

# International Patent Classification

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Section F

Mechanical engineering; Lighting;  
Heating; Weapons; Blasting



World Intellectual Property Organization

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## SECTION F – MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

### ENGINES OR PUMPS

<b>F01</b>	<b>MACHINES OR ENGINES IN GENERAL; ENGINE PLANTS IN GENERAL; STEAM ENGINES .....</b>	<b>7</b>
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## **WEAPONS; BLASTING**

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## SECTION F - MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

### ENGINES OR PUMPS

#### Guide to the use of this subsection (classes F01 to F04)

The following notes are meant to assist in the use of this part of the classification scheme.

- (1) In this subsection, subclasses or groups designating “engines” or “pumps” cover methods of operating the same, unless otherwise specifically provided for.
- (2) In this subsection, the following terms or expressions are used with the meanings indicated:
  - “engine” means a device for continuously converting fluid energy into mechanical power. Thus, this term includes, for example, steam piston engines or steam turbines, per se, or internal-combustion piston engines, but it excludes single-stroke devices. “Engine” also includes the fluid-motive portion of a meter unless such portion is particularly adapted for use in a meter;
  - “pump” means a device for continuously raising, forcing, compressing, or exhausting fluid by mechanical or other means. Thus, this term includes fans or blowers;
  - “machine” means a device which could equally be an engine and a pump, and not a device which is restricted to an engine or one which is restricted to a pump;
  - “positive displacement” means the way the energy of a working fluid is transformed into mechanical energy, in which variations of volume created by the working fluid in a working chamber produce equivalent displacements of the mechanical member transmitting the energy, the dynamic effect of the fluid being of minor importance, and vice versa;
  - “non-positive displacement” means the way the energy of a working fluid is transformed into mechanical energy, by transformation of the energy of the working fluid into kinetic energy, and vice versa;
  - “oscillating-piston machine” means a positive-displacement machine in which a fluid-engaging work-transmitting member oscillates. This definition applies also to engines and pumps;
  - “rotary-piston machine” means a positive-displacement machine in which a fluid-engaging work-transmitting member rotates about a fixed axis or about an axis moving along a circular or similar orbit. This definition applies also to engines and pumps;
  - “rotary piston” means the work-transmitting member of a rotary-piston machine and may be of any suitable form, e.g., like a toothed gear;
  - “cooperating members” means the “oscillating piston” or “rotary piston” and another member, e.g., the working-chamber wall, which assists in the driving or pumping action;
  - “movement of the co-operating members” is to be interpreted as relative, so that one of the “co-operating members” may be stationary, even though reference may be made to its rotational axis, or both may move;
  - “teeth or tooth equivalents” include lobes, projections or abutments;
  - “internal-axis type” means that the rotational axes of the inner and outer co-operating members remain at all times within the outer member, e.g., in a similar manner to that of a pinion meshing with the internal teeth of a ring gear;
  - “free piston” means a piston of which the length of stroke is not defined by any member driven thereby;
  - “cylinders” means positive-displacement working chambers in general. Thus, this term is not restricted to cylinders of circular cross-section;
  - “main shaft” means the shaft which converts reciprocating piston motion into rotary motion or vice versa;
  - “plant” means an engine together with such additional apparatus as is necessary to run the engine. For example, a steam engine plant includes a steam engine and means for generating the steam;
  - “working fluid” means the driven fluid in a pump and the driving fluid in an engine. The working fluid may be in a gaseous state, i.e., compressible, or liquid. In the former case coexistence of two states is possible;
  - “steam” includes condensable vapours in general, and “special vapour” is used when steam is excluded;
  - “reaction type” as applied to non-positive-displacement machines or engines means machines or engines in which pressure/velocity transformation takes place wholly or partly in the rotor. Machines or engines with no, or only slight, pressure/velocity transformation in the rotor are called “impulse type”.
- (3) In this subsection:
  - cyclically operating valves, lubricating, gas-flow silencers or exhaust apparatus, or cooling are classified in subclasses F01L, F01M, F01N, F01P irrespective of their stated application, unless their classifying features are peculiar to their application, in which case they are classified only in the relevant subclass of classes F01 to F04;
  - lubricating, gas-flow silencers or exhaust apparatus, or cooling of machines or engines are classified in subclasses F01M, F01N, F01P except for those peculiar to steam engines which are classified in subclass F01B.
- (4) For use of this subsection with a good understanding, it is essential to remember, so far as subclasses F01B, F01C, F01D, F03B, and F04B, F04C, F04D, which form its skeleton, are concerned:
  - the principle which resides in their elaboration,
  - the classifying characteristics which they call for, and
  - their complementarity.
  - (i) Principle  
This concerns essentially the subclasses listed above. Other subclasses, notably those of class F02, which cover better-defined matter, are not considered here.

Each subclass covers fundamentally a genus of apparatus (engine or pump) and by extension covers equally “machines” of the same kind. Two different subjects, one having a more general character than the other, are thus covered by the same subclass.

Subclasses F01B, F03B, F04B, beyond the two subjects which they cover, have further a character of generality in relation to other subclasses concerning the different species of apparatus in the genus concerned.

This generality applies as well for the two subjects dealt with, without these always being in relation to the same subclasses. Thus, subclass F03B, in its part dealing with “machines”, should be considered as being the general class relating to subclasses F04B, F04C, and in its part dealing with “engines” as being general in relation to subclass F03C.

(ii) Characteristics

- (a) The principal classifying characteristic of the subclass is that of genera of apparatus, of which there are three possible: Machines; engines; pumps.
- (b) As stated above, “machines” are always associated with one of the other two genera. These main genera are subdivided according to the general principles of operation of the apparatus: Positive displacement; non-positive displacement.
- (c) The positive displacement apparatus are further subdivided according to the ways of putting into effect the principle of operation, that is, to the kind of apparatus: Simple reciprocating piston; rotary or oscillating piston; other kind.
- (d) Another classifying characteristic is that of the working fluid, in respect of which three kinds of apparatus are possible, namely: Liquid and elastic fluid; elastic fluid; liquid.

(iii) Complementarity

This resides in association of pairs of the subclasses listed above, according to the characteristics under consideration in respect of kind of apparatus or working fluid.

The subclasses concerned with the various principles, characteristics and complementarity are shown in the subsection index below.

It is seen from this index that:

- For the same kind of apparatus in a given genus, the characteristics of “working fluid” associates:  
F01B and F04B to Machines  
F01C and F04C to Machines  
F01D and F03B to Machines  
F01B and F03C to Engines  
F01C and F03C to Engines  
F01D and F03B to Engines
- For the same kind of working fluid, the “apparatus” characteristic relates subclasses in the same way as considerations of relative generality.

**Subsection index**

**MACHINES**

positive displacement  
     rotary or oscillating piston  
         liquid and elastic fluid or  
         elastic fluid .....F01C  
         liquid only .....F04C  
     reciprocating piston or other  
         liquid and elastic fluid or  
         elastic fluid .....F01B  
         liquid only .....F04B  
 non-positive displacement  
     liquid and elastic fluid or  
     elastic fluid ..... F01D  
     liquid only .....F03B

**ENGINES**

positive displacement  
     rotary or oscillating piston  
         liquid and elastic fluid or  
         elastic fluid .....F01C

liquid only ..... F03C  
 reciprocating piston or other  
     liquid and elastic fluid or  
     elastic fluid ..... F01B  
     liquid only ..... F03C  
 non-positive displacement  
     liquid and elastic fluid or  
     elastic fluid ..... F01D  
     liquid only ..... F03B

**PUMPS**

positive displacement  
     rotary or oscillating piston ..... F04C  
     reciprocating piston or other ..... F04B  
 non-positive displacement ..... F04D

**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; gears for interconverting rotary motion and reciprocating motion in general F16H; pistons, piston-rods, cylinders, for engines in general F16J)

- (1) This subclass covers, with the exception of the matter provided for in subclasses F01C to 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, 1/00; 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]

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

**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 1/00)

**9/00 Reciprocating-piston machines or engines characterised by connections between pistons and main shafts and not specific to groups F01B 1/00 to F01B 7/00** (connections disengageable during idling F01B 31/00)

**11/00 Reciprocating-piston machines or engines without rotary main shaft, e.g. of free-piston type** (engines combined with pumps F01B 23/00)

**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]

**15/00 Reciprocating-piston machines or engines with movable cylinders other than provided for in group F01B 13/00** (with one piston within another F01B 7/00; with movable cylinder sleeves for working-fluid control F01L)

**17/00 Reciprocating-piston machines or engines characterised by use of uniflow principle**

**19/00 Positive-displacement machines or engines of flexible-wall type**

**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)

**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)

**25/00 Regulating, controlling, or safety means** (safety means against water hammer or the like in steam engines F01B 31/00; regulating or controlling in general G05)

**27/00 Starting of machines or engines** (starting combustion engines F02N)

**29/00 Machines or engines with pertinent characteristics other than those provided for in main groups F01B 1/00 to F01B 27/00** (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)



**F01C ROTARY-PISTON OR OSCILLATING-PISTON MACHINES OR ENGINES** (internal-combustion aspects F02B 53/00, F02B 55/00)

- (1) This subclass covers:
- rotary-piston or oscillating-piston engines for elastic fluids, e.g. steam;
  - rotary-piston or oscillating-piston engines for liquids and elastic fluids;
  - rotary-piston or oscillating-piston machines for elastic fluids;
  - rotary-piston or oscillating-piston machines for liquids and elastic fluids.
- (2) In this subclass, the following expression is used with the meaning indicated:
- “rotary-piston machine” includes the German expressions “Drehkolbenmaschinen”, “Kreiskolbenmaschinen”, and “Umlaufkolbenmaschinen”.
- (3) Attention is drawn to the Notes preceding class F01, especially as regards the definitions of “rotary-piston machine”, “oscillating-piston machine”, “rotary piston”, “co-operating members”, “movement of co-operating members”, “teeth or tooth-equivalents” and “internal-axis”.

**Subclass index**

MACHINES OR ENGINES	COMBINATIONS OR ADAPTATIONS OF
With rotary pistons..... 1/00 to 7/00	MACHINES OR ENGINES..... 11/00, 13/00
With oscillating pistons ..... 9/00	DRIVE OF CO-OPERATING MEMBERS;
Control; monitoring; safety	SEALING ARRANGEMENTS ..... 17/00; 19/00
arrangements ..... 20/00	OTHER DETAILS OR ACCESSORIES ..... 21/00

<b>1/00 Rotary-piston machines or engines</b> (with axes of co-operating members non-parallel F01C 3/00; with the working-chamber walls at least partly resiliently deformable F01C 5/00; with fluid ring or the like F01C 7/00; rotary-piston machines or engines in which the working fluid is exclusively displaced by, or exclusively displaces, one or more reciprocating pistons F01B 13/00)	<b>11/00 Combinations of two or more machines or engines, each being of rotary-piston or oscillating-piston type</b> (F01C 13/00 takes precedence; combinations of two or more pumps F04; fluid gearing F16H)
<b>3/00 Rotary-piston machines or engines with non-parallel axes of movement of co-operating members</b> (with the working-chamber walls being at least partly resiliently deformable F01C 5/00)	<b>13/00 Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby</b> (aspects predominantly concerning driven devices, <u>see</u> the relevant classes for these devices)
<b>5/00 Rotary-piston machines or engines with the working-chamber walls at least partly resiliently deformable</b>	<b>17/00 Arrangements for drive of co-operating members, e.g. for rotary piston and casing</b>
<b>7/00 Rotary-piston machines or engines with fluid ring or the like</b>	<b>19/00 Sealing arrangements in rotary-piston machines or engines</b> (sealings in general F16J)
<b>9/00 Oscillating-piston machines or engines</b>	<b>20/00 Control of, monitoring of, or safety arrangements for, machines or engines [8]</b>
	<b>21/00 Component parts, details, or accessories, not provided for in groups F01C 1/00 to F01C 20/00</b>

**F01D NON-POSITIVE-DISPLACEMENT MACHINES OR ENGINES, E.G. STEAM TURBINES** (machines or engines for liquids F03; non-positive-displacement pumps F04D)

- (1) This subclass covers:
- non-positive-displacement engines for elastic fluids, e.g. steam turbines;
  - non-positive-displacement engines for liquids and elastic fluids;
  - non-positive-displacement machines for elastic fluids;
  - non-positive-displacement machines for liquids and elastic fluids.
- (2) Attention is drawn to the Notes preceding class F01, especially as regards the definitions of “reaction type”, e.g. with airfoil-like blades, and “impulse type”, e.g. bucket turbines.

**Subclass index**NON-POSITIVE-DISPLACEMENT  
MACHINES OR ENGINES

- General characteristics; with axial-thrust balancing; with other than pure rotation..... 1/00; 3/00; 23/00
- Component parts
- blades and carrying members, protection thereof; rotors with adjustable blades; stators ..... 5/00; 7/00; 9/00

means against internal leakage ..... 11/00

- COMBINATIONS OR ADAPTATIONS OF MACHINES OR ENGINES ..... 13/00, 15/00
- REGULATION, CONTROLLING, SAFETY MEANS ..... 17/00, 19/00, 21/00
- STARTING; SHUTTING-DOWN..... 19/00; 21/00
- OTHER DETAILS AND ACCESSORIES ..... 25/00

- 1/00 Non-positive-displacement machines or engines, e.g. steam turbines** (with working-fluid flows in opposite axial directions for balancing axial thrust F01D 3/00; with other than pure rotation F01D 23/00; turbines characterised by their use in special steam systems, cycles, or processes, regulating devices therefor F01K)
- 3/00 Machines or engines with axial-thrust balancing effected by working fluid**
- 5/00 Blades; Blade-carrying members** (nozzle boxes F01D 9/02); **Heating, heat-insulating, cooling, or antivibration means on the blades or the members**
- 5/02 . Blade-carrying members, e.g. rotors (rotors of non-bladed type F01D 1/00; stators F01D 9/00)
  - 5/12 . Blades (blade roots F01D 5/00; rotors with blades adjustable in operation F01D 7/00; stator blades F01D 9/02)
  - 5/14 . . Form or construction (selecting particular materials, measures against erosion or corrosion F01D 5/28)
  - 5/18 . . . Hollow blades; Heating, heat-insulating, or cooling means on blades
  - 5/28 . . Selecting particular materials; Measures against erosion or corrosion
- 7/00 Rotors with blades adjustable in operation; Control thereof** (for reversing F01D 1/00)
- 9/00 Stators** (non-fluid guiding aspects of casings, regulating, controlling, or safety aspects, see the relevant groups)
- 9/02 . Nozzles; Nozzle boxes; Stator blades; Guide conduits
  - 9/04 . . forming ring or sector
- 11/00 Preventing or minimising internal leakage of working fluid, e.g. between stages** (sealings in general F16J)
- 11/08 . for sealing space between rotor blade tips and stator (specially-shaped blade tips therefor F01D 5/14)
- 13/00 Combinations of two or more machines or engines** (F01D 15/00 takes precedence; combinations of two or more pumps F04; fluid gearing F16H; regulating or controlling, see the relevant groups)

- 15/00 Adaptations of machines or engines for special use; Combinations of engines with devices driven thereby** (combinations of engines with mechanical gearing driven by multiple engines F01D 13/00; regulating or controlling, see the relevant groups; aspects predominantly concerning driven devices, see the relevant classes for the devices)
- 17/00 Regulating or controlling by varying flow** (for reversing F01D 1/00; by varying rotor blade position F01D 7/00; specially for starting F01D 19/00; shutting-down F01D 21/00; regulating or controlling in general G05)
- 19/00 Starting of machines or engines; Regulating, controlling, or safety means in connection therewith** (warming-up before starting F01D 25/08; turning or inching gear F01D 25/00)
- 21/00 Shutting-down of machines or engines, e.g. in emergency; Regulating, controlling, or safety means not otherwise provided for**
- 23/00 Non-positive-displacement machines or engines with movement other than pure rotation, e.g. of endless-chain type**
- 25/00 Component parts, details, or accessories, not provided for in, or of interest apart from, other groups**
- 25/08 . Cooling (of machines or engines in general F01P); Heating; Heat insulation (of blade-carrying members, of blades F01D 5/00)
  - 25/16 . Arrangement of bearings; Supporting or mounting bearings in casings (bearings per se F16C)
  - 25/24 . Casings (modified for heating or cooling F01D 25/08); Casing parts, e.g. diaphragms, casing fastenings (casings for rotary machines or engines in general F16M)
  - 25/28 . Supporting or mounting arrangements, e.g. for turbine casing

**F01K STEAM ENGINE PLANTS; STEAM ACCUMULATORS; ENGINE PLANTS NOT OTHERWISE PROVIDED FOR; ENGINES USING SPECIAL WORKING FLUIDS OR CYCLES** (gas-turbine or jet-propulsion plants F02; steam generation F22; nuclear power plants, engine arrangements therein G21D)

### Note

Attention is drawn to the Notes preceding class F01, especially as regards the definitions of “steam” and “special vapour”.

