SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

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; combustion engines F02; internal-combustion aspects of reciprocating-piston engines F02B 57/00, F02B 59/00; machines for liquids F03, F04; 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)

Note(s)

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 Notes preceding class F01, especially as regards the definitions of "steam" and "special vapour".

Subclass index

MACHINES OR ENGINES
With reciprocating pistons characterised by
number or relative disposition of cylinders....1/00
disposition of cylinder axes relative to main shaft....3/00, 5/00
pistons reciprocating in same or coaxial cylinders; piston-main-shaft connections other than covered above....7/00, 1/08, 9/00
no rotary main shaft....11/00
rotary or other movement of cylinders....13/00, 15/00
uniflow principle....17/00
With positive displacement of flexible-wall type....19/00
COMBINATIONS OR ADAPTATIONS OF MACHINES OR ENGINES....21/00, 23/00
REGULATING, CONTROLLING, SAFETY MEANS; STARTING....25/00, 27/00
OTHER CHARACTERISTICS; DETAILS, ACCESSORIES....29/00, 31/00

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, 2, 2006.01]**

1/01 • with one single cylinder **[2, 2006.01]**

1/02 • with cylinders all in one line **[1, 2006.01]**

1/04 • with cylinders in V-arrangement **[1, 2006.01]**

1/06 • with cylinders in star or fan arrangement **[1, 2006.01]**

1/08 • with cylinders arranged oppositely relative to main shaft and of "flat" type **[1, 2006.01]**

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, 2006.01]**

1/12 • Separate cylinder-crankcase elements coupled together to form a unit **[1, 2006.01]**

3/00 Reciprocating-piston machines or engines with cylinder axes coaxial with, or parallel or inclined to, main shaft axis [1, 2006.01]

3/02 • with wobble-plate **[1, 2006.01]**

3/04 • the piston motion being transmitted by curved surfaces **[1, 2006.01]**

3/06 • • by multi-turn helical surfaces and automatic reversal **[1, 2006.01]**

3/08 • • • the helices being arranged on the pistons **[1, 2006.01]**

3/10 • Control of working-fluid admission or discharge peculiar thereto (suitable for more general application F01L) **[1, 2006.01]**

5/00 Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis [1, 2006.01]

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) **[1, 2006.01]**

7/02 • with oppositely reciprocating pistons **[1, 2006.01]**

7/04 • • acting on same main shaft **[1, 2006.01]**

7/06 • • • using only connecting-rods for conversion of reciprocatory into rotary motion or vice versa **[1, 2006.01]**
7/08 • • • • with side rods **[1, 2006.01]**
7/10 • • • • having piston-rod of one piston passed through other piston **[1, 2006.01]**
7/12 • • • using rockers and connecting-rods **[1, 2006.01]**
7/14 • • acting on different main shafts **[1, 2006.01]**
7/16 • with pistons synchronously moving in tandem arrangement **[1, 2006.01]**
7/18 • with differential piston (F01B 7/20 takes precedence) **[1, 2006.01]**
7/20 • with two or more pistons reciprocating one within another, e.g. one piston forming cylinder of the other **[1, 2006.01]**

9/00 Reciprocating-piston machines or engines characterised by connections between pistons and main shafts and not specific to groups F01B 1/00-F01B 7/00 (connections disengageable during idling F01B 31/24) **[1, 2006.01]**
9/02 • with crankshaft **[1, 2006.01]**
9/04 • with rotary main shaft other than crankshaft **[1, 2006.01]**
9/06 • • the piston motion being transmitted by curved surfaces **[1, 2006.01]**
9/08 • • with ratchet and pawl **[1, 2006.01]**

11/00 Reciprocating-piston machines or engines without rotary main shaft, e.g. of free-piston type [1, 2006.01]
11/02 • Equalising or cushioning devices **[1, 2006.01]**
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) **[1, 2006.01]**
11/06 • • for generating vibration only **[1, 2006.01]**
11/08 • with direct fluid transmission link (F01B 11/02 takes precedence) **[1, 2006.01]**

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) **[1, 2, 2006.01]**
13/02 • with one cylinder only **[1, 2006.01]**
13/04 • with more than one cylinder **[1, 2006.01]**
13/06 • • in star arrangement **[1, 2006.01]**

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) **[1, 2006.01]**
15/02 • with reciprocating cylinders (with one piston within another F01B 7/20) **[1, 2006.01]**
15/04 • with oscillating cylinder **[1, 2006.01]**
15/06 • • Control of working-fluid admission or discharge peculiar thereto **[1, 2006.01]**

17/00 Reciprocating-piston machines or engines characterised by use of uniflow principle [1, 2006.01]
17/02 • Engines **[1, 2006.01]**
17/04 • • Steam engines **[1, 2006.01]**

19/00 Positive-displacement machines or engines of flexible-wall type [1, 2006.01]
19/02 • with plate-like flexible members **[1, 2006.01]**
19/04 • with tubular flexible members **[1, 2006.01]**

