrangements} | 7/14 | • . . acting on different main shafts |
| 3/0052 | • . . . {Cylinder barrel} | 7/16 | • with pistons synchronously moving in tandem arrangement |
| 3/0055 | • . . . {Valve means, e.g. valve plate} | 7/18 | • with differential piston (F01B 7/20 takes precedence) |
| 3/0058 | • {Cylindrical valve means} | 7/20 | • with two or more pistons reciprocating one within another, e.g. one piston forming cylinder of the other |
| 3/0061 | • {Conical valve means} | 9/00 | Reciprocating-piston machines or engines characterised by connections between pistons and main shafts and not specific to preceding groups (connections disengageable during idling F01B 31/24) |
| 3/0064 | • . . . {Machine housing} | 9/02 | • with crankshaft |
| 3/0067 | • {cylinder barrel bearing means} | 9/023 | • . . {of Bourke-type or Scotch yoke} |
| 3/007 | • . . . {Swash plate} | 9/026 | • . . {Rigid connections between piston and rod; Oscillating pistons} |
| 3/0073 | • {swash plate bearing means or driving or driven axis bearing means} | 9/04 | • with rotary main shaft other than crankshaft |
| 3/0076 | • . . {Connection between cylinder barrel and inclined swash plate} | 9/042 | • . . {the connections comprising gear transmissions} |
| 3/0079 | • {having pistons with rotary and reciprocating motion, i.e. spinning pistons} | 2009/045 | • . . . {Planetary gearings} |
| 3/0082 | • {Details} | 9/047 | • . . {with rack and pinion} |
| 3/0085 | • . . {Pistons} | 9/06 | • . . the piston motion being transmitted by curved surfaces |
| 3/0088 | • . . . {Piston shoe retaining means} | | |
| 3/0091 | • . . {Casings, housings} | | |
| 3/0094 | • . . {Driving or driven means} | | |
| 2003/0097 | • . . . {Z-shafts, i.e. driven or driving shafts in Z-form} | | |
| 3/02 | • with wobble-plate | | |
| 3/04 | • the piston motion being transmitted by curved surfaces | | |
| 3/045 | • . . {by two or more curved surfaces, e.g. for two or more pistons in one cylinder} | | |
| 3/06 | • . . by multi-turn helical surfaces and automatic reversal | | |
| 3/08 | • . . . the helices being arranged on the pistons | | |

- 2009/061 . . . {by cams}
- 2009/063 . . . {Mono-lobe cams}
- 2009/065 . . . {Bi-lobe cams}
- 2009/066 . . . {Tri-lobe cams}
- 2009/068 . . . {Quadri-lobe cams}
- 9/08 . . with ratchet and pawl
- 11/00 Reciprocating-piston machines or engines without rotary main shaft, e.g. of free-piston type**
- 11/001 . {in which the movement in the two directions is obtained by one double acting piston motor}
- 11/002 . . {one side of the double acting piston motor being always under the influence of the fluid under pressure}
- 11/003 . . . {the fluid under pressure being continuously delivered to one motor chamber and reacting the other chamber through a valve located in the piston, to bring the piston back in its start-position}
- 11/004 . {in which the movement in the two directions is obtained by two single acting piston motors, each acting in one direction}
- 2011/005 . . {with oscillating pistons, i.e. the pistons are arranged in ring like cylinder sections and oscillate with respect to the center of the ring}
- 11/006 . . {one single acting piston motor being always under the influence of the fluid under pressure}
- 11/007 . {in which the movement in only one direction is obtained by a single acting piston motor, e.g. with actuation in the other direction by spring means}
- 11/008 . . {with actuation in the other direction by gravity}
- 11/009 . {in which the movement in two directions is obtained by two or more double acting piston motors}
- 11/02 . Equalising or cushioning devices
- 11/04 . Engines combined with reciprocatory driven devices, e.g. hammers (with pumps F01B 23/08; predominating aspects of driven devices, see the relevant classes for the devices)
- 11/06 . . for generating vibration only
- 11/08 . with direct fluid transmission link (F01B 11/02 takes precedence)
- 13/00 Reciprocating-piston machines or engines with rotating cylinders in order to obtain the reciprocating-piston motion (machines or engines of flexible-wall type F01B 19/00)**
- 13/02 . with one cylinder only
- 13/04 . with more than one cylinder {(F01B 3/0032 takes precedence)}
- 13/045 . . {with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis}
- 13/06 . . in star arrangement
- 13/061 . . . {the connection of the pistons with the actuated or actuating element being at the outer ends of the cylinders}
- 13/062 {cylinder block and actuating or actuated cam both rotating (F01B 13/064 and F01B 13/066 take precedence)}