### Subclass index

#### STEAM ENGINE PLANTS

Characterised by the use of  
 accumulators or heaters;  
 storing means in alkali;  
 specific types of engines ..... 3/00; 5/00;  
 7/00  
 special steam systems, cycles,  
 or processes ..... 7/00  
 Characterised by the disposition of  
 condenser; structural  
 combination of engine and  
 boiler or condenser ..... 9/00; 11/00  
 Not otherwise provided for ..... 21/00  
 General layout or operation;  
 adaptations for special use ..... 13/00; 15/00

#### Utilisation of steam

for feed-water heating; in the  
 regeneration or other treating;  
 for other purposes ..... 7/00; 19/00;  
 17/00

#### ENGINE PLANTS NOT RESTRICTED TO STEAM UTILISATION

With several engines driven by  
 different fluids ..... 23/00  
 Not otherwise provided for, other  
 types with special working fluids or  
 working with enclosed cycles ..... 25/00, 27/00

#### STEAM ACCUMULATORS ..... 1/00

#### SPECIAL TYPES OF ENGINES

Steam engines ..... 7/00  
 Other than steam ..... 25/00

**1/00 Steam accumulators** (use of accumulators in steam engine plants F01K 3/00)

**15/00 Adaptations of steam engine plants for special use**

**17/00 Use of steam or condensate extracted or exhausted from steam engine plant** (for heating feed-water F01K 7/00; returning condensate to boiler F22D)

### Steam engine plants

**3/00 Plants characterised by the use of steam or heat accumulators, or intermediate steam heaters, therein** (regenerating exhaust steam F01K 19/00)

**19/00 Regenerating or otherwise treating steam exhaust from steam engine plant** (plants characterised by use of means for storing steam in an alkali to increase steam pressure F01K 5/00; returning condensate to boiler F22D)

**5/00 Plants characterised by use of means for storing steam in an alkali to increase steam pressure, e.g. of Honigmann or Koenemann type**

**21/00 Steam engine plants not otherwise provided for**

**7/00 Steam engine plants characterised by the use of specific types of engine** (F01K 3/00 takes precedence); **Plants or engines characterised by their use of special steam systems, cycles, or processes** (reciprocating-piston engines using uniflow principle F01B 17/00); **Regulating means peculiar to such systems, cycles, or processes; Use of withdrawn or exhaust steam for feed-water heating**

**23/00 Plants characterised by more than one engine delivering power external to the plant, the engines being driven by different fluids**

23/02 . the engine cycles being thermally coupled

23/06 . . combustion heat from one cycle heating the fluid in another cycle

23/10 . . . with exhaust fluid of one cycle heating the fluid in another cycle

**9/00 Steam engine plants characterised by condensers arranged or modified to co-operate with the engines** (by condensers structurally combined with engines F01K 11/00; steam condensers *per se* F28B)

**25/00 Plants or engines characterised by use of special working fluids, not otherwise provided for; Plants operating in closed cycles and not otherwise provided for** (plants using mixtures of steam and gas F01K 21/00)

**11/00 Steam engine plants characterised by the engines being structurally combined with boilers or condensers**

**27/00 Plants for converting heat or fluid energy into mechanical energy, not otherwise provided for**

**13/00 General layout or general methods of operation, of complete steam engine plants**

**F01L CYCLICALLY OPERATING VALVES FOR MACHINES OR ENGINES** (valves in general F16K)

- (1) Groups F01L 1/00 to F01L 13/00 cover only valve-gear or valve arrangements without provision for variable fluid distribution. **[2009.01]**
- (2) Valve gear or valve arrangements specially adapted for steam engines are covered by groups F01L 15/00 to F01L 35/00. **[2009.01]**
- (3) Valve-gear or valve arrangements specially adapted for machines or engines with variable working-fluid distribution are covered by groups F01L 15/00 to F01L 35/00. **[2009.01]**
- (4) Attention is drawn to the Notes preceding class F01, especially Note (3).
- (5) As regards the above-mentioned Note (3), attention is drawn to F01B 3/00, F01B 15/00, F01C 20/00, F01C 21/00, F02B 53/00, F03C 1/00, F04B 1/12, F04B 7/00, F04B 39/08, F04B 39/10, F04C 14/00, F04C 15/00, F04C 28/00 and F04C 29/12.

**Subclass index**VALVE-GEAR OR VALVE  
ARRANGEMENTS IN GENERAL

General features.....	1/00
Operation	
mechanical .....	1/00
non-mechanical .....	9/00
Lift valves .....	3/00
Slide valves .....	5/00, 7/00
Arrangements in piston or piston-rod .....	11/00
Modified to facilitate engine operations .....	13/00

VALVE-GEAR OR VALVE  
ARRANGEMENTS FOR VARIABLE  
WORKING-FLUID DISTRIBUTION

General features .....	1/00
With slide valves	
surrounding cylinder or piston .....	17/00
with rotary or oscillatory motion; combined .....	33/00; 19/00
other features .....	15/00
With lift valves .....	35/00
Arrangements with particular characteristics; reversing gear .....	21/00 to 27/00; 29/00
Other valve-gear or valve arrangements .....	15/00
Drive, control, or adjustment .....	25/00, 31/00

**Valve-gear or valve arrangements for positive-displacement machines or engines other than steam engines, e.g. for internal-combustion piston engines, without provision for variable fluid distribution**

- 1/00 Valve-gear or valve arrangements, e.g. lift-valve gear** (lift valve and valve seat assemblies *per se* F01L 3/00; slide-valve gear F01L 5/00; actuated non-mechanically F01L 9/00; valve arrangements in working piston or piston-rod F01L 11/00; modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations F01L 13/00)
- 1/02 . Valve drive (transmitting-gear between valve drive and valve F01L 1/12)
- 1/04 . . by means of cams, camshafts, cam discs, eccentrics, or the like (F01L 1/10 takes precedence)
- 1/08 . . . Shape of cams
- 1/10 . . by means of crank- or eccentric-driven rods
- 1/12 . Transmitting-gear between valve drive and valve (simultaneously operating two or more valves F01L 1/26)
- 1/14 . . Tappets; Push-rods
- 1/18 . . Rocking arms or levers
- 1/20 . Adjusting or compensating clearance, i.e. lash adjustment
- 1/26 . characterised by the provision of two or more valves operated simultaneously by same transmitting-gear; peculiar to machines or engines with more than two lift valves per cylinder (with coaxial valves F01L 1/28)

- 1/28 . characterised by the provision of coaxial valves; characterised by the provision of valves co-operating with both intake and exhaust ports
- 1/34 . characterised by the provision of means for changing the timing of the valves without changing the duration of opening
- 1/344 . . changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear [6]
- 3/00 Lift valves, i.e. cut-off apparatus with closure members having at least a component of their opening and closing motion perpendicular to the closing faces; Parts or accessories thereof**
- 3/02 . Selecting particular materials for valve members or valve seats; Valve members or valve seats composed of two or more materials
- 3/10 . Connecting springs to valve members
- 5/00 Slide-valve gear or valve arrangements** (with pure rotary or oscillatory movement F01L 7/00)
- 7/00 Rotary or oscillatory slide-valve gear or valve arrangements** (slide valves with combined rotary and non-rotary movements, combinations of rotary and non-rotary slide valves F01L 5/00)
- 9/00 Valve-gear or valve arrangements actuated non-mechanically**
- 9/04 . by electric means
- 11/00 Valve arrangements in working piston or piston-rod**

- 13/00 Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations**
- 13/02 . for reversing
  - 13/04 . for starting by means of fluid pressure
  - 13/06 . for braking
  - 13/08 . for decompression, e.g. during starting; for changing compression ratio

**Valve-gear or valve arrangements specially adapted for steam engines, or specially adapted for other positive-displacement machines or engines with variable working-fluid distribution**

- (1) Groups F01L 15/00 to F01L 31/00 cover:
    - valve drive or means external to valves for adjustment during operation;
    - tripping-gear;
    - reversing-gear;
    - use of pistons or piston-rods as valves or as valve-supporting elements;
    - valve-gear or valve arrangements peculiar to free-piston machines or engines.
  - (2) Groups F01L 15/00 to F01L 31/00 do not fully cover subject matter restricted to rotary, oscillatory, or lift-valve gear or valve arrangements, which is covered by group F01L 33/00 or F01L 35/00.
- 15/00 Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, other than provided for in groups F01L 17/00 to F01L 29/00** (valve drive or external valve-adjustment during operation, see the relevant groups, e.g. F01L 31/00; tripping-gear or tripping of valves F01L 31/00)
- 17/00 Slide-valve gear or valve arrangements with cylindrical, sleeve, or part-annularly-shaped valves surrounding working cylinder or piston**
- 19/00 Slide-valve gear or valve arrangements with reciprocatory and other movement of same valve, other than provided for in group F01L 17/00, e.g. longitudinally and in cross direction of working cylinder**

- 21/00 Use of working pistons or piston-rods as fluid-distributing valves or as valve-supporting elements, e.g. in free-piston machines**
- 23/00 Valves controlled by impact of piston, e.g. in free-piston machines**
- 25/00 Drive, or adjustment during operation, of distribution or expansion valves by non-mechanical means**
- 27/00 Distribution or expansion-valve gear peculiar to free-piston machines or engines and not provided for in groups F01L 21/00 to F01L 25/00**
- 29/00 Reversing-gear** (equally usable for control of degree of working fluid admission, and reversing being of secondary importance F01L 31/00)
- 31/00 Valve drive, valve adjustment during operation, or other valve control, not provided for in groups F01L 15/00 to F01L 29/00** (sensing elements measuring the variable or condition to be controlled or regulated F01B)

**Rotary or oscillatory slide-valve gear or lift-valve gear or such valve arrangements specially adapted for steam engines, or specially adapted for other positive-displacement machines or engines with variable working-fluid distribution**

- 33/00 Rotary or oscillatory slide-valve gear or valve arrangements, specially adapted for machines or engines with variable fluid distribution** (drive, adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines F01L 15/00 to F01L 31/00)
- 35/00 Lift-valve gear or valve arrangements specially adapted for machines or engines with variable fluid distribution** (drive, adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines F01L 15/00 to F01L 31/00)

**F01M LUBRICATING OF MACHINES OR ENGINES IN GENERAL; LUBRICATING INTERNAL-COMBUSTION ENGINES; CRANKCASE VENTILATING [2]**

- (1) Attention is drawn to the Notes preceding class F01, especially as regards Note (3).
- (2) Attention is drawn to the following places, which cover lubrication of specific machines or engines: [8]
 

F01B	31/00	Steam engines
F01C	21/00	Rotary-piston or oscillating-piston machines or engines
F01D	25/00	Non-positive-displacement machines
F02C	7/06	Gas-turbine plants
F02F	1/18	Cylinders of combustion engines
F04B	39/02	Pumps for elastic fluids
F04C	29/02	Rotary-piston or oscillating-piston pumps for liquids
F04D	29/04	Non-positive-displacement pumps

**Subclass index**

PRESSURE LUBRICATION .....	1/00	LUBRICANT CONDITIONING .....	5/00
SPECIAL LUBRICATION .....	3/00, 7/00, 9/00	DETAILS, ACCESSORIES .....	11/00
		CRANKCASE VENTILATION .....	13/00

<b>1/00</b>	<b>Pressure lubrication</b>	<b>7/00</b>	<b>Lubrication means specially adapted for machine or engine running-in</b>
1/02	· using lubricating pumps		
1/06	· Lubricating systems characterised by the provision therein of crankshafts or connecting-rods with lubricant passageways, e.g. bores	<b>9/00</b>	<b>Lubrication means having pertinent characteristics not provided for in, or of interest apart from, groups F01M 1/00 to F01M 7/00</b>
1/16	· Controlling lubricant pressure or quantity		
<b>3/00</b>	<b>Lubrication specially adapted for engines with crankcase compression of fuel-air mixture, or for other engines in which lubricant is contained in fuel, combustion air, or fuel-air mixture</b> (separating lubricant from air or fuel-air mixture before entry into cylinder F01M 11/00)	<b>11/00</b>	<b>Component parts, details, or accessories, not provided for in, or of interest apart from, groups F01M 1/00 to F01M 9/00</b>
		11/02	· Arrangements of lubricant conduits
<b>5/00</b>	<b>Heating, cooling, or controlling temperature of lubricant</b> (arrangement of lubricant coolers in engine cooling system F01P 11/08); <b>Lubrication means facilitating engine starting</b>	11/03	· Mounting or connecting of lubricant purifying means relative to the machine or engine; Details of lubricant purifying means [3]
		11/04	· Filling or draining lubricant of or from machines or engines
		11/10	· Indicating devices; Other safety devices
		<b>13/00</b>	<b>Crankcase ventilating or breathing [2]</b>

**F01N** **GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR MACHINES OR ENGINES IN GENERAL; GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR INTERNAL-COMBUSTION ENGINES** (arrangements in connection with gas exhaust of propulsion units in vehicles B60K 13/00; combustion-air intake silencers specially adapted for, or arranged on, internal-combustion engines F02M 35/00; protecting against, or damping, noise in general G10K 11/00)

#### Note

Attention is drawn to the Notes preceding class F01, especially as regards Note (3).

