

## 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)

- 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.
- 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) [2]

- 1/01 • with one single cylinder [2]
- 1/02 • with cylinders all in one line
- 1/04 • with cylinders in V-arrangement
- 1/06 • with cylinders in star or fan arrangement
- 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**

- 3/02 • with wobble-plate

- 3/04 • the piston motion being transmitted by curved surfaces
- 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)

**5/00 Reciprocating-piston machines or engines with cylinder axes arranged substantially tangentially to a circle centred on main shaft axis**

**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

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- 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 groups F01B 1/00-F01B 7/00 (connections disengageable during idling F01B 31/24)**
- 9/02 • with crankshaft
- 9/04 • with rotary main shaft other than crankshaft
- 9/06 • • the piston motion being transmitted by curved surfaces
- 9/08 • • with ratchet and pawl
  
- 11/00 Reciprocating-piston machines or engines without rotary main shaft, e.g. of free-piston type**
- 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) [2]**
- 13/02 • with one cylinder only
- 13/04 • with more than one cylinder
- 13/06 • • in star arrangement
  
- 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)**
- 15/02 • 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
  
- 17/00 Reciprocating-piston machines or engines characterised by use of uniflow principle**
- 17/02 • Engines
- 17/04 • • Steam engines
  
- 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; combinations of two or more pumps F04; fluid gearing F16H; regulating or controlling, see the relevant groups)**
- 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
- 23/08 • Adaptations for driving, or combinations with, pumps
- 23/10 • Adaptations for driving, or combinations with, electric generators
- 23/12 • Adaptations for driving rolling mills or other heavy reversing machinery
  
- 25/00 Regulating, controlling, or safety means (regulating or controlling in general G05)**
- 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)
- 25/04 • • Sensing elements
- 25/06 • • • responsive to speed
- 25/08 • • Final actuators
- 25/10 • • • Arrangements or adaptations of working-fluid admission or discharge valves (valves in general F16K)
- 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)
- 25/14 • • peculiar to particular kinds of machines or engines
- 25/16 • Safety means responsive to specific conditions (against water hammer or the like in steam engines F01B 31/34)
- 25/18 • • preventing rotation in wrong direction
- 25/20 • Checking operation of safety devices
- 25/22 • Braking by redirecting working fluid
- 25/24 • • thereby regenerating energy
- 25/26 • Warning devices
  
- 27/00 Starting of machines or engines (starting combustion engines F02N)**
- 27/02 • of reciprocating-piston engines
- 27/04 • • by directing working-fluid supply, e.g. by aid of by-pass steam conduits
- 27/06 • • • specially for compound engines
- 27/08 • • Means for moving crank off dead-centre (turning-gear in general F16H)
  
- 29/00 Machines or engines with pertinent characteristics other than those provided for in main groups F01B 1/00-F01B 27/00**
- 29/02 • Atmospheric engines, i.e. atmosphere acting against vacuum
- 29/04 • characterised by means for converting from one type to a different one
- 29/06 • • from steam engine into combustion engine
- 29/08 • Reciprocating-piston machines or engines not otherwise provided for
- 29/10 • • Engines (refrigeration machines F25B)

- 29/12 • • • Steam engines (toy steam engines A63H 25/00)
- 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)
  - 31/02 • De-icing means for engines having icing phenomena
  - 31/04 • Means for equalising torque in reciprocating-piston machines or engines (compensation of inertial forces, suppression of vibration in systems F16F)
  - 31/06 • Means for compensating relative expansion of component parts
  - 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)
  - 31/10 • Lubricating arrangements of steam engines (of fluid machines or engines in general F01M)
  - 31/12 • Arrangements of measuring or indicating devices (warning apparatus F01B 25/26; measuring instruments or the like per se G01)
- 31/14 • Changing of compression ratio
- 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)
- 31/18 • Draining
  - 31/20 • • of cylinders
  - 31/22 • Idling devices, e.g. having by-passing valves
  - 31/24 • • Disengagement of connections between pistons and main shafts
- 31/26 • Other component parts, details, or accessories, peculiar to steam engines
  - 31/28 • • Cylinders or cylinder covers
  - 31/30 • • Arrangements of steam conduits
  - 31/32 • • Arrangements or adaptations of vacuum breakers
  - 31/34 • • Safety means against water hammer or against the penetration of water (steam traps F16T)
  - 31/36 • • • automatically cutting-off steam supply