21/00 Combinations of two or more machines or engines (F01B 23/00 takes precedence; combinations of two or more pumps F04; fluid gearing F16H; regulating or controlling, see the relevant groups) **[1, 2006.01]**
21/02 • the machines or engines being all of reciprocating-piston type **[1, 2006.01]**
21/04 • the machines or engines being not all of reciprocating-piston type, e.g. of reciprocating steam engine with steam turbine **[1, 2006.01]**

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) **[1, 2006.01]**
23/02 • Adaptations for driving vehicles, e.g. locomotives (arrangements in vehicles, see the relevant classes for vehicles) **[1, 2006.01]**
23/04 • • the vehicles being waterborne vessels **[1, 2006.01]**
23/06 • Adaptations for driving, or combinations with, hand-held tools or the like **[1, 2006.01]**
23/08 • Adaptations for driving, or combinations with, pumps **[1, 2006.01]**
23/10 • Adaptations for driving, or combinations with, electric generators **[1, 2006.01]**
23/12 • Adaptations for driving rolling mills or other heavy reversing machinery **[1, 2006.01]**

25/00 Regulating, controlling, or safety means (regulating or controlling in general G05) **[1, 2006.01]**
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) **[1, 2006.01]**
25/04 • • Sensing elements **[1, 2006.01]**
25/06 • • • responsive to speed **[1, 2006.01]**
25/08 • • Final actuators **[1, 2006.01]**
25/10 • • • Arrangements or adaptations of working-fluid admission or discharge valves (valves in general F16K) **[1, 2006.01]**
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) **[1, 2006.01]**
25/14 • • peculiar to particular kinds of machines or engines **[1, 2006.01]**
25/16 • Safety means responsive to specific conditions (against water hammer or the like in steam engines F01B 31/34) **[1, 2006.01]**
25/18 • • preventing rotation in wrong direction **[1, 2006.01]**
25/20 • Checking operation of safety devices **[1, 2006.01]**
25/22 • Braking by redirecting working fluid **[1, 2006.01]**
25/24 • • thereby regenerating energy **[1, 2006.01]**
25/26 • Warning devices **[1, 2006.01]**

27/00 Starting of machines or engines (starting combustion engines F02N) **[1, 2006.01]**
27/02 • of reciprocating-piston engines **[1, 2006.01]**
27/04 • • by directing working-fluid supply, e.g. by aid of by-pass steam conduits **[1, 2006.01]**
27/06 • • • specially for compound engines **[1, 2006.01]**
27/08 • • Means for moving crank off dead-centre (turning-gear in general F16H) **[1, 2006.01]**

29/00 Machines or engines with pertinent characteristics other than those provided for in main groups F01B 1/00-F01B 27/00 [1, 2006.01]

29/02 • Atmospheric engines, i.e. atmosphere acting against vacuum **[1, 2006.01]**

29/04 • characterised by means for converting from one type to a different one **[1, 2006.01]**

29/06 • • from steam engine into combustion engine **[1, 2006.01]**

29/08 • Reciprocating-piston machines or engines not otherwise provided for **[1, 2006.01]**

29/10 • • Engines (refrigeration machines F25B) **[1, 2006.01]**

29/12 • • • Steam engines (toy steam engines A63H 25/00) **[1, 2006.01]**

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) **[1, 2006.01]**

31/02 • De-icing means for engines having icing phenomena **[1, 2006.01]**

31/04 • Means for equalising torque in reciprocating-piston machines or engines (compensation of inertial forces, suppression of vibration in systems F16F) **[1, 2006.01]**

31/06 • Means for compensating relative expansion of component parts **[1, 2006.01]**

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) **[1, 2006.01]**

31/10 • Lubricating arrangements of steam engines (of fluid machines or engines in general F01M) **[1, 2006.01]**

31/12 • Arrangements of measuring or indicating devices (warning apparatus F01B 25/26; measuring instruments or the like per se G01) **[1, 2006.01]**

31/14 • Changing of compression ratio **[1, 2006.01]**

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) **[1, 2006.01]**

31/18 • Draining **[1, 2006.01]**

31/20 • • of cylinders **[1, 2006.01]**

31/22 • Idling devices, e.g. having by-passing valves **[1, 2006.01]**

31/24 • • Disengagement of connections between pistons and main shafts **[1, 2006.01]**

31/26 • Other component parts, details, or accessories, peculiar to steam engines **[1, 2006.01]**

31/28 • • Cylinders or cylinder covers **[1, 2006.01]**

31/30 • • Arrangements of steam conduits **[1, 2006.01]**

31/32 • • Arrangements or adaptations of vacuum breakers **[1, 2006.01]**

31/34 • • Safety means against water hammer or against the penetration of water (steam traps F16T) **[1, 2006.01]**

31/36 • • • automatically cutting-off steam supply **[1, 2006.01]**