<b>1/00</b>	<b>Silencing apparatus characterised by method of silencing</b>	3/05	· . by means of air, e.g. by mixing exhaust with air (silencers working by addition of air to exhaust F01N 1/14; arrangements for the supply of additional air for the thermal or catalytic conversion of noxious components of exhaust F01N 3/30) [7]
1/02	· by using resonance		
1/06	· by using interference effect	3/08	· for rendering innocuous (using electric or electrostatic separators F01N 3/00; chemical aspects B01D 53/92) [1,7]
1/08	· by reducing exhaust energy by throttling or whirling	3/10	· . by thermal or catalytic conversion of noxious components of exhaust [3]
1/14	· by adding air to exhaust gases	3/18	· . . characterised by methods of operation; Regulation [3]
1/16	· by using movable parts	3/20	· . . . specially adapted for catalytic conversion (F01N 3/22 takes precedence) [3]
1/24	· by using sound-absorbing materials (F01N 1/02, F01N 1/06, F01N 1/08, F01N 1/14, F01N 1/16 take precedence)	3/22	· . . . Regulation of additional air supply only, e.g. using by-passes or variable air pump drives [3]
<b>3/00</b>	<b>Exhaust or silencing apparatus having means for purifying, rendering innocuous, or otherwise treating exhaust</b> (electric control F01N 9/00; monitoring or diagnostic devices for exhaust-gas treatment apparatus F01N 11/00) [4]	3/24	· . . characterised by constructional aspects of converting apparatus (filtering in combination with catalytic reactors F01N 3/035) [3,7]
3/02	· for cooling, or for removing solid constituents of, exhaust (by means of electric or electrostatic separators F01N 3/00) [1,7]	3/26	· . . . Construction of thermal reactors [3]
3/021	· . by means of filters [7]	3/28	· . . . Construction of catalytic reactors [3]
3/022	· . . characterised by specially adapted filtering structure, e.g. honeycomb, mesh or fibrous [7]	3/30	· . . . Arrangements for supply of additional air (regulation, e.g. using by-passes or variable air pump drives, F01N 3/22) [3]
3/023	· . . using means for regenerating the filters, e.g. by burning trapped particles [7]	3/36	· . . . Arrangements for supply of additional fuel [3]
3/031	· . . having means for by-passing filters, e.g. when clogged or during cold engine start [7]	3/38	· . . . Arrangements for igniting [3]
3/033	· . . in combination with other devices [7]		
3/035	· . . . with catalytic reactors [7]		
3/037	· . by means of inertial or centrifugal separators, e.g. associated with agglomerators [7]		
3/038	· . by means of perforated plates defining expansion chambers associated with condensation and collection chambers [7]		
3/04	· . by means of liquids		

- |   |   |
|---|---|
| <p><b>5/00 Exhaust or silencing apparatus combined or associated with devices profiting by exhaust energy</b> (using kinetic or wave energy of exhaust gases in exhaust systems for charging F02B; predominant aspects of such devices, <u>see</u> the relevant classes for the devices)</p> <p><b>9/00 Electrical control of exhaust gas treating apparatus</b> (monitoring or diagnostic devices for exhaust-gas treatment apparatus F01N 11/00; conjoint electrical control of two or more combustion engine functions F02D 43/00) [4]</p> | <p><b>11/00 Monitoring or diagnostic devices for exhaust-gas treatment apparatus</b> [7]</p> <p><b>13/00 Exhaust or silencing apparatus characterised by constructional features</b> [2010.01]</p> <p>13/08 . Other arrangements or adaptations of exhaust conduits [2010.01]</p> <p>13/10 . . of exhaust manifolds [2010.01]</p> <p>13/14 . having thermal insulation [2010.01]</p> <p>13/18 . Construction facilitating manufacture, assembly or disassembly [2010.01]</p> <p><b>99/00 Subject matter not provided for in other groups of this subclass</b> [2010.01]</p> |
|---|---|

**F01P COOLING OF MACHINES OR ENGINES IN GENERAL; COOLING OF INTERNAL-COMBUSTION ENGINES** (arrangements in connection with cooling of propulsion units in vehicles B60K 11/00; heat-transfer, heat-exchange or heat-storage materials C09K 5/00; heat-exchange in general, radiators F28)

- (1) In this subclass, the following terms or expressions are used with the meanings indicated:
- “air” also includes other gaseous cooling fluids;
  - “liquid cooling” also includes cooling where liquid is used as the heat-transferring fluid between parts to be cooled and the air, e.g. using radiators;
  - “air cooling” means direct air cooling and thus excludes indirect air cooling occurring in liquid cooling systems as explained under liquid cooling above;
  - “cooling-air” includes directly- or indirectly-acting cooling-air.
- (2) Attention is drawn to the Notes preceding class F01, especially as regards Note (3).
- (3) Cooling by lubricant is classified in subclass F01M when the lubrication aspect predominates, and in subclass F01P when the cooling aspect predominates.

**Air cooling; Liquid cooling**

- 1/00 Air cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00)
- 3/00 Liquid cooling** (propelling cooling-air or liquid coolants F01P 5/00; controlling supply or circulation of coolants F01P 7/00)
- 3/02 . Arrangements for cooling cylinders or cylinder heads
- 3/20 . Cooling circuits not specific to a single part of engine or machine (F01P 3/22 takes precedence)
- 3/22 . characterised by evaporation and condensation of coolant in closed cycles (other cooling by evaporation F01P 9/00); characterised by the coolant reaching higher temperatures than normal atmospheric boiling-point

**Pumping cooling-air or liquid coolants; Controlling circulation or supply of coolants**

- 5/00 Pumping cooling-air or liquid coolants** (controlling circulation or supply of coolants by influencing drive of pumps F01P 7/00)
- 5/02 . Pumping cooling-air; Arrangements of cooling-air pumps, e.g. fans or blowers
- 7/00 Controlling of coolant flow**
- 7/14 . the coolant being liquid
- 
- 9/00 Cooling having pertinent characteristics not provided for in, or of interest apart from, groups F01P 1/00 to F01P 7/00** (profiting from waste heat of combustion-engine cooling F02G 5/00)
- 11/00 Component parts, details, or accessories, not provided for in, or of interest apart from, groups F01P 1/00 to F01P 9/00**
- 11/08 . Arrangements of lubricant coolers (in lubrication apparatus F01M)
- 11/10 . Guiding or ducting cooling-air to or from liquid-to-air heat-exchangers
- 11/14 . Indicating devices; Other safety devices

**F02B****F02 COMBUSTION ENGINES** (cyclically operating valves therefor, lubricating, exhausting, or silencing engines F01); **HOT-GAS OR COMBUSTION-PRODUCT ENGINE PLANTS****F02B INTERNAL-COMBUSTION PISTON ENGINES; COMBUSTION ENGINES IN GENERAL** (internal-combustion turbines F02C; plants in which engines use combustion products F02C, F02G)

- (1) In this subclass, the following terms or expression are used with the meanings indicated:
- “positive ignition” means ignition by a source external to the working fluid, e.g. by spark or incandescent source;
  - “charging” means forcing air or fuel-air mixture into engine cylinders, and thus includes supercharging;
  - “scavenging” means forcing the combustion residues from the cylinders other than by movement of the working pistons, and thus includes tuned exhaust systems.
- (2) Attention is drawn to the Notes preceding class F01, especially as regards Note (1).
- (3) Engines with specified cycles or number of cylinders are classified in group F02B 75/02 or F02B 75/00, unless other classifying features predominate.

**Subclass index****ENGINES USING FLUID FUEL**

Characterised by fluid to be compressed or by ignition ..... 1/00 to 11/00

Characterised by the combustion, inlet or charging, or evacuation

combustion

chambers for:

precombustion; air

storage; combustion ..... 19/00; 21/00; 23/00

charge: stratification;

rotation ..... 17/00; 31/00

introduction of fuel ..... 13/00, 15/00, 49/00

inlet or charging, or scavenging

general characteristics;

details ..... 25/00 to 29/00; 29/00

pumps; details ..... 33/00 to 37/00; 39/00

Special means for improving efficiency ..... 41/00

**ENGINES USING NON-LIQUID FUEL, THEIR COMBINATIONS WITH FUEL-GENERATING APPARATUS** ..... 43/00, 45/00

**OPERATION CHARACTERISED BY TREATMENT OR PRETREATMENT OF**

**FUEL, AIR, OR MIXTURE** ..... 7/00, 47/00, 49/00, 51/00

**SPECIAL FORMS OR APPLICATIONS**

Kinds of engine

kinds of piston: rotary,

oscillating; reciprocating in

rotary engines or movable

cylinders; free-piston or

without rotating main shaft ..... 53/00, 55/00;

57/00, 59/00; 71/00

convertible or with

interchangeable parts ..... 69/00

with special auxiliary

apparatus ..... 67/00

other kinds; component parts,

details, or accessories ..... 75/00; 77/00

Combinations, not otherwise

provided for, of two or more

engines ..... 73/00

Engines for particular use,

combinations with other devices ..... 61/00 to 67/00

**RUNNING-IN** ..... 79/00

**Engines characterised by the working fluid to be compressed or characterised by the type of ignition**

**1/00 Engines characterised by fuel-air mixture compression** (with fuel-air charge ignited by compression ignition of an additional fuel F02B 7/00; with non-timed positive ignition F02B 9/00; characterised by both fuel-air mixture compression and air compression, or characterised by both positive ignition and compression ignition F02B 11/00; characterised by precombustion chambers F02B 19/00; characterised by air-storage chambers F02B 21/00; characterised by special shape or construction of combustion chambers F02B 23/00)

**3/00 Engines characterised by air compression and subsequent fuel addition** (characterised by both fuel-air mixture compression and air compression, or characterised by both positive ignition and compression ignition F02B 11/00; characterised by precombustion chambers F02B 19/00; characterised by air-storage chambers F02B 21/00; characterised by special shape or construction of combustion chambers F02B 23/00)

**5/00 Engines characterised by positive ignition** (F02B 1/00, F02B 3/00 take precedence; with non-timed positive ignition F02B 9/00; characterised by both fuel-air mixture compression and air compression, or characterised by both positive ignition and compression ignition F02B 11/00; characterised by precombustion chambers F02B 19/00; characterised by air-storage chambers F02B 21/00; characterised by special shape or construction of combustion chambers F02B 23/00)



**7/00 Engines characterised by the fuel-air charge being ignited by compression ignition of an additional fuel** (characterised by both fuel-air mixture compression and air compression, or characterised by both positive ignition and compression ignition F02B 11/00; characterised by precombustion chambers F02B 19/00; characterised by air-storage chambers F02B 21/00; characterised by special shape or construction of combustion chambers F02B 23/00)

**9/00 Engines characterised by other types of ignition** (characterised by both fuel-air mixture compression and air compression, or characterised by both positive ignition and compression ignition F02B 11/00; characterised by precombustion chambers F02B 19/00; characterised by air-storage chambers F02B 21/00; characterised by special shape or construction of combustion chambers F02B 23/00)

**11/00 Engines characterised by both fuel-air mixture compression and air compression, or characterised by both positive ignition and compression ignition, e.g. in different cylinders** (characterised by precombustion chambers F02B 19/00; characterised by air-storage chambers F02B 21/00; characterised by special shape or construction of combustion chambers F02B 23/00)

#### **Engines characterised by the method of introducing liquid fuel into cylinders**

**13/00 Engines characterised by the introduction of liquid fuel into cylinders by use of auxiliary fluid**

**15/00 Engines characterised by the method of introducing liquid fuel into cylinders and not otherwise provided for**

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**17/00 Engines characterised by means for effecting stratification of charge in cylinders**

#### **Engines characterised by precombustion chambers or air-storage chambers, or characterised by special shape or construction of combustion chambers to improve operation**

**19/00 Engines characterised by precombustion chambers** (engines with incandescent chambers F02B 9/00)

19/08 . the chamber being of air-swirl type

**21/00 Engines characterised by air-storage chambers**

**23/00 Other engines characterised by special shape or construction of combustion chambers to improve operation** (engines with incandescent chambers F02B 9/00)

23/02 . with compression ignition

23/08 . with positive ignition

23/10 . . with separate admission of air and fuel into cylinder

#### **Engines characterised by provision for charging or scavenging**

**25/00 Engines characterised by using fresh charge for scavenging cylinders** (aspects characterised by provision of driven charging or scavenging pumps F02B 33/00 to F02B 39/00)

**27/00 Use of kinetic or wave energy of charge in induction systems, or of combustion residues in exhaust systems, for improving quantity of charge or for increasing removal of combustion residues** (aspects characterised by provision of driven charging or scavenging pumps F02B 33/00 to F02B 39/00, e.g. use of driven apparatus for immediate conversion of combustion gas pressure into pressure of fresh charge F02B 33/00)

27/02 . the systems having variable, i.e. adjustable, cross-sectional areas, chambers of variable volume, or like variable means (in exhaust systems only F02B 27/00)

**29/00 Engines characterised by provision for charging or scavenging not provided for in groups F02B 25/00, F02B 27/00 or F02B 33/00 to F02B 39/00; Details thereof**

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**31/00 Modifying induction systems for imparting a rotation to the charge in the cylinder** (structural features of induction systems F02M)

#### **Engines characterised by provision of driven charging or scavenging pumps**

**33/00 Engines characterised by provision of pumps for charging or scavenging** (characterised by the introduction of liquid fuel into cylinders by use of auxiliary fluid F02B 13/00; characterised by after-charging F02B 29/00; characterised by provision of pumps for sucking combustion residues from cylinders F02B 35/00; characterised by provision of exhaust-driven pumps F02B 37/00)

33/02 . Engines with reciprocating-piston pumps; Engines with crankcase pumps

33/44 . Passages conducting the charge from the pump to the engine inlet, e.g. reservoirs (cooling of charge after leaving pump F02B 29/00)

**35/00 Engines characterised by provision of pumps for sucking combustion residues from cylinders**

**37/00 Engines characterised by provision of pumps driven at least for part of the time by exhaust** (characterised by the introduction of liquid fuel into cylinders by use of auxiliary fluid F02B 13/00; characterised by after-charging F02B 29/00; characterised by passages conducting the charge from the pump to the engine inlet F02B 33/44)

37/007 . with exhaust-driven pumps arranged in parallel [6]

37/013 . with exhaust-driven pumps arranged in series [6]

37/02 . Gas passages between engine outlet and pump drive, e.g. reservoirs

37/04 . Engines with exhaust drive and other drive of pumps, e.g. with exhaust-driven pump and mechanically-driven second pump

37/12 . Control of the pumps [3]

37/18 . . by bypassing exhaust [6]

**39/00 Component parts, details, or accessories relating to driven charging or scavenging pumps, not provided for in groups F02B 33/00 to F02B 37/00**

39/02 . Drives of pumps (exhaust drives or combined exhaust and other drives F02B 37/00); Varying pump drive gear ratio (control acting both on engine and on pump drive gear ratio F02D)

- 41/00** Engines characterised by special means for improving conversion of heat or pressure energy into mechanical power (use of exhaust turbines for charging F02B 37/00)

**Engines operating on non-liquid fuels; Plants including such engines, i.e. combinations of the engine with fuel-generating apparatus**

- 43/00** Engines characterised by operating on gaseous fuels; **Plants including such engines** (engines characterised by the gas-air charge being ignited by compression ignition of an additional fuel F02B 7/00; engines convertible from gas to other fuel consumption F02B 69/00)
- 45/00** Engines characterised by operating on non-liquid fuels other than gas; **Plants including such engines** (plants involving generation of gaseous fuel from solid fuel F02B 43/00; engines convertible from gas to other fuel consumption F02B 69/00)

**Methods of operating engines involving specific pre-treating of, or adding specific substances to, combustion air, fuel or fuel-air mixture of the engines, and not otherwise provided for**

- 47/00** Methods of operating engines involving adding non-fuel substances or anti-knock agents to combustion air, fuel, or fuel-air mixtures of engines
- 49/00** Methods of operating air-compressing compression-ignition engines involving introduction of small quantities of fuel in the form of a fine mist into the air in the engine's intake
- 51/00** Other methods of operating engines involving pre-treating of, or adding substances to, combustion air, fuel, or fuel-air mixture of the engines

**Internal-combustion aspects of rotary-piston or oscillating-piston engines**

- 53/00** Internal-combustion aspects of rotary-piston or oscillating-piston engines (internal-combustion aspects of rotary pistons or outer members for co-operation therewith F02B 55/00)
- 55/00** Internal-combustion aspects of rotary pistons; **Outer members for co-operation with rotary pistons**

