

# 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.

<b>1/00</b>	<b>Reciprocating-piston machines or engines characterised by number or relative disposition of cylinders or by being built-up from separate cylinder-crankcase elements (<a href="#">F01B 3/00</a>, <a href="#">F01B 5/00</a> take precedence)</b>	<b>1/0641</b>	. . {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 ( <a href="#">in general F01B 31/24</a> )}
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	3/10	• Control of working-fluid admission or discharge peculiar thereto ( <a href="#">suitable for more general application F01L</a> )
1/10	• with more than one main shaft, e.g. coupled to common output shaft ( <a href="#">combinations of two or more machines or engines F01B 21/00</a> )	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}
<b>3/00</b>	<b>Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis</b>	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 ( <a href="#">F01B 3/106 takes precedence</a> )}
3/002	• . . . {Cylinders}	<b>5/00</b>	<b>Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis</b>
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}	<b>7/00</b>	<b>Machines or engines with two or more pistons reciprocating within same cylinder or within essentially coaxial cylinders (<a href="#">in opposite arrangement relative to main shaft F01B 1/08</a>)</b>
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 ( <a href="#">F01B 7/20 takes precedence</a> )
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}	<b>9/00</b>	<b>Reciprocating-piston machines or engines characterised by connections between pistons and main shafts and not specific to preceding groups (<a href="#">connections disengageable during idling F01B 31/24</a>)</b>
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

23/06	• Adaptations for driving, or combinations with, hand-held tools or the like	31/00	<b>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)</b>
23/08	• Adaptations for driving, or combinations with, pumps	31/005	• { <a href="#">Silencing equipment</a> (silencing for steam engines <a href="#">F01B 31/16</a> )}
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 ( <a href="#">compensation of inertial forces, suppression of vibration in systems F16F</a> )
<b>25/00</b>	<b>Regulating, controlling, or safety means (<a href="#">regulating or controlling in general G05</a>)</b>	31/06	• Means for compensating relative expansion of component parts
	<b>NOTE</b>	31/08	• Cooling of steam engines ( <a href="#">cooling of fluid machines or engines in general F01P</a> ); Heating; Heat insulation ( <a href="#">heat insulation in general F16L 59/00</a> )
	in this group the following indexing codes are used:	31/10	• Lubricating arrangements of steam engines ( <a href="#">of fluid machines or engines in general F01M</a> )
	<a href="#">F01B 2250/001</a> - <a href="#">F01B 2250/009</a>	31/12	• Arrangements of measuring or indicating devices ( <a href="#">warning apparatus F01B 25/26; measuring instruments or the like per se G01</a> )
25/02	• Regulating or controlling by varying working-fluid admission or exhaust, e.g. by varying pressure or quantity ( <a href="#">distributing or expansion valve gear F01L</a> )	31/14	• Changing of compression ratio
25/04	• . Sensing elements	31/16	• Silencers specially adapted for steam engines ( <a href="#">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</a> )
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 ( <a href="#">valves in general F16K</a> )	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 ( <a href="#">sensing elements alone F01B 25/04; final actuators alone F01B 25/08</a> )	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 ( <a href="#">against water hammer or the like in steam engines F01B 31/34</a> )	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 ( <a href="#">steam traps F16T</a> )
25/24	• . thereby regenerating energy	31/36	• . . automatically cutting-off steam supply
25/26	• Warning devices		
<b>27/00</b>	<b>Starting of machines or engines (<a href="#">starting combustion engines F02N</a>)</b>	<b>2170/00</b>	<b>Steam engines, e.g. for locomotives or ships</b>
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 ( <a href="#">turning-gear in general F16H</a> )	2170/0417	• . . for locomobiles driven by small motors
<b>29/00</b>	<b>Machines or engines with pertinent characteristics other than those provided for in preceding main groups</b>	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 ( <a href="#">refrigeration machines F25B</a> )	2170/0452	• . . Engines without connecting rods
29/12	• . . Steam engines ( <a href="#">toy steam engines A63H 29/16</a> )	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