- 13/063 {with two or more series radial piston-cylinder units}
- 13/064 {cylinder block and actuating or actuated cam both rotating (F01B 13/066 takes precedence)}
- 13/065 {directly located side by side}
- 13/066 {cylinder block and actuating or actuated cam both rotating}
- 13/067 {with pistons and cylinders having two different parallel axis of rotation}
- 13/068 . . . {the connection of the pistons with an actuated or actuating element being at the inner ends of the cylinders}
- 15/00 Reciprocating-piston machines or engines with movable cylinders other than provided for in group F01B 13/00 (with movable cylinder sleeves for working fluid control F01L)**
- 15/002 . {having cylinders in star or fan arrangement, the connection of the pistons with the actuated or actuating element being at the outer ends of the cylinders}
- 15/005 . {having cylinders in star or fan arrangement, the connection of the pistons with the actuated or actuating element being at the inner ends of the cylinders}
- 15/007 . {having spinning cylinders, i.e. the cylinders rotating about their longitudinal axis}
- 15/02 . with reciprocating cylinders (with one piston within another F01B 7/20)
- 15/04 . with oscillating cylinder
- 15/06 . . Control of working-fluid admission or discharge peculiar thereto
- 15/065 . . . {by cam-actuated distribution members}
- 17/00 Reciprocating-piston machines or engines characterised by use of uniflow principle**
- 17/02 . Engines
- 17/022 . . {with fluid heating}
- 17/025 . . {using liquid air}
- 17/027 . . {using separators}
- 17/04 . . Steam engines
- NOTE**
- in this group the following indexing codes are used:
F01B 2170/0411 - F01B 2170/0494
- 19/00 Positive-displacement machines or engines of flexible-wall type**
- 19/02 . with plate-like flexible members
- 19/04 . with tubular flexible members
- 21/00 Combinations of two or more machines or engines (F01B 23/00 takes precedence; regulating or controlling, see the relevant groups; combinations of two or more pumps F04; fluid gearing F16H)**
- 21/02 . the machines or engines being all of reciprocating-piston type
- 21/04 . the machines or engines being not all of reciprocating-piston type, e.g. of reciprocating steam engine with steam turbine
- 23/00 Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby (F01B 11/00 takes precedence; fluid gearing F16H; aspects predominantly concerning driven devices, see the relevant classes for these devices; regulating or controlling, see the relevant groups)**
- 23/02 . Adaptations for driving vehicles, e.g. locomotives (arrangements in vehicles, see the relevant classes for vehicles)
- 23/04 . . the vehicles being waterborne vessels

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| 23/06 | • Adaptations for driving, or combinations with, hand-held tools or the like | 31/00 | Component parts, details, or accessories not provided for in, or of interest apart from, other groups (machine or engine casings, other than those peculiar to steam engines, F16M) |
| 23/08 | • Adaptations for driving, or combinations with, pumps | 31/005 | • { Silencing equipment (silencing for steam engines F01B 31/16)} |
| 23/10 | • Adaptations for driving, or combinations with, electric generators | 31/02 | • De-icing means for engines having icing phenomena |
| 23/12 | • Adaptations for driving rolling mills or other heavy reversing machinery | 31/04 | • Means for equalising torque in reciprocating-piston machines or engines (compensation of inertial forces, suppression of vibration in systems F16F) |
| 25/00 | Regulating, controlling, or safety means (regulating or controlling in general G05) | 31/06 | • Means for compensating relative expansion of component parts |
| | NOTE | 31/08 | • Cooling of steam engines (cooling of fluid machines or engines in general F01P); Heating; Heat insulation (heat insulation in general F16L 59/00) |
| | in this group the following indexing codes are used: | 31/10 | • Lubricating arrangements of steam engines (of fluid machines or engines in general F01M) |
| | F01B 2250/001 - F01B 2250/009 | 31/12 | • Arrangements of measuring or indicating devices (warning apparatus F01B 25/26; measuring instruments or the like per se G01) |
| 25/02 | • Regulating or controlling by varying working-fluid admission or exhaust, e.g. by varying pressure or quantity (distributing or expansion valve gear F01L) | 31/14 | • Changing of compression ratio |