**Internal-combustion aspects of reciprocating-piston engines with movable cylinders**

- 57/00** Internal-combustion aspects of rotary engines in which the combusted gases displace one or more reciprocating pistons
- 59/00** Internal-combustion aspects of other reciprocating-piston engines with movable, e.g. oscillating, cylinders (with yieldable walls F02B 75/00)

**Adaptations of engines for special use; Combinations of engines with devices other than engine parts or auxiliaries**

- 61/00** Adaptations of engines for driving vehicles or for driving propellers; **Combinations of engines with gearing** (the engine torque being divided by a differential gear for driving a scavenging or charging pump and the engine output shaft F02B 39/02; adaptations or combinations of rotary-piston or oscillating-piston engines F02B 53/00; arrangements in vehicles, see the relevant classes for vehicles)

- 63/00** Adaptations of engines for driving pumps, hand-held tools or electric generators; **Portable combinations of engines with engine-driven devices** (of rotary-piston or oscillating-piston engines F02B 53/00)

- 65/00** Adaptations of engines for special uses not provided for in groups F02B 61/00 or F02B 63/00; **Combinations of engines with other devices, e.g. with non-driven apparatus** (of rotary-piston or oscillating-piston engines F02B 53/00; combinations of prime-movers consisting of electric motors and internal combustion engines for mutual or common propulsion B60K 6/00)

**Engines with pertinent characteristics other than those provided for in, or of interest apart from, preceding main groups**

- 67/00** Engines characterised by the arrangement of auxiliary apparatus not being otherwise provided for, e.g. the apparatus having different functions; **Driving auxiliary apparatus from engines, not otherwise provided for**
- 67/04 . of mechanically-driven auxiliary apparatus
- 67/06 . . driven by means of chains, belts, or like endless members
- 69/00** Internal-combustion engines convertible into other combustion-engine type, not provided for in group F02B 11/00; **Internal-combustion engines of different types characterised by constructions facilitating use of same main engine-parts in different types**
- 71/00** Free-piston engines; **Engines without rotary main shaft**
- 73/00** Combinations of two or more engines, not otherwise provided for
- 75/00** Other engines, e.g. single-cylinder engines
- 75/02 . Engines characterised by their cycles, e.g. six-stroke
- 75/32 . Engines characterised by connections between pistons and main shafts and not specific to preceding main groups
- 77/00** Component parts, details, or accessories, not otherwise provided for
- 77/02 . Surface coverings of combustion-gas-swept parts (of pistons or cylinders only F02F)
- 77/04 . Cleaning of, preventing corrosion or erosion in, or preventing unwanted deposits in, combustion engines
- 77/08 . Safety, indicating, or supervising devices (thermal insulation F02B 77/11; monitoring or diagnostic devices for exhaust-gas treatment apparatus F01N 11/00)
- 77/10 . . Safety means relating to crankcase explosions
- 77/11 . Thermal or acoustic insulation [3]
- 77/14 . Engine-driven auxiliary devices combined into units
- 79/00** Running-in of internal-combustion engines (lubrication thereof F01M)

**F02C GAS-TURBINE PLANTS; AIR INTAKES FOR JET-PROPULSION PLANTS; CONTROLLING FUEL SUPPLY IN AIR-BREATHING JET-PROPULSION PLANTS** (construction of turbines F01D; jet-propulsion plants F02K; construction of compressors or fans F04; combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/00; generating combustion products of high pressure or high velocity F23R; using gas turbines in compression refrigeration plants F25B 11/00; using gas-turbine plants in vehicles, see the relevant vehicle classes)

- (1) This subclass covers:
  - combustion product or hot gas turbine plants;
  - internal combustion turbines or turbine plants;
  - turbine plants in which the working fluid is an unheated, pressurised gas.
- (2) This subclass does not cover:
  - steam turbine plants, which are covered by subclass F01K;
  - special vapour plants, which are covered by subclass F01K.
- (3) In this subclass, the following expression is used with the meaning indicated:
  - “gas-turbine plants” covers all the subject matter of Note (1) above and covers also features of jet-propulsion plants common to gas-turbine plants.
- (4) Attention is drawn to the Notes preceding class F01.

- |  |   |
|--|---|
| <p><b>1/00 Gas-turbine plants characterised by the use of hot gases or unheated pressurised gases, as the working fluid</b> (by the use of combustion products F02C 3/00, F02C 5/00) [3]</p>   | <p>7/06 . Arrangement of bearings (bearings F16C); Lubricating (of engines in general F01M) [3]</p>   |
| <p><b>3/00 Gas-turbine plants characterised by the use of combustion products as the working fluid</b> (generated by intermittent combustion F02C 5/00)</p>  | <p>7/08 . Heating air supply before combustion, e.g. by exhaust gases</p>   |
| <p>3/20 . using a special fuel, oxidant, or dilution fluid to generate the combustion products [3]</p>   | <p>7/12 . Cooling of plants (of component parts, <u>see</u> the relevant subclasses, e.g. F01D; cooling of engines in general F01P)</p>   |
| <p>3/26 . . the fuel or oxidant being solid or pulverulent, e.g. in slurry or suspension</p>   | <p>7/16 . . characterised by cooling medium</p>   |
| <p><b>5/00 Gas-turbine plants characterised by the working fluid being generated by intermittent combustion</b></p>  | <p>7/20 . Mounting or supporting of plant; Accommodating heat expansion or creep</p>  |
| <p><b>6/00 Plural gas-turbine plants; Combinations of gas-turbine plants with other apparatus</b> (aspects predominantly concerning such apparatus, <u>see</u> the relevant classes for the apparatus); <b>Adaptations of gas-turbine plants for special use</b> [3]</p> | <p>7/22 . Fuel supply systems</p>   |
| <p>6/18 . using the waste heat of gas-turbine plants outside the plants themselves, e.g. gas-turbine power heat plants (using waste heat as source of energy for refrigeration plants F25B 27/02) [3]</p>  | <p>7/24 . Heat or noise insulation (air intakes having provisions for noise suppression F02C 7/04; turbine exhaust heads, chambers, or the like F01D 25/00; silencing nozzles of jet-propulsion plants F02K 1/00) [3]</p>                       |
| <p><b>7/00 Features, component parts, details or accessories, not provided for in, or of interest apart from, groups F02C 1/00 to F02C 6/00; Air intakes for jet-propulsion plants</b> (controlling F02C 9/00) [3]</p>   | <p>7/26 . Starting; Ignition</p>  |
| <p>7/04 . Air intakes for gas-turbine plants or jet-propulsion plants [3]</p>  | <p>7/28 . Arrangement of seals</p>  |
|  | <p><b>9/00 Controlling gas-turbine plants; Controlling fuel supply in air-breathing jet-propulsion plants</b> (controlling air intakes F02C 7/04; fuel valves F02C 7/22; controlling turbines F01D; controlling compressors F04D 27/00) [3]</p> |

**F02D** **CONTROLLING COMBUSTION ENGINES** (vehicle fittings, acting on a single sub-unit only, for automatically controlling vehicle speed B60K 31/00; conjoint control of vehicle sub-units of different type or different function, road vehicle drive control systems for purposes other than the control of a single sub-unit B60W; cyclically operating valves for combustion engines F01L; controlling combustion engine lubrication F01M; cooling internal-combustion engines F01P; supplying combustion engines with combustible mixtures or constituents thereof, e.g. carburettors, injection pumps, F02M; starting of combustion engines F02N; controlling of ignition F02P; controlling gas-turbine plants, jet-propulsion plants, or combustion-product engine plants, see the relevant subclasses for these plants) [4,8]

- (1) In this subclass, the following term or expression is used with the meanings indicated:
- “fuel injection” means the introduction of a combustible substance into a space, e.g. cylinder, by means of a pressure source, e.g. a pump, continuously or cyclically acting behind the substance;
  - “supercharging” means supplying to the working space, e.g. cylinder, combustion-air pressurised by means of a pressure source, e.g. a pump.
- (2) Attention is drawn to the Notes preceding class F01.
- (3) In this subclass, electrical aspects of control arrangements are classified in groups F02D 41/00 to F02D 45/00. [4]

### Subclass index

#### CONTROLLING COMBUSTION ENGINES IN GENERAL

Characterised by action on engine operation

- on injection: general; low pressure; other means ..... 1/00; 3/00; 7/00
- by throttling air or fuel-and-air induction or exhaust ..... 9/00
- on valve-operating cycle; varying compression ratio ..... 13/00; 15/00
- cutting-out cylinders, rendering engines inoperative or idling ..... 17/00
- on delivery of fuel or combustion-air, not otherwise provided for ..... 33/00
- on two or more associated functions not otherwise provided for ..... 37/00

Characterised by initiating or actuating means

- non-automatic initiation, e.g. by operator ..... 11/00
- initiation by speed-sensing governors or by interior or exterior conditions, not otherwise provided for ..... 31/00, 35/00
- Programme control ..... 28/00

#### CONTROL OF PARTICULAR ENGINES

- engines: characterised by fuel; by combustion medium used; by supercharge ..... 19/00; 21/00; 23/00
- co-operating engines; reversible engines; engines driving vehicle or particular devices ..... 25/00; 27/00; 29/00

#### OTHER CONTROL

- Non-electrical ..... 39/00
- Electrical ..... 41/00 to 45/00

### Controlling, e.g. regulating, fuel injection

- 1/00** **Controlling fuel-injection pumps, e.g. of high-pressure injection type** (F02D 3/00 takes precedence) [2]
- 1/02 . not restricted to adjustment of injection timing, e.g. varying amount of fuel delivered
- 1/04 . . by mechanical means dependent on engine speed, e.g. using centrifugal governors (F02D 1/08 takes precedence)
- 1/08 . . Transmission of control impulse to pump control, e.g. with power drive or power assistance
- 3/00** **Controlling low-pressure fuel injection, i.e. where the air-fuel mixture containing fuel thus injected will be substantially compressed by the compression stroke of the engine, by means other than controlling only an injection pump** (carburettors F02M) [2]

### Note

When the control apparatus or system forms part of the low-pressure fuel-injection apparatus it is classified in group F02M 69/00. [5]

#### **7/00** **Other non-electrical fuel injection control** [4]

#### **9/00** **Controlling engines by throttling air or fuel-and-air induction conduits or exhaust conduits**

- 9/02 . concerning induction conduits (throttle valves, or arrangements thereof in conduits F02D 9/08)
- 9/08 . Throttle valves specially adapted therefor; Arrangements of such valves in conduits (throttle valves modified for use in, or arranged in, carburettors F02M; throttle valves in general F16K)

- 11/00 Arrangements for, or adaptations to, non-automatic engine control initiation means, e.g. operator initiated** (specially for reversing F02D 27/00; arrangement or mounting of prime-mover control devices in vehicles B60K 26/00) [2,5]
- 11/06 . characterised by non-mechanical control linkages, e.g. fluid control linkages or by control linkages with power drive or assistance [5]
- 11/10 . . of the electric type [5]
- 13/00 Controlling the engine output power by varying inlet or exhaust valve operating characteristics, e.g. timing** (modifying valve gear F01L)
- 13/02 . during engine operation
- 13/04 . . using engine as brake
- 13/06 . . Cutting-out cylinders
- 15/00 Varying compression ratio** (modifying valve-gear F01L)
- 17/00 Controlling engines by cutting-out individual cylinders; Rendering engines inoperative or idling** (controlling or rendering inoperative by varying inlet or exhaust valve operating characteristics F02D 13/00; cutting-out engines in multiple-engine arrangements F02D 25/00; dependent on lubricating conditions F01M 1/00; dependent on cooling F01P 5/00)

#### **Controlling peculiar to specified types or adaptations of engines**

- 19/00 Controlling engines characterised by their use of non-liquid fuels, pluralities of fuels, or non-fuel substances added to the combustible mixtures** (the non-fuel substances being gaseous F02D 21/00)
- 21/00 Controlling engines characterised by their being supplied with non-airborne oxygen or other non-fuel gas**
- 23/00 Controlling engines characterised by their being supercharged**
- 25/00 Controlling two or more co-operating engines**
- 27/00 Controlling engines characterised by their being reversible**
- 28/00 Programme-control of engines** (programme-control specific to a type or purpose covered by one of the groups of this subclass, except groups F02D 29/00, F02D 39/00, or by one group of another subclass, e.g. of F01L, see that group) [2]
- 29/00 Controlling engines, such controlling being peculiar to the devices driven thereby, the devices being other than parts or accessories essential to engine operation, e.g. controlling of engines by signals external thereto** [2]
- 29/02 . peculiar to engines driving vehicles; peculiar to engines driving variable-pitch propellers [2]
- 29/04 . peculiar to engines driving pumps
- 29/06 . peculiar to engines driving electric generators

#### **Other non-electrical control of combustion engines** [4]

- 31/00 Use of non-electrical speed-sensing governors to control combustion engines, not otherwise provided for**
- 33/00 Non-electrical control of delivery of fuel or combustion-air, not otherwise provided for**

- 35/00 Non-electrical control of engines, dependent on conditions exterior or interior to engines, not otherwise provided for**
- 35/02 . on interior conditions
- 37/00 Non-electrical conjoint control of two or more functions of engines, not otherwise provided for**
- 39/00 Other non-electrical control** [4]

#### **Electrical control of combustion engines** [4]

- (1) Groups F02D 41/00 to F02D 45/00 cover electrical aspects of electrically controlled devices. [6]
- (2) Groups F02D 41/00 to F02D 45/00 do not cover: [6]
- non-electrical aspects of electrically controlled devices, which are covered by groups F02D 1/00 to F02D 39/00 or by subclass F02M; [6]
  - both electrical and non-electrical aspects of electrically controlled devices, which are covered by groups F02D 1/00 to F02D 39/00 or by subclass F02M. [4,6]
- 41/00 Electrical control of supply of combustible mixture or its constituents** (F02D 43/00 takes precedence) [4]
- 41/02 . Circuit arrangements for generating control signals [4]
- 41/04 . . Introducing corrections for particular operating conditions (F02D 41/14 takes precedence) [4]
- 41/06 . . . for engine starting or warming up [4]
- 41/08 . . . for idling (F02D 41/06, F02D 41/16 take precedence) [4]
- 41/10 . . . for acceleration [4]
- 41/12 . . . for deceleration [4]
- 41/14 . . Introducing closed-loop corrections [4]
- 41/16 . . . for idling [4]
- 41/18 . . by measuring intake air flow (measuring flow, in general G01F) [4]
- 41/20 . Output circuits, e.g. for controlling currents in command coils (current control in inductive loads in general H03K 17/60) [4]
- 41/22 . Safety or indicating devices for abnormal conditions [4]
- 41/30 . Controlling fuel injection [4]
- 41/32 . . of the low pressure type [4]
- 41/34 . . . with means for controlling injection timing or duration (ignition timing F02P 5/00) [4]
- 41/38 . . of the high pressure type [4]
- 41/40 . . . with means for controlling injection timing or duration [4]
- 43/00 Conjoint electrical control of two or more functions, e.g. ignition, fuel-air mixture, recirculation, supercharging, exhaust-gas treatment** (electrical control of exhaust gas treating apparatus per se F01N 9/00) [4]
- 43/02 . using only analogue means [4]
- 43/04 . using only digital means [4]
- 45/00 Electrical control not provided for in groups F02D 41/00 to F02D 43/00** (electrical control of exhaust gas treating apparatus F01N 9/00; electrical control of one of the functions: ignition, lubricating, cooling, starting, intake-heating, see the relevant subclasses for such functions) [4]

**F02F CYLINDERS, PISTONS, OR CASINGS FOR COMBUSTION ENGINES; ARRANGEMENTS OF SEALINGS IN COMBUSTION ENGINES** (specially adapted for rotary-piston or oscillating-piston internal-combustion engines F02B; specially adapted for gas-turbine plants F02C; specially adapted for jet-propulsion plants F02K) [2]

- (1) Attention is drawn to the Notes preceding class F01.  
 (2) Class F16 takes precedence over this subclass, except for subject matter specific to combustion engines.

