

CPC COOPERATIVE PATENT CLASSIFICATION

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

ENGINES OR PUMPS

F01 MACHINES OR ENGINES IN GENERAL (combustion engines [F02](#); machines for liquids [F03](#), [F04](#)); 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.

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}

- 1/08 . with cylinders arranged oppositely relative to main shaft and of "flat" type
- 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](#))
- 1/12 . Separate cylinder-crankcase elements coupled together to form a unit
- 3/00 Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis**
 - 3/0002 . {having stationary cylinders}
 - 3/0005 . . {having two or more sets of cylinders or pistons}
 - 3/0008 . . {having self-acting distribution members, e.g. actuated by working fluid}
 - 3/0011 . . . {Cylindrical distribution members}
 - 3/0014 . . . {Conical distribution members}
 - 3/0017 . . {Component parts, details, e.g. sealings, lubrication}
 - 3/002 . . . {Cylinders}
 - 3/0023 . . . {Actuating or actuated elements}
 - 3/0026 {Actuating or actuated element bearing means or driving or driven axis bearing means}
 - 3/0029 {Casings, housings}
 - 3/0032 . {having rotary cylinder block}
 - 3/0035 . . {having two or more sets of cylinders or pistons}
 - 3/0038 . . . {inclined to main shaft axis}
 - 3/0041 . . {Arrangements for pressing the cylinder barrel against the valve plate, e.g. fluid pressure}
 - 3/0044 . . {Component parts, details, e.g. valves, sealings, lubrication}
 - 3/0047 . . . {Particularities in the contacting area between cylinder barrel and valve plate}
 - 3/005 {Bearing arrangements}
 - 3/0052 {Cylinder barrel}
 - 3/0055 {Valve means, e.g. valve plate}
 - 3/0058 {Cylindrical valve means}
 - 3/0061 {Conical valve means}
 - 3/0064 {Machine housing}
 - 3/0067 {cylinder barrel bearing means}
 - 3/007 . . . {Swash plate}
 - 3/0073 {swash plate bearing means or driving or driven axis bearing means}
 - 3/0076 . . {Connection between cylinder barrel and inclined swash plate}
 - 3/0079 . {having pistons with rotary and reciprocating motion, i.e. spinning pistons}
 - 3/0082 . {Details}
 - 3/0085 . . {Pistons}
 - 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
- 3/10 . Control of working-fluid admission or discharge peculiar thereto ([suitable for more general application F01L](#))
 - 3/101 . . {for machines with stationary cylinders}
 - 3/102 . . . {Changing the piston stroke by changing the position of the swash plate}
 - 3/103 . . . {for machines with rotary cylinder block}
 - 3/104 {by turning the valve plate}
 - 3/105 {by moving the swash plate in a direction perpendicular to the axis of rotation of the cylinder barrel}
 - 3/106 {by changing the inclination of the swash plate}
 - 3/107 {using wedges}
 - 3/108 {by turning the swash plate (with fixed inclination)}
 - 3/109 {by changing the inclination of the axis of the cylinder barrel relative to the swash plate ([F01B 3/106 takes precedence](#))}
- 5/00 Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis**
 - 5/003 . {the connection of the pistons with an actuated or actuating element being at the outer ends of the cylinders}
 - 5/006 . {the connection of the pistons with an actuated or actuating element being at the inner ends of the cylinders}
- 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](#))**
 - 7/02 . with oppositely reciprocating pistons
 - 7/04 . . acting on same main shaft
 - 7/06 . . . using only connecting-rods for conversion of reciprocatory into rotary motion or *vice versa*
 - 7/08 with side rods
 - 7/10 having piston-rod of one piston passed through other piston
 - 7/12 . . . using rockers and connecting-rods
 - 7/14 . . acting on different main shafts
 - 7/16 . with pistons synchronously moving in tandem arrangement
 - 7/18 . with differential piston ([F01B 7/20 takes precedence](#))
 - 7/20 . with two or more pistons reciprocating one within another, e.g. one piston forming cylinder of the other
- 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](#))**
 - 9/02 . with crankshaft
 - 9/023 . . {of Bourke-type or Scotch yoke}
 - 9/026 . . {Rigid connections between piston and rod; Oscillating pistons}
 - 9/04 . with rotary main shaft other than crankshaft
 - 9/042 . . {the connections comprising gear transmissions}
- 2009/045 . . . {Planetary gearings}
 - 9/047 . . {with rack and pinion}
 - 9/06 . . the piston motion being transmitted by curved surfaces

- 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

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
		2170/0423	• . . Single acting steam engines with 1, 2 or 3 cylinders
29/00	Machines or engines with pertinent characteristics other than those provided for in preceding main groups	2170/0429	• . . Double acting high pressure machines
29/02	• Atmospheric engines, i.e. atmosphere acting against vacuum	2170/0435	• . . Compound machines with double or plural expansion; Auxiliaries driven by main engine
29/04	• characterised by means for converting from one type to a different one	2170/0441	• . . Compound engines with monolytic pistons in same cylinder
29/06	• . from steam engine into combustion engine	2170/0447	• . . Machines with more than one piston in a cylinder and with counter moving pistons
29/08	• Reciprocating-piston machines or engines not otherwise provided for	2170/0452	• . . Engines without connecting rods
29/10	• . Engines (refrigeration machines F25B)	2170/0458	• . . Moving cylinders for steam engines, e.g. with telescopic cylinder arrangements
29/12	• . . Steam engines (toy steam engines A63H 29/16)	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