| 25/04 | • . Sensing elements | 31/16 | • Silencers specially adapted for steam engines (arrangements of exhaust pipes or tubes on steam engines F01B 31/30; gas-flow silencers or exhaust silencers for machines or engines in general F01N) |
| 25/06 | • . . responsive to speed | 31/18 | • Draining |
| 25/08 | • . Final actuators | 31/20 | • . of cylinders |
| 25/10 | • . . Arrangements or adaptations of working-fluid admission or discharge valves (valves in general F16K) | 31/22 | • Idling devices, e.g. having by-passing valves |
| 25/12 | • . Devices dealing with sensing elements or final actuators or transmitting means between them, e.g. power-assisted (sensing elements alone F01B 25/04; final actuators alone F01B 25/08) | 31/24 | • . Disengagement of connections between pistons and main shafts |
| 25/14 | • . peculiar to particular kinds of machines or engines | 31/26 | • Other component parts, details, or accessories, peculiar to steam engines |
| 25/16 | • Safety means responsive to specific conditions (against water hammer or the like in steam engines F01B 31/34) | 31/28 | • . Cylinders or cylinder covers |
| 25/18 | • . preventing rotation in wrong direction | 31/30 | • . Arrangements of steam conduits |
| 25/20 | • Checking operation on safety devices | 31/32 | • . Arrangements or adaptations of vacuum breakers |
| 25/22 | • Braking by redirecting working-fluid | 31/34 | • . Safety means against water hammers or against the penetration of water (steam traps F16T) |
| 25/24 | • . thereby regenerating energy | 31/36 | • . . automatically cutting-off steam supply |
| 25/26 | • Warning devices | | |
| 27/00 | Starting of machines or engines (starting combustion engines F02N) | 2170/00 | Steam engines, e.g. for locomotives or ships |
| 27/02 | • of reciprocating-piston engines | 2170/04 | • To-be-deleted with administrative transfer to parent group |
| 27/04 | • . by directing working-fluid supply, e.g. by aid of by-pass steam conduits | 2170/0405 | • . To-be-deleted with administrative transfer to parent group |
| 27/06 | • . . specially for compound engines | 2170/0411 | • . . for locomotives |
| 27/08 | • . Means for moving crank off dead-centre (turning-gear in general F16H) | 2170/0417 | • . . for locomobiles driven by small motors |
| 29/00 | Machines or engines with pertinent characteristics other than those provided for in preceding main groups | 2170/0423 | • . . Single acting steam engines with 1, 2 or 3 cylinders |
| 29/02 | • Atmospheric engines, i.e. atmosphere acting against vacuum | 2170/0429 | • . . Double acting high pressure machines |
| 29/04 | • characterised by means for converting from one type to a different one | 2170/0435 | • . . Compound machines with double or plural expansion; Auxiliaries driven by main engine |
| 29/06 | • . from steam engine into combustion engine | 2170/0441 | • . . Compound engines with monolytic pistons in same cylinder |
| 29/08 | • Reciprocating-piston machines or engines not otherwise provided for | 2170/0447 | • . . Machines with more than one piston in a cylinder and with counter moving pistons |
| 29/10 | • . Engines (refrigeration machines F25B) | 2170/0452 | • . . Engines without connecting rods |
| 29/12 | • . . Steam engines (toy steam engines A63H 29/16) | 2170/0458 | • . . Moving cylinders for steam engines, e.g. with telescopic cylinder arrangements |
| | | 2170/0464 | • . . Oscillating cylinders for steam engines |
| | | 2170/047 | • . . General arrangements for steam engines |
| | | 2170/0476 | • . . Components or parts for steam engines |
| | | 2170/0482 | • . . with toroidal cylinder space |

- 2170/0488 To-be-deleted with administrative transfer to
parent group
- 2170/0494 with fixed cylinder space
- 2250/00** **Accessories of steam engines; Arrangements or
control devices of piston pumps, compressors
without crank shafts or condensers for so far as
they influence the functioning of the engines**
- 2250/001 . Valves for steam inlet or outlet
- 2250/002 . Valves, brakes, control or safety devices for steam
engines
- 2250/003 . Apparatus for control or receiver or condensor
pressure
- 2250/004 . Devices for draining or idling of steam cylinders or
for uncoupling piston and connecting rod
- 2250/005 . Oil separators for steam engines
- 2250/006 . Arrangement of or controlling of piston pumps or
compressors without crank shaft
- 2250/007 . Condensing devices for steam engines
- 2250/008 . Surface condensers for so far as they influence the
functioning of the engine
- 2250/009 . Condenser pumps for steam engines