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<b>1/00</b>	<b>Cylinders; Cylinder heads</b> (in general F16J)	3/16	. having cooling means
1/02	. having cooling means (cylinder heads F02F 1/26)	3/24	. having means for guiding gases in cylinders, e.g. for guiding scavenging charge in two-stroke engines
1/18	. Other cylinders		
1/24	. Cylinder heads	3/26	. having combustion chamber in piston head (the surface thereof being covered F02F 3/10)
1/26	. . having cooling means		
1/42	. . Shape or arrangement of intake or exhaust channels in cylinder heads	3/28	. Other pistons with specially-shaped head
<b>3/00</b>	<b>Pistons</b> (in general F16J)	<b>5/00</b>	<b>Piston rings, e.g. associated with piston crown</b>
3/02	. having means for accommodating or controlling heat expansion	<b>7/00</b>	<b>Casings, e.g. crankcases</b> (engine casings in general F16M)
3/10	. having surface coverings (F02F 3/02 takes precedence)	<b>11/00</b>	<b>Arrangements of sealings in combustion engines</b> (piston rings F02F 5/00; sealings <u>per se</u> F16J)

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**F02G HOT-GAS OR COMBUSTION-PRODUCT POSITIVE-DISPLACEMENT ENGINE PLANTS** (steam engine plants, special vapour plants, plants operating on either hot gas or combustion-product gases together with other fluid F01K; gas-turbine plants F02C; jet-propulsion plants F02K); **USE OF WASTE HEAT OF COMBUSTION ENGINES, NOT OTHERWISE PROVIDED FOR**

**Note**

Attention is drawn to the Notes preceding class F01.

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- 1/00 Hot gas positive-displacement engine plants** (positive-displacement engine plants characterised by the working gas being generated by combustion in the plant F02G 3/00) [3]
- 3/00 Positive-displacement engine plants characterised by the working gas being generated by combustion in the plant** [3]
- 5/00 Profiting from waste heat of combustion engines, not otherwise provided for**
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**F02K JET-PROPULSION PLANTS** (arrangement or mounting of jet-propulsion plants in land vehicles or vehicles in general B60K; arrangement or mounting of jet-propulsion plants in waterborne vessels B63H; controlling aircraft attitude, flight direction, or altitude by jet reaction B64C; arrangement or mounting of jet-propulsion plants in aircraft B64D; plants characterised by the power of the working fluid being divided between jet propulsion and another form of propulsion, e.g. propeller, F02B, F02C; features of jet-propulsion plants common to gas-turbine plants, air intakes or fuel supply control of air-breathing jet-propulsion plants F02C)

- (1) In this subclass, the following expression is used with the meaning indicated:  
 – “jet-propulsion plants” means plants using combustion to produce a fluid stream from which a propulsive thrust on the plants is obtained on the reaction principle.
- (2) Attention is drawn to the Notes preceding class F01.

**Subclass index**

PLANTS CHARACTERISED BY JET PIPE  
OR NOZZLE..... 1/00, 9/00  
PLANTS WITH COMPRESSOR OR FAN ..... 3/00, 5/00  
PLANTS WITHOUT COMPRESSOR OR  
FAN ..... 7/00

ROCKET-ENGINE PLANTS ..... 9/00  
CONTROL..... 1/00, 7/00,  
9/00  
OTHER PLANTS ..... 99/00

**1/00** Plants characterised by the form or arrangement of  
the jet pipe or nozzle; Jet pipes or nozzles peculiar  
thereto (rocket nozzles F02K 9/00)

**3/00** Plants including a gas turbine driving a compressor  
or a ducted fan (after-burners, combustion chambers  
F23R)

**5/00** Plants including an engine, other than a gas turbine,  
driving a compressor or a ducted fan

**7/00** Plants in which the working-fluid is used in a jet  
only, i.e. the plants not having a turbine or other  
engine driving a compressor or a ducted fan; Control  
thereof (rocket-engine plants F02K 9/00)

**9/00** Rocket-engine plants, i.e. plants carrying both fuel  
and oxidant therefor; Control thereof (combined with  
a ram-jet engine F02K 7/00; chemical composition of  
propellants C06B, C06D) [3]

**99/00** Subject matter not provided for in other groups of  
this subclass [2009.01]

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**F02M SUPPLYING COMBUSTION ENGINES IN GENERAL WITH COMBUSTIBLE MIXTURES OR CONSTITUENTS THEREOF** (charging such engines F02B)

- (1) In this subclass, the following terms or expressions are used with the meanings indicated:
- “carburettors” means essentially apparatus for mixing fuel with air, the fuel being brought into mixing contact with the air by lowering the air pressure, e.g. in a venturi;
  - “fuel-injection apparatus” means apparatus for introducing fuel into a space, e.g. engine cylinder, by pressurising the fuel, e.g. by a pump acting behind the fuel, and thus includes the so-called “solid-fuel injection” in which liquid fuel is introduced without any admixture of gas;
  - “low-pressure fuel injection” means fuel injection in which the fuel-air mixture containing fuel thus injected will be substantially compressed in the compression stroke of the engine;
  - “pumping element” means a single piston-cylinder unit in a reciprocating-piston fuel-injection pump or the equivalent unit in any other type of fuel-injection pump.
- (2) Attention is drawn to the Notes preceding class F01.

**Subclass index****SUPPLYING WITH LIQUID FUEL****Carburettors**

starting, idling; float-controlled  
fuel level; mixture control;  
throttling, mixing chambers..... 1/00, 3/00;  
5/00; 7/00; 9/00

heating, cooling, insulating..... 15/00  
multi-stage, register type;  
combinations of carburettors or  
fuels; combination with low-  
pressure injection ..... 11/00; 13/00;  
71/00

other characteristics; other  
details, or accessories..... 17/00; 19/00

**Injection apparatus**

general characteristics,  
injection without gas  
with two or more  
sequentially-fed injectors;  
with two or more liquids ..... 41/00; 43/00  
with cyclic delivery  
characteristics; with fluid-  
actuated valves ..... 45/00; 47/00

with pump or injector  
actuated by cylinder  
pressure or by the piston..... 49/00  
electrically-operated ..... 51/00  
with heating, cooling, or  
insulating means;  
characterised by fuel pipes  
or venting means..... 53/00; 55/00  
injectors combined with  
other devices ..... 57/00  
arrangements of apparatus  
relative to engine, related  
pump drives ..... 39/00  
other adaptations of  
pumps; other injectors ..... 59/00; 61/00  
other apparatus, details, or  
accessories ..... 63/00; 69/00  
testing ..... 65/00  
using high-pressure gas ..... 67/00  
low-pressure apparatus ..... 51/02, 69/00,  
71/00

**SUPPLYING WITH NON-LIQUID FUEL** ..... 21/00

FEEDING OR PRETREATING AIR, FUEL,  
OR FUEL-AIR MIXTURE

- Pre-treating fuel, air, or mixture
- adding secondary air; adding non-fuel substances or secondary fuel ..... 23/00; 25/00
  - by catalytic, electrical, or magnetic means, or by sound or radiation; thermally ..... 27/00; 31/00

- by re-atomising or homogenising; air cleaning; other treatment ..... 29/00; 35/00; 33/00

- Air intakes or silencers, induction systems ..... 35/00
- Fuel transfer to carburettors or injection apparatus ..... 37/00

SUBJECT MATTER NOT PROVIDED FOR  
IN OTHER GROUPS OF THIS SUBCLASS ..... 99/00

**Carburettors for liquid fuels**

- 1/00 Carburettors with means for facilitating engine's starting or its idling below operational temperatures**
- 3/00 Idling devices for carburettors** (with means for facilitating idling below operational temperatures F02M 1/00)
- 5/00 Float-controlled apparatus for maintaining a constant fuel level in carburettors**
- 7/00 Carburettors with means for influencing, e.g. enriching or keeping constant, fuel/air ratio of charge under varying conditions** (choke valves for starting F02M 1/00)
- 9/00 Carburettors having air or fuel-air mixture passage throttling valves other than of butterfly type** (register-type carburettors F02M 11/00); **Carburettors having fuel-air mixing chambers of variable shape or position**
- 11/00 Multi-stage carburettors; Register-type carburettors, i.e. with slidable or rotatable throttling valves in which a plurality of fuel nozzles, other than only an idling nozzle and a main one, are sequentially exposed to air stream by throttling valve**
- 13/00 Arrangements of two or more separate carburettors** (apparatus for testing, tuning, or synchronising carburettors F02M 19/00; re-atomising condensed fuel or homogenising fuel-air mixture F02M 29/00); **Carburettors using more than one fuel** (apparatus for adding small quantities of secondary fuel F02M 25/00)
- 15/00 Carburettors with heating, cooling, or thermal insulating means for combustion-air, fuel, or fuel-air mixture** (heating, cooling, or thermally insulating float apparatus F02M 5/00; apparatus for thermally treating combustion-air, fuel, or fuel-air mixture, not being part of a carburettor F02M 31/00)
- 17/00 Carburettors having pertinent characteristics not provided for in, or of interest apart from, the apparatus of main groups F02M 1/00 to F02M 15/00** (external control gear F02M 19/00; apparatus for treating combustion-air, fuel, or fuel-air mixture by catalysts, electric means, magnetism, rays, sonic waves, or the like F02M 27/00; combinations of carburettors and low-pressure fuel-injection apparatus F02M 71/00)
- 19/00 Details, component parts, or accessories of carburettors, not provided for in, or of interest apart from, the apparatus of groups F02M 1/00 to F02M 17/00** (measuring or testing apparatus in general G01)

- 21/00 Apparatus for supplying engines with non-liquid fuels, e.g. gaseous fuels stored in liquid form**
- 21/02 . for gaseous fuels (apparatus for vaporising liquid fuel by heat F02M 31/00; engines with apparatus generating gas from solid fuel, e.g. from wood, F02B 43/00)
- 21/04 . . Gas-air mixing apparatus (carburettors adapted to use liquid and gaseous fuels F02M 13/00; carburetting gases in general C10J)
- 21/06 . . Apparatus for de-liquefying, e.g. by heating (discharging liquefied gases in general F17C)

**Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or fuel-air mixture**

- 23/00 Apparatus for adding secondary air to fuel-air mixture**
- 25/00 Engine-pertinent apparatus for adding non-fuel substances or small quantities of secondary fuel to combustion-air, main fuel, or fuel-air mixture** (F02M 43/00 takes precedence; adding secondary air to fuel-air mixture F02M 23/00; using rays and simultaneously generating ozone F02M 27/00)
  - 25/06 . adding lubricant vapours or exhaust gases
  - 25/07 . . adding exhaust gases [5]
  - 25/08 . adding fuel vapours drawn from engine fuel reservoir
- 27/00 Apparatus for treating combustion-air, fuel, or fuel-air mixture, by catalysts, electric means, magnetism, rays, sonic waves, or the like**
- 29/00 Apparatus for re-atomising condensed fuel or homogenising fuel-air mixture** (combined with secondary-air supply F02M 23/00)
- 31/00 Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture** (F02M 21/06, F02M 21/00 take precedence; such apparatus being part of a carburettor or fuel-injection apparatus F02M 15/00, F02M 53/00; adding hot secondary air to fuel-air mixture F02M 23/00)
  - 31/02 . for heating
- 33/00 Other apparatus for treating combustion-air, fuel or fuel-air mixture** (combustion-air cleaners F02M 35/00; arrangements for purifying liquid fuel F02M 37/22)
- 35/00 Combustion-air cleaners, air intakes, intake silencers, or induction systems specially adapted for, or arranged on, internal-combustion engines** (air cleaners in general B01D)
  - 35/02 . Air cleaners
  - 35/10 . Air intakes; Induction systems (using kinetic or wave energy of charge in induction systems for improving quantity of charge F02B)
  - 35/104 . . Intake manifolds [6]



- 35/12 . Intake silencers
- 35/14 . Combined air cleaners and silencers
- 37/00 Apparatus or systems for feeding liquid fuel from storage containers to carburettors or fuel-injection apparatus** (F02M 69/00 takes precedence; feeding liquid fuel to combustion apparatus, in general F23K 5/00; fuel supply to apparatus for generating combustion products of high pressure or high velocity F23R 3/28); **Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines** (separating apparatus, filters per se B01D; centrifuges B04B) [5]
- 37/02 . Feeding by means of suction apparatus, e.g. by air flow through carburettors (by driven pumps F02M 37/04)
- 37/04 . Feeding by means of driven pumps (pump construction F04)
- 37/06 . . mechanically driven
- 37/08 . . electrically driven
- 37/18 . . characterised by provision of main and auxiliary pumps
- 37/20 . characterised by means for preventing vapour lock
- 37/22 . Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines, e.g. arrangement in the feeding system [3]

#### Fuel-injection apparatus

##### Note

Low-pressure fuel injection is classified in groups F02M 51/00, F02M 69/00 or F02M 71/00. [2009.01]

- 39/00 Arrangements of fuel-injection apparatus with respect to engines; Pump drives adapted to such arrangements** (F02M 49/00 takes precedence; arrangements of injectors F02M 61/00)
- 41/00 Fuel-injection apparatus with two or more injectors fed from a common pressure-source sequentially by means of a distributor**
- 41/08 . the distributor and pumping elements being combined
- 43/00 Fuel-injection apparatus operating simultaneously on two or more fuels or on a liquid fuel and another liquid, e.g. the other liquid being an anti-knock additive**
- 45/00 Fuel-injection apparatus characterised by having a cyclic delivery of specific time/pressure or time/quantity relationship** (fuel injectors having such deliveries by means of valves furnished at seated ends with pintle- or plug-shaped extensions F02M 61/00)
- 47/00 Fuel-injection apparatus operated cyclically with fuel-injection valves actuated by fluid pressure** (F02M 49/00 takes precedence; apparatus with injection valves opened by fuel pressure and closed by non-fluid means, see the groups providing for other characteristics)
- 47/02 . of accumulator-injector type, i.e. having fuel pressure of accumulator tending to open, and fuel pressure in other chamber tending to close, injection valves, and having means for periodically releasing that closing pressure

- 49/00 Fuel-injection apparatus in which injection pumps are driven, or injectors are actuated, by the pressure in engine working cylinders, or by impact of engine working piston**
  - 51/00 Fuel-injection apparatus characterised by being operated electrically**
  - 51/02 . specially for low-pressure fuel-injection (pumps per se F02M 51/04; injectors per se F02M 51/08)
  - 51/04 . Pumps peculiar thereto
  - 51/06 . Injectors peculiar thereto
  - 51/08 . . specially for low-pressure fuel-injection
  - 53/00 Fuel-injection apparatus characterised by having heating, cooling, or thermally-insulating means**
  - 55/00 Fuel-injection apparatus characterised by their fuel conduits or their venting means**
  - 55/02 . Conduits between injection pumps and injectors
  - 57/00 Fuel injectors combined or associated with other devices**
  - 59/00 Pumps specially adapted for fuel-injection and not provided for in groups F02M 39/00 to F02M 57/00** (general features of pumps F04)
  - 59/20 . Varying fuel delivery in quantity or timing
  - 61/00 Fuel injectors not provided for in groups F02M 39/00 to F02M 57/00 or F02M 67/00**
  - 63/00 Other fuel-injection apparatus having pertinent characteristics not provided for in groups F02M 39/00 to F02M 57/00 or F02M 67/00; Details, component parts or accessories of fuel-injection apparatus, not provided for in, or of interest apart from, the apparatus of groups F02M 39/00 to F02M 61/00 or F02M 67/00**
  - 65/00 Testing fuel-injection apparatus, e.g. testing injection timing**
- 
- 67/00 Apparatus in which fuel-injection is effected by means of high-pressure gas, the gas carrying the fuel into working cylinders of the engine, e.g. air-injection type** (using compressed air for low-pressure fuel-injection apparatus F02M 69/08)
  - 69/00 Low-pressure fuel-injection apparatus** (electrically-operated F02M 51/00)
  - 69/02 . Pumps peculiar thereto
  - 69/04 . Injectors peculiar thereto
  - 69/06 . characterised by the pressurisation of the fuel being caused by centrifugal force acting on the fuel
  - 69/08 . characterised by the fuel being carried by compressed air into main stream of combustion-air
  - 69/10 . peculiar to scavenged two-stroke engines, e.g. injecting into crankcase-pump chamber
  - 69/12 . comprising a fuel-displaced free piston for intermittently metering and supplying fuel to injection nozzles [5]
  - 69/14 . having cyclically-operated valves connecting injection nozzles to a source of fuel under pressure during the injection period [5]
  - 69/16 . characterised by means for metering continuous fuel flow to injectors or means for varying fuel pressure upstream of injectors [5]
  - 69/28 . characterised by means for cutting-out the fuel supply to the engine or to main injectors during certain operating periods, e.g. deceleration [5]

- |       |   |              |   |
|-------|---|--------------|---|
| 69/30 | . characterised by means for facilitating the starting-up or idling of engines or by means for enriching fuel charge, e.g. below operational temperatures or upon high power demand of engines (at acceleration F02M 69/44) [5] | 69/44        | . characterised by means for supplying extra fuel to the engine on sudden air throttle opening, e.g. at acceleration [5]  |
|       |   | 69/46        | . Details, component parts or accessories not provided for in, or of interest apart from, the apparatus covered by groups F02M 69/02 to F02M 69/44 [5]              |
|       |   | <b>71/00</b> | <b>Combinations of carburettors and low-pressure fuel-injection apparatus</b> (means for enriching charge on sudden air throttle opening of carburettors F02M 7/00) |
|       |   | <b>99/00</b> | <b>Subject matter not provided for in other groups of this subclass [8]</b>   |

**F02N STARTING OF COMBUSTION ENGINES** (starting of free-piston combustion-engines F02B 71/00; starting of gas-turbine plants F02C 7/26); **STARTING AIDS FOR SUCH ENGINES, NOT OTHERWISE PROVIDED FOR**

- (1) Attention is drawn to the Notes preceding class F01.
- (2) The starting of engines which are not explicitly stated to be combustion engines is classified in this subclass in so far as their starting is equivalent to that of combustion engines.

**Subclass index**

STARTING BY MUSCLE POWER .....	1/00, 3/00, 5/00	By direct action in the working chamber: by fluid pressure; by explosives.....	9/00; 13/00
STARTING OTHERWISE		By other apparatus, details, accessories.....	15/00
With mechanical energy storage .....	5/00	OTHER MEANS OR AIDS FOR STARTING .....	19/00, 99/00
By fluid motor; by electric motor .....	7/00; 11/00		

**Muscle-operated starting apparatus**

- 1/00 Starting apparatus having hand cranks** (with intermediate power storage F02N 5/00 to F02N 15/00)
- 3/00 Other muscle-operated starting apparatus** (with intermediate power storage F02N 5/00 to F02N 15/00)

**Power-operated starting apparatus; Muscle-operated starting apparatus with intermediate power storage**

- 5/00 Starting apparatus having mechanical power storage**
- 7/00 Starting apparatus having fluid-driven auxiliary engines or apparatus** (characterised by using explosive cartridges F02N 13/00)
- 9/00 Starting of engines by supplying auxiliary pressure fluid to their working chambers** (the fluid being generated by using explosive cartridges F02N 13/00)

- 11/00 Starting of engines by means of electric motors** (arrangement or mounting of prime-movers consisting of electric motors and internal combustion engines for mutual or common propulsion B60K 6/00)
- 11/04 . the motors being associated with current generators
- 11/08 . Circuits specially adapted for starting of engines
- 13/00 Starting of engines, or driving of starting apparatus by use of explosives, e.g. stored in cartridges**
- 15/00 Other power-operated starting apparatus; Component parts, details, or accessories, not provided for in, or of interest apart from, groups F02N 5/00 to F02N 13/00**
- 15/02 . Gearing between starting-engines and started engines; Engagement or disengagement thereof

- 19/00 Starting aids for combustion engines, not otherwise provided for [2010.01]**
- 99/00 Subject matter not provided for in the other groups of this subclass [2010.01]**

**F02P IGNITION, OTHER THAN COMPRESSION IGNITION, FOR INTERNAL-COMBUSTION ENGINES; TESTING OF IGNITION TIMING IN COMPRESSION-IGNITION ENGINES** (specially adapted for rotary-piston or oscillating-piston engines F02B 53/00; ignition of combustion apparatus in general, glowing plugs F23Q; measuring of physical variables in general G01; controlling in general G05; data processing in general G06; electrical components in general, see section H; sparking plugs H01T)

### Subclass index

ELECTRIC SPARK IGNITION	Safety means .....	11/00
Directly from generator; other installations .....	Other features .....	15/00
1/00; 3/00	Testing .....	17/00
Sparking plugs structurally combined with engine parts .....	IGNITION OTHERWISE THAN BY ELECTRIC SPARK: BY INCANDESCENCE; BY DIRECT FLAME; BY OTHER MEANS .....	19/00; 21/00; 23/00
13/00		
Control: timing, distributing; other .....		
5/00; 7/00; 9/00		

### Electric spark ignition installations characterised by the type of ignition power generation or storage

- 1/00 Installations having electric ignition energy generated by magneto- or dynamo-electric generators without subsequent storage**
- 3/00 Other electric spark ignition installations characterised by the type of ignition power generation storage**
- 3/02 . having inductive energy storage, e.g. arrangements of induction coils

### Advancing or retarding electric ignition spark; Arrangements of distributors or of circuit-makers or -breakers for electric spark ignition; Electric spark ignition control or safety means, not otherwise provided for

- 5/00 Advancing or retarding electric ignition spark; Control therefor [6]**
- 5/04 . automatically, as a function of the working conditions of the engine or vehicle or of the atmospheric conditions (dependent on position of personal controls of engine F02P 5/00)
- 5/145 . . using electrical means [4]
- 5/15 . . . Digital data processing [4]
- 5/152 . . . . dependent on pinking (detecting or indicating knocks in internal-combustion engines G01L 23/00) [6]
- 5/153 . . . . dependent on combustion pressure [6]
- 7/00 Arrangement of distributors, circuit-makers, circuit-breakers or pick-up devices for electric spark ignition** (advancing or retarding ignition or control therefor F02P 5/00; ignition occurring simultaneously at different places in one engine cylinder or in two or more separate engine cylinders F02P 15/00; such devices per se, see the relevant classes of section H, e.g. rotary switches H01H 19/00, contact-breakers, distributors H01R 39/00, generators H02K)

**9/00 Electric spark ignition control, not otherwise provided for**

**11/00 Safety means for electric spark ignition, not otherwise provided for**

**13/00 Sparking plugs structurally combined with other parts of internal-combustion engines** (with fuel injectors F02M 57/00; predominant aspects of the parts, see the relevant subclasses)

**15/00 Electric spark ignition having characteristics not provided for in, or of interest apart from, groups F02P 1/00 to F02P 13/00**

**17/00 Testing of ignition installations, e.g. in combination with adjusting** (testing fuel injection apparatus F02M 65/00; testing ignition installations in general F23Q 23/00); **Testing of ignition timing in compression-ignition engines [4]**

17/12 . Testing characteristics of the spark, ignition voltage or current (testing of sparking plugs G01M 19/02) [6]

### Other ignition

**19/00 Incandescent ignition, e.g. during starting of internal-combustion engines; Combination of incandescent and spark ignition [4]**

**21/00 Direct use of flames or burners for ignition**

**23/00 Other ignition**

**F03 MACHINES OR ENGINES FOR LIQUIDS** (for liquids and elastic fluids F01; positive-displacement machines for liquids F04); **WIND, SPRING, OR WEIGHT MOTORS; PRODUCING MECHANICAL POWER OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR**

**F03B MACHINES OR ENGINES FOR LIQUIDS** (machines or engines for liquids and elastic fluids F01; positive-displacement engines for liquids F03C; positive-displacement machines for liquids F04)

- (1) This subclass covers:
- engines, other than of positive-displacement type, driven by liquids;
  - machines, other than of positive-displacement type, for liquids.
- (2) Attention is drawn to the Notes preceding class F01, especially as regards the definition of “reaction type”.

**Subclass index**

TURBINES: IMPULSE; REACTION .....	1/00; 3/00	PARTS OR DETAILS OF ABOVE KINDS .....	1/00, 3/00, 11/00
MACHINES OR ENGINES: NON-BLADED ROTOR TYPE; WATER WHEELS; ENDLESS-CHAIN TYPE .....	5/00; 7/00; 9/00	ADAPTATIONS OR COMBINATIONS .....	13/00
		CONTROLLING .....	15/00
		OTHER MACHINES OR ENGINES .....	17/00

<b>1/00</b>	<b>Engines of impulse type, i.e. turbines with jets of high-velocity liquid impinging on bladed or like rotors, e.g. Pelton wheels; Parts or details peculiar thereto</b>	<b>11/00</b>	<b>Parts or details not provided for in, or of interest apart from, groups F03B 1/00 to F03B 9/00</b> (controlling F03B 15/00)
<b>3/00</b>	<b>Machines or engines of reaction type; Parts or details peculiar thereto</b>	<b>13/00</b>	<b>Adaptations of machines or engines for special use; Combinations of machines or engines with driving or driven apparatus</b> (if the apparatus aspects are predominant, <i>see</i> the relevant places for such apparatus, e.g. H02K 7/18); <b>Power stations or aggregates</b> (hydraulic-engineering aspects E02B; incorporating only machines or engines of positive-displacement type F03C)
<b>5/00</b>	<b>Machines or engines characterised by non-bladed rotors, e.g. serrated, using friction</b>		
<b>7/00</b>	<b>Water wheels</b>		
<b>9/00</b>	<b>Endless-chain type machines or engines</b>	<b>15/00</b>	<b>Controlling</b> (controlling in general G05)
		<b>17/00</b>	<b>Other machines or engines</b>

**F03C POSITIVE-DISPLACEMENT ENGINES DRIVEN BY LIQUIDS** (positive-displacement engines for liquids and elastic fluids F01; positive-displacement machines for liquids F04; fluid-pressure actuators F15B; fluid gearing F16H)

**Note**

Attention is drawn to the Notes preceding class F01, especially as regards the definitions of “positive displacement”, “rotary-piston machines”, “oscillating-piston machines”, “rotary-piston”, “co-operating members”, “movement of co-operating members”, “teeth or tooth-equivalents”, and “internal axis”.

<b>1/00</b>	<b>Reciprocating-piston liquid engines</b> (of flexible-wall type F03C 7/00)	<b>4/00</b>	<b>Oscillating-piston engines</b> [3]
1/007	· with single cylinder, double-acting piston [5]	<b>7/00</b>	<b>Engines of flexible-wall type</b> [2010.01]
<b>2/00</b>	<b>Rotary-piston engines</b> (in which the liquid exclusively displaces one or more piston reciprocating in rotary cylinders F03C 1/00) [3]	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b> [2010.01]

**F03D WIND MOTORS****Note**

In this subclass, the following terms or expressions are used with the meanings indicated:

- “wind motor” means a mechanism for converting the energy of natural wind into useful mechanical power, and the transmission of such power to its point of use;
- “rotor” means the wind-engaging parts of the wind motor and the rotary member carrying them;
- “rotation axis” means the axis of rotation of the rotor.

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<b>1/00</b>	<b>Wind motors with rotation axis substantially in wind direction</b> (controlling F03D 7/00)	<b>7/00</b>	<b>Controlling wind motors</b>
<b>3/00</b>	<b>Wind motors with rotation axis substantially at right angle to wind direction</b> (controlling F03D 7/00)	<b>9/00</b>	<b>Adaptations of wind motors for special use; Combinations of wind motors with apparatus driven thereby</b> (aspects predominantly concerning driven apparatus, <u>see</u> the relevant classes for such apparatus)
<b>5/00</b>	<b>Other wind motors</b> (controlling F03D 7/00)	<b>11/00</b>	<b>Details, component parts, or accessories not provided for in, or of interest apart from, the other groups of this subclass</b>

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**F03G SPRING, WEIGHT, INERTIA, OR LIKE MOTORS; MECHANICAL-POWER-PRODUCING DEVICES OR MECHANISMS, NOT OTHERWISE PROVIDED FOR OR USING ENERGY SOURCES NOT OTHERWISE PROVIDED FOR** (arrangements in connection with power supply in vehicles from force of nature B60K 16/00; electric propulsion with power supply in vehicles from force of nature B60L 8/00)

**Note**

In this subclass, the following term is used with the meaning indicated:

- “motors” means mechanisms for producing mechanical power from potential energy of solid bodies.

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<b>1/00</b>	<b>Spring motors</b> (spring-driven toys A63H; springs in general F16F; precision time mechanisms, e.g. for clocks or watches, G04B)	<b>6/00</b>	<b>Devices for producing mechanical power from solar energy</b> (solar boilers F24) [5]
<b>3/00</b>	<b>Other motors, e.g. gravity or inertia motors</b>	<b>7/00</b>	<b>Mechanical-power-producing mechanisms, not otherwise provided for or using energy sources not otherwise provided for</b>
<b>4/00</b>	<b>Devices for producing mechanical power from geothermal energy</b> [5]	<b>7/06</b>	<ul style="list-style-type: none"> <li>• using expansion or contraction of bodies due to heating, cooling, moistening, drying, or the like (using thermal expansion of non-vaporising liquids F01K)</li> </ul>
<b>5/00</b>	<b>Devices for producing mechanical power from muscle energy</b> (driving cycles B62M)		

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**F03H PRODUCING A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR** (from combustion products F02K)

<b>1/00</b>	<b>Use of plasma to produce a reactive propulsive thrust</b> (generating plasma H05H 1/00)	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass [2009.01]</b>
<b>3/00</b>	<b>Use of photons to produce a reactive propulsive thrust</b>		

**F04 POSITIVE-DISPLACEMENT MACHINES FOR LIQUIDS; PUMPS FOR LIQUIDS OR ELASTIC FLUIDS** (portable fire extinguishers with manually-operated pumps A62C 11/00, with power-driven pumps A62C 25/00; charging or scavenging combustion engines by pumps F02B; engine fuel-injection pumps F02M; ion pumps H01J 41/00; electrodynamic pumps H02K 44/00)

#### Note

Combinations of positive-displacement and non-positive-displacement pumps are classified in subclass F04B as a general subclass for pumps, and in subclasses F04C, F04D in respect of matter specific to those subclasses.

**F04B POSITIVE-DISPLACEMENT MACHINES FOR LIQUIDS; PUMPS** (machines for liquids, or pumps, of rotary-piston or oscillating-piston type F04C; non-positive-displacement pumps F04D; pumping of fluid by direct contact of another fluid or by using inertia of fluid to be pumped F04F; crankshafts, crossheads, connecting-rods F16C; flywheels F16F; gearings for interconverting rotary motion and reciprocating motion in general F16H; pistons, piston-rods, cylinders, in general F16J)

- (1) In this subclass, the following term is used with the meaning indicated:  
– “piston” also covers a plunger.
- (2) Attention is drawn to the Notes following the titles of class B81 and subclass B81B relating to “micro-structural devices” and “micro-structural systems”. [7]
- (3) Attention is drawn to the Notes preceding class F01, especially as regards the definitions of “machines”, “pumps”, and “positive-displacement”.
- (4) Machines, pumps or pumping installations having flexible working members are classified in groups F04B 43/00 or F04B 45/00. [2009.01]

#### Subclass index

##### POSITIVE-DISPLACEMENT MACHINES FOR LIQUIDS, PUMPS IN GENERAL

General characteristics of machines and pumps

- multiple cylinders; single cylinders, pistons coacting in cylinder; differential-surface pistons; flexible working members ..... 1/00; 3/00; 5/00; 43/00
- positively-driven distribution members; driving or driven means to or from working members ..... 7/00; 9/00
- equalization of pulses, counteracting cavitation ..... 11/00
- other characteristics ..... 19/00

Characteristics peculiar to pumps, their adaptations or combinations

- delivering measured quantities; handling specific fluids; pumping from great depths ..... 13/00; 15/00; 47/00
- associated with specific driving engines ..... 17/00

Other characteristics ..... 19/00  
Pumping installations or systems ..... 23/00, 43/00, 47/00

Component parts, details or accessories ..... 53/00

##### PUMPS FOR ELASTIC FLUIDS

General characteristics

- multiple stages; multiple cylinders ..... 25/00; 27/00
- free piston; flexible working member; actuation by muscle power ..... 31/00; 45/00; 33/00
- driving means ..... 35/00

For pumping from great depths ..... 47/00

Other characteristics; other details or accessories ..... 37/00; 39/00

Pumping installations or systems ..... 41/00, 45/00, 47/00

CONTROL, SAFETY MEASURES; TESTING ..... 49/00; 51/00

COMPONENT PARTS, DETAILS OR ACCESSORIES ..... 53/00

#### Pumps for liquids or for liquid and elastic fluids; Positive-displacement machines for liquids

- 1/00 **Multi-cylinder machines or pumps characterised by number or arrangement of cylinders** (F04B 3/00 takes precedence; fluid-driven pumps F04B 9/00; control of reciprocating machines or pumps in general F04B 49/00)
- 1/12 . having cylinder axes coaxial with, or parallel or inclined to, main shaft axis
- 1/20 . . having rotary cylinder block

- 3/00 **Machines or pumps with pistons coacting within one cylinder, e.g. multi-stage**
- 5/00 **Machines or pumps with differential-surface pistons**
- 7/00 **Piston machines or pumps characterised by having positively-driven valving** (with cylinders in star- or fan-arrangement F04B 1/00; with cylinder axes coaxial with, or parallel or inclined to, main shaft axis F04B 1/12)

- 9/00** **Piston machines or pumps characterised by the driving or driven means to or from their working members**
- 9/02 . the means being mechanical (with cylinder axes coaxial with, or parallel or inclined to, main shaft axis F04B 1/12)
- 11/00** **Equalisation of pulses, e.g. by use of air vessels; Counteracting cavitation**
- 13/00** **Pumps specially modified to deliver fixed or variable measured quantities** (for transferring liquid from bulk storage containers or reservoirs into vehicles or into portable containers B67D 7/58)
- 15/00** **Pumps adapted to handle specific fluids, e.g. by selection of specific materials for pumps or pump parts**
- 17/00** **Pumps characterised by combination with, or adaptation to, specific driving engines or motors**
- 17/03 . driven by electric motors [6]
- 19/00** **Machines or pumps having pertinent characteristics not provided for in, or of interest apart from, groups F04B 1/00 to F04B 17/00**
- 23/00** **Pumping installations or systems** (F04B 17/00 takes precedence)

#### Pumps specially adapted for elastic fluids

- 25/00** **Multi-stage pumps specially adapted for elastic fluids**
- 27/00** **Multi-cylinder pumps specially adapted for elastic fluids and characterised by number or arrangement of cylinders** (F04B 25/00 takes precedence; control of reciprocating machines or pumps in general F04B 49/00)
- 27/08 . having cylinders coaxial with, or parallel or inclined to, main shaft axis
- 27/10 . . having stationary cylinders [6]
- 27/14 . . Control [6]
- 31/00** **Free-piston pumps specially adapted for elastic fluids; Systems incorporating such pumps** (muscle-driven pumps in which the stroke is not defined by gearing F04B 33/00; free-piston combustion engines, free-piston gas generators F02B 71/00; systems predominated by prime mover aspects, see the relevant class for the prime mover)
- 33/00** **Pumps specially adapted for elastic fluids actuated by muscle power, e.g. for inflating**
- 35/00** **Piston pumps specially adapted for elastic fluids and characterised by the driving means to their working members, or by combination with, or adaptation to, specific driving engines or motors, not otherwise provided for** (predominant aspects of the engines or motors, see the relevant classes)
- 37/00** **Pumps specially adapted for elastic fluids and having pertinent characteristics not provided for in, or of interest apart from, groups F04B 25/00 to F04B 35/00**
- 39/00** **Component parts, details, or accessories, of pumps or pumping systems specially adapted for elastic fluids, not otherwise provided for in, or of interest apart from, groups F04B 25/00 to F04B 37/00** (for controlling F04B 49/00)
- 39/02 . Lubrication (of machines or engines in general F01M)

- 39/04 . Measures to avoid lubricant contaminating the pumped fluid
- 39/06 . Cooling (of machines or engines in general F01P); Heating; Prevention of freezing
- 39/08 . Actuation of distribution members
- 39/10 . Adaptation or arrangement of distribution members
- 39/12 . Casings (casings for machines or engines in general F16M); Cylinders; Cylinder heads; Fluid connections
- 39/14 . Provisions for readily assembling or disassembling
- 39/16 . Filtration; Moisture separation
- 41/00** **Pumping installations or systems specially adapted for elastic fluids** (F04B 31/00, F04B 35/00 take precedence)

#### Machines or pumps having flexible working members

- 43/00** **Machines, pumps, or pumping installations having flexible working members** (pumps or pumping installations specially adapted for elastic fluids F04B 45/00)
- 43/02 . having plate-like flexible members, e.g. diaphragms (F04B 43/12 takes precedence) [3]
- 43/06 . . Pumps having fluid drive
- 43/12 . having peristaltic action
- 45/00** **Pumps or pumping installations having flexible working members and specially adapted for elastic fluids**
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- 47/00** **Pumps or pumping installations specially adapted for raising fluids from great depths, e.g. well pumps** (by using positive or negative pressurised fluid medium acting directly on the liquid to be pumped F04F 1/00)
- 49/00** **Control of, or safety measures for, machines, pumps, or pumping installations, not otherwise provided for in, or of interest apart from, groups F04B 1/00 to F04B 47/00**
- 49/02 . Stopping, starting, unloading, or idling control (controlled electrically F04B 49/06) [6]
- 49/04 . Regulating by means of floats (F04B 49/02 takes precedence) [6]
- 49/06 . Control using electricity (regulating by means of floats actuating electric switches F04B 49/04)
- 49/08 . Regulating by delivery pressure
- 49/10 . Other safety measures
- 49/12 . by varying the length of stroke of the working members [6]
- 49/16 . by adjusting the capacity of dead spaces of working chambers [6]
- 49/18 . by changing the effective cross-section of the working surface of the piston [6]
- 49/20 . by changing the driving speed (controlled electrically F04B 49/06) [6]
- 49/22 . by means of valves (F04B 49/02 takes precedence) [6]
- 51/00** **Testing machines, pumps, or pumping installations**
- 53/00** **Component parts, details or accessories not provided for in, or of interest apart from, groups F04B 1/00 to F04B 23/00 or F04B 39/00 to F04B 47/00** [6]
- 53/10 . Valves; Arrangement of valves [6]

**F04C ROTARY-PISTON, OR OSCILLATING-PISTON, POSITIVE-DISPLACEMENT MACHINES FOR LIQUIDS** (engines F03C); **ROTARY-PISTON, OR OSCILLATING-PISTON, POSITIVE-DISPLACEMENT PUMPS**
**Note**

Attention is drawn to the Notes preceding class F01, especially as regards the definitions of “machines”, “pumps”, “positive displacement”, “rotary-piston machines”, “oscillating-piston machines”, “rotary piston”, “co-operating members”, “movement of co-operating members”, “teeth or tooth-equivalents”, and “internal axis”.

**Subclass index**
**MACHINES OR PUMPS**

Rotary-piston	
general characteristics; non-parallel axes of movement of co-operating members .....	2/00; 3/00
resiliently-deformable chamber walls; fluid ring .....	5/00; 7/00
Oscillating-piston .....	9/00
Combinations or adaptations .....	11/00, 13/00
Pump installations .....	11/00
Control; monitoring; safety arrangements .....	14/00
Other details or accessories .....	15/00

**PUMPS SPECIALLY ADAPTED FOR ELASTIC FLUIDS**

Rotary-piston pumps .....	18/00
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Rotary-piston pumps with fluid ring or the like .....	19/00
Oscillating-piston pumps .....	21/00
Combinations of two or more pumps, each being of rotary-piston or oscillating-piston type; Pumping installations; Multi-stage pumps .....	23/00
Adaptations of pumps for special use .....	25/00
Sealing arrangements in rotary-piston pumps .....	27/00
Control; monitoring; safety arrangements .....	28/00
Other components parts, details or accessories .....	29/00

- 2/00 Rotary-piston machines or pumps** (with non-parallel axes of co-operating members F04C 3/00; with the working-chamber walls at least partly resiliently deformable F04C 5/00; with fluid ring or the like F04C 7/00; rotary-piston pumps specially adapted for elastic fluids F04C 18/00, F04C 19/00; rotary-piston machines or pumps in which the working-fluid is exclusively displaced by, or exclusively displaces, one or more reciprocating pistons F04B) [3]
- 3/00 Rotary-piston machines or pumps, with non-parallel axes of movement of co-operating members, e.g. of screw type** (with the working-chamber walls at least partly resiliently deformable F04C 5/00; rotary-piston pumps with non-parallel axes of movement of co-operating members specially adapted for elastic fluids F04C 18/48)
- 5/00 Rotary-piston machines or pumps with the working-chamber walls at least partly resiliently deformable** (such pumps specially adapted for elastic fluids F04C 18/00)
- 7/00 Rotary-piston machines or pumps with fluid ring or the like** (such pumps specially adapted for elastic fluids F04C 19/00)
- 9/00 Oscillating-piston machines or pumps** (such pumps specially adapted for elastic fluids F04C 21/00)
- 11/00 Combinations of two or more machines or pumps, each being of rotary-piston or oscillating-piston type** (combinations of such pumps specially adapted for elastic fluids F04C 23/00); **Pumping installations** (F04C 13/00 takes precedence; specially adapted for elastic fluids F04C 23/00; fluid gearing F16H)
- 13/00 Adaptations of machines or pumps for special use, e.g. for extremely high pressures** (of pumps specially adapted for elastic fluids F04C 25/00)

- 14/00 Control of, monitoring of, or safety arrangements for, machines, pumps or pumping installations** (of pumps or pumping installations specially adapted for elastic fluids F04C 28/00) [8]
- 15/00 Component parts, details or accessories of machines, pumps or pumping installations, not provided for in groups F04C 2/00 to F04C 14/00** (of pumps specially adapted for elastic fluids F04C 18/00 to F04C 29/00) [1,8]

**Pumps specially adapted for elastic fluids**

- 18/00 Rotary-piston pumps specially adapted for elastic fluids** (with fluid ring or the like F04C 19/00; rotary-piston pumps in which the working-fluid is exclusively displaced by one or more reciprocating pistons F04B) [3]
- 18/02 . of arcuate-engagement type, i.e. with circular translatory movement of co-operating members, each member having the same number of teeth or tooth-equivalents [3]
- 18/04 . . of internal-axis type [3]
- 18/06 . . of other than internal-axis type (F04C 18/063 takes precedence) [3]
- 18/063 . . with coaxially-mounted members having continuously-changing circumferential spacing between them [3]
- 18/08 . of intermeshing-engagement type, i.e. with engagement of co-operating members similar to that of toothed gearing [3]
- 18/12 . . of other than internal-axis type [3]
- 18/14 . . . with toothed rotary pistons [3]
- 18/16 . . . . with helical teeth, e.g. chevron-shaped, screw type [3]



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| <p>18/22 . of internal-axis type with equidirectional movement of co-operating members at the points of engagement, or with one of the co-operating members being stationary, the inner member having more teeth or tooth-equivalents than the outer member [3]</p> <p>18/24 . of counter-engagement type, i.e. the movement of co-operating members at the points of engagement being in opposite directions [3]</p> <p>18/30 . having the characteristics covered by two or more of groups F04C 18/02, F04C 18/08, F04C 18/22, F04C 18/24, F04C 18/48, or having the characteristics covered by one of these groups together with some other type of movement between co-operating members [3]</p> <p>18/34 . . having the movement defined in group F04C 18/08 or F04C 18/22 and relative reciprocation between the co-operating members [3]</p> <p>18/356 . . . with vanes reciprocating with respect to the outer member [3]</p> <p>18/48 . Rotary-piston pumps with non-parallel axes of movement of co-operating members [5]</p> <p><b>Note</b></p> <p>Group F04C 18/30 takes precedence over group F04C 18/48. [8]</p> <p><b>19/00 Rotary-piston pumps with fluid ring or the like, specially adapted for elastic fluids</b></p> | <p><b>21/00 Oscillating-piston pumps specially adapted for elastic fluids</b></p> <p><b>23/00 Combinations of two or more pumps, each being of rotary-piston or oscillating-piston type, specially adapted for elastic fluids; Pumping installations specially adapted for elastic fluids; Multi-stage pumps specially adapted for elastic fluids</b> (F04C 25/00 takes precedence)</p> <p><b>25/00 Adaptations for special use of pumps for elastic fluids</b></p> <p><b>27/00 Sealing arrangements in rotary-piston pumps specially adapted for elastic fluids</b></p> <p><b>28/00 Control of, monitoring of, or safety arrangements for, pumps or pumping installations specially adapted for elastic fluids [8]</b></p> <p><b>29/00 Component parts, details, or accessories, of pumps or pumping installations specially adapted for elastic fluids, not provided for in groups F04C 18/00 to F04C 28/00</b></p> <p>29/02 . Lubrication (of machines or engines in general F01M); Lubricant separation (separation in general B01D)</p> <p>29/04 . Heating; Cooling (of machines or engines in general F01P); Heat insulation (heat insulation in general F16L 59/00)</p> <p>29/06 . Silencing (gas-flow silencers or exhaust apparatus for machines or engines in general F01N)</p> <p>29/12 . Arrangements for admission or discharge of the working fluid, e.g. constructional features of the inlet or outlet [8]</p> |
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## F04D NON-POSITIVE-DISPLACEMENT PUMPS

- (1) This subclass covers non-positive-displacement pumps for liquids, for elastic fluids, or for liquids and elastic fluids whether rotary or not having pure rotation.
- (2) This subclass does not cover combinations of non-positive-displacement pumps with other pumps, which are covered by subclass F04B, except that the use of such other pumps for priming or boosting non-positive-displacement is covered by this subclass.
- (3) Attention is drawn to the Notes preceding class F01, especially as regards the definition of "pump".

### Subclass index

#### ROTARY PUMPS FOR LIQUID AND ELASTIC FLUID OR LIQUID ALONE

Kind of flow: radial or helico-centrifugal; axial; circumferential or transverse; other ..... 1/00; 3/00; 5/00; 11/00

For handling specific fluids ..... 7/00

Priming, preventing vapour lock ..... 9/00

Pumping installations or systems; control ..... 13/00; 15/00

#### ROTARY PUMPS FOR ELASTIC FLUID

Kind of flow: radial or helico-centrifugal; axial; other ..... 17/00; 19/00; 23/00

Involving supersonic speed of fluid ..... 21/00

Pumping installations; control ..... 25/00; 27/00

#### DETAILS OR ACCESSORIES ..... 29/00

#### OTHER KINDS OF PUMPS

Pumping liquid and elastic fluid at the same time ..... 31/00

With other than pure rotation ..... 33/00

Wave producers ..... 35/00

**1/00 Radial-flow pumps, e.g. centrifugal pumps; Helico-centrifugal pumps** (adapted for pumping specific fluids F04D 7/00; priming or boosting F04D 9/00; pumping liquids and elastic fluids at the same time F04D 31/00)

**3/00 Axial-flow pumps** (priming or boosting F04D 9/00; pumping liquids and elastic fluids at the same time F04D 31/00)

5/00	<b>Pumps with circumferential or transverse flow</b> (pumping liquids and elastic fluids at the same time F04D 31/00)	27/00	<b>Control, e.g. regulation, of pumps, pumping installations or pumping systems specially adapted for elastic fluids</b>
7/00	<b>Pumps adapted for handling specific fluids, e.g. by selection of specific materials for pumps or pump parts</b> (pumping liquids and elastic fluids at the same time F04D 31/00)	27/02	• Surge control
9/00	<b>Priming; Preventing vapour lock</b>		
11/00	<b>Other rotary non-positive-displacement pumps</b> (pumping installations or systems F04D 13/00; pumping liquids and elastic fluids at the same time F04D 31/00)	29/00	<b>Details, component parts, or accessories</b> (machine elements in general F16)
13/00	<b>Pumping installations or systems</b> (controlling F04D 15/00; pumping liquids and elastic fluids at the same time F04D 31/00)	29/04	• Shafts or bearings, or assemblies thereof (specially adapted for elastic fluid pumps F04D 29/05) [1,8]
13/02	• Units comprising pumps and their driving means (predominant aspects of the driving means, <u>see</u> the relevant classes for such means)	29/05	• Shafts or bearings, or assemblies thereof, specially adapted for elastic fluid pumps [8]
13/06	• . . the pump being electrically driven	29/06	• Lubrication [1,8]
15/00	<b>Control, e.g. regulation, of pumps, pumping installations, or systems</b>	29/08	• Sealings
15/02	• Stopping of pumps, or operating valves, on occurrence of unwanted conditions	29/18	• Rotors (specially adapted for elastic fluids F04D 29/26)
		29/26	• Rotors specially adapted for elastic fluids
		29/28	• . . for centrifugal or helico-centrifugal pumps
		29/30	• . . . Vanes
		29/32	• . . for axial-flow pumps
		29/38	• . . . Blades
		29/40	• Casings; Connections for working fluid
		29/42	• . . for radial or helico-centrifugal pumps
		29/44	• . . . Fluid-guiding means, e.g. diffusers
		29/46	• . . . . adjustable
		29/58	• Cooling (of machines or engines in general F01P); Heating; Diminishing heat transfer
		29/60	• Mounting; Assembling; Disassembling
		29/66	• Combating cavitation, whirls, noise, vibration, or the like (gas-flow silencers for machines or engines in general F01N); Balancing (surge control F04D 27/02)
			<b>Other non-positive-displacement pumps</b>
		31/00	<b>Pumping liquids and elastic fluids at the same time</b>
		33/00	<b>Non-positive-displacement pumps with other than pure rotation, e.g. of oscillating type</b> (F04D 35/00 takes precedence; hand-held fans A45B) [2]
		35/00	<b>Pumps producing waves in liquids, i.e. wave-producers</b> (for bath tubs A47K 3/10) [2]

**F04F PUMPING OF FLUID BY DIRECT CONTACT OF ANOTHER FLUID OR BY USING INERTIA OF FLUID TO BE PUMPED** (containers or packages with special means for dispensing liquid or semi-liquid contents by internal gaseous pressure B65D 83/14); **SIPHONS** [2]

- (1) Attention is drawn to the Notes preceding class F01.  
(2) Combinations of pumps covered by this subclass with other pumps are only classified in this subclass if such other pumps are intended for preliminary pumping for diffusion pumps.

#### **Subclass index**

PUMPS USING PRESSURE OR FLOW OF ANOTHER FLUID..... 1/00, 5/00  
PUMPS USING NEGATIVE PRESSURE;  
PUMPS USING INERTIA OF THE FLUID..... 1/00, 3/00;  
7/00

DIFFUSION PUMPS, e.g. WITH FORE PUMPS ..... 9/00  
SIPHONS; OTHER PUMPS..... 10/00; 99/00  
JET-PUMP INSTALLATIONS ..... 5/00

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| <p><b>1/00</b>    <b>Pumps using positively or negatively pressurised fluid medium acting directly on the liquid to be pumped</b> (using only negative pressure F04F 3/00; jet pumps F04F 5/00; siphons F04F 10/00)</p> <p><b>3/00</b>    <b>Pumps using negative pressure acting directly on the liquid to be pumped</b> (siphons F04F 10/00)</p> <p><b>5/00</b>    <b>Jet pumps, i.e. devices in which fluid flow is induced by pressure drop caused by velocity of another fluid flow</b> (diffusion pumps F04F 9/00; combination of jet pumps with pumps of other than jet type F04B; use of jet pumps for priming or boosting non-positive-displacement pumps F04D)</p> | <p><b>7/00</b>    <b>Pumps displacing fluids by using inertia thereof, e.g. by generating vibrations therein</b></p> <p><b>9/00</b>    <b>Diffusion pumps</b></p> <p><b>10/00</b>   <b>Siphons</b></p> <p><b>13/00</b>   <b>Pressure exchangers [2009.01]</b></p> <p><b>99/00</b>   <b>Subject matter not provided for in other groups of this subclass [2009.01]</b></p> |
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## ENGINEERING IN GENERAL

### F15 FLUID-PRESSURE ACTUATORS; HYDRAULICS OR PNEUMATICS IN GENERAL

**F15B SYSTEMS ACTING BY MEANS OF FLUIDS IN GENERAL; FLUID-PRESSURE ACTUATORS, E.G. SERVOMOTORS; DETAILS OF FLUID-PRESSURE SYSTEMS, NOT OTHERWISE PROVIDED FOR** (motors, turbines, compressors, blowers, pumps F01 to F04; fluid dynamics F15D; fluid clutches or brakes F16D; fluid springs F16F; fluid gearing F16H; pistons, cylinders, packing F16J; valves, taps, cocks, actuating-floats F16K; safety valves with auxiliary fluid operation of the main valve F16K 17/04; fluid-operating means for valves F16K 31/12; pipes, pipe joints F16L; lubricating F16N)

#### Note

In this subclass, the following terms are used with the meanings indicated:

- “telemotor” means a system or device in which a substantially constant amount of fluid is trapped between an input member and an output member to act as a fluid link;
- “servomotor” means a fluid-pressure actuator, e.g. a piston and cylinder, directly controlled by a valve or other device which is responsive to operation of an initial controlling member; “Servomotor” does not cover a telemotor. The initial controlling member may be adjacent to the servomotor or at a distance, and may be, for example, a hand lever.

#### Subclass index

SUPPLYING FLUID UNDER PRESSURE .....	1/00	Servomotors .....	9/00, 11/00, 13/00
INTENSIFIERS OR FLUID-PRESSURE CONVERTERS; TRANSDUCERS .....	3/00; 5/00	Devices for displacing a member .....	15/00
FLUID-PRESSURE ACTUATOR SYSTEMS		Combinations of telemotors and servomotors; other systems; details.....	17/00; 18/00; 21/00
Telemotors or systems related to the output of a pump.....	7/00	TESTING; SAFETY .....	19/00; 20/00

- 1/00 Installations or systems with accumulators; Supply reservoir or sump assemblies**
- 3/00 Intensifiers or fluid-pressure converters, e.g. pressure exchangers; Conveying pressure from one fluid system to another, without contact between the fluids**
- 5/00 Transducers converting variations of physical quantities, e.g. expressed by variations in positions of members, into fluid-pressure variations or *vice versa*; Varying fluid pressure as a function of variations of a plurality of fluid pressures or variations of other quantities (F15B 9/00 takes precedence; for measuring or controlling G01, G05)**

#### Fluid-pressure actuator systems

- (1) Groups F15B 7/00 to F15B 21/00 cover systems in which members are moved into one or more definite positions by means of fluid pressure.
- (2) Pump, motor, and control features so far as not peculiar to this purpose are classified in the relevant classes.
- 7/00 Fluid-pressure actuator systems in which the movement produced is definitely related to the output of a volumetric pump; Telemotors**

- 9/00 Servomotors with follow-up action, i.e. in which the position of the actuated member conforms with that of the controlling member**
- 11/00 Servomotor systems without provision for follow-up action (F15B 3/00 takes precedence)**
- 13/00 Details of servomotor systems (F15B 15/00 takes precedence)**
- 15/00 Fluid-actuated devices for displacing a member from one position to another (motors for continuous movement F01 to F03); Gearing associated therewith**
- 17/00 Combinations of telemotor and servomotor systems**
- 18/00 Parallel arrangements of independent servomotor systems**
- 19/00 Testing fluid-pressure actuator systems or apparatus, so far as not provided for elsewhere**
- 20/00 Safety arrangements for fluid actuator systems; Applications of safety devices in fluid actuator systems; Emergency measures for fluid actuator systems**
- 21/00 Common features of fluid actuator systems; Fluid-pressure actuator systems or details thereof, not covered by any other group of this subclass**

**F15C FLUID-CIRCUIT ELEMENTS PREDOMINANTLY USED FOR COMPUTING OR CONTROL PURPOSES** (transducers F15B 5/00; fluid dynamics in general F15D; computers comprising fluid elements G06D, G06G)

**Note**

Attention is drawn to the Notes following the titles of class B81 and subclass B81B relating to “micro-structural devices” and “micro-structural systems”. [7]

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<b>1/00</b>	<b>Circuit elements having no moving parts</b>	<b>4/00</b>	<b>Circuit elements characterised by their special functions</b>
<b>3/00</b>	<b>Circuit elements having moving parts</b> (valves, construction of valves F16K)	<b>5/00</b>	<b>Manufacture of fluid-circuit elements; Manufacture of assemblages of such elements</b>
		<b>7/00</b>	<b>Hybrid elements, i.e. circuit elements having features according to groups F15C 1/00 and F15C 3/00 [2]</b>

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**F15D FLUID DYNAMICS, I.E. METHODS OR MEANS FOR INFLUENCING THE FLOW OF GASES OR LIQUIDS** (fluid-circuit elements F15C)

**Note**

This subclass covers boundary-layer control and other arrangements and methods, not provided for in other classes, for influencing the flow of fluids relative to constraining surfaces and after leaving these surfaces, e.g. producing or removing turbulence, deflecting jets, guiding flow through bends in conduits, affecting distribution of fluid in a conduit, reducing fluid friction.

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**1/00 Influencing the flow of fluids**

**F16 ENGINEERING ELEMENTS OR UNITS; GENERAL MEASURES FOR PRODUCING AND MAINTAINING EFFECTIVE FUNCTIONING OF MACHINES OR INSTALLATIONS; THERMAL INSULATION IN GENERAL**

**F16B DEVICES FOR FASTENING OR SECURING CONSTRUCTIONAL ELEMENTS OR MACHINE PARTS TOGETHER, E.G. NAILS, BOLTS, CIRCLIPS, CLAMPS, CLIPS OR WEDGES; JOINTS OR JOINTING** (couplings for transmitting rotation F16D)

**Note**

Attention is drawn to:

(a) the Note following group E04B 1/38; [5]

(b) the following places:

A44B		Buckles, slide fasteners
A47G	3/00	Ornamental heads for nails, screws, or the like
B42F	3/00	Means, not using staples, for attaching sheets temporarily together
E01B	9/00	Screws or bolts for railway sleepers
E01B	11/00	Rail joints
E04		Connections for building
E04D	13/04	Clamping means for down pipes for roof drainage
E04F	13/21	Fastening means specially adapted for covering or lining elements for buildings
E04G	5/00	Fastening scaffolds against buildings
E04G	7/00	Scaffolding couplings
E05C		Bolts or fasteners for wings, specially for doors or windows
F16C	29/00	Locking bearings for parts moving only linearly
F16G	17/00	Hooks as integral parts of chains
F16L		Pipe joints
F16L	3/00	Supports for pipes, cables or protective tubing, e.g. hangers, holders, clamps, cleats, clips, brackets
F16L	33/02	Clips for connecting hoses to rigid members
H01F	7/00	Magnetic holding devices
H02N	13/00	Electrostatic holding devices.

**Subclass index**

**TYPES OF FASTENING**

By: clamping, wedging ..... 2/00; 3/00

By: shrinking or force fit; sticking  
or pressing together; penetration of  
one member into a hole in another ..... 4/00; 11/00;  
17/00

Fastening of plates, strips, bars, or  
tubes together or to flat surfaces ..... 5/00, 7/00,  
9/00

For specific applications

for furniture ..... 12/00

for fixing in walls ..... 13/00

by screw-thread modified in  
view of tensile load ..... 31/00

**FASTENING MEANS**

General

clamps; clips; wedges, keys ..... 2/00; 3/00

dowels ..... 13/00

other fastening means ..... 1/00, 45/00,  
47/00

Without screw-thread

nails, staples; bolts, pins, or  
rivets ..... 15/00; 19/00

locking stud-and-socket  
fastenings against axial  
movement ..... 21/00

With screw-thread

screws; bolts, break-bolts, nuts ..... 25/00, 15/00,  
27/00; 27/00, 31/00, 35/00, 37/00

features common to bolts and  
screws ..... 23/00, 27/00,  
33/00

deformation of nut or  
equivalent while fastening;  
locking of screws, bolts, or  
nuts ..... 29/00; 39/00

Accessories for fastening means ..... 41/00, 43/00

**1/00 Devices for securing together, or preventing relative movement between, constructional elements or machine parts**

**Note**

Groups F16B 2/00 to F16B 47/00 take precedence over group F16B 1/00. [2]

**Fastenings for constructional elements or machine parts in general**

- 2/00 Friction-grip releasable fastenings** (for cables or ropes, e.g. cleats, F16G 11/00; supports for pipes, cables or protective tubing F16L 3/00)
- 2/02 . Clamps, i.e. with gripping action effected by positive means other than the inherent resistance to deformation of the material of the fastening
- 2/20 . Clips, i.e. with gripping action effected solely by the inherent resistance to deformation of the material of the fastening
- 3/00 Key-type connections; Keys** (F16B 2/00 takes precedence; for rods or tubes mutually F16B 7/00)
- 4/00 Shrinkage connection, e.g. assembled with the parts at different temperature; Force fits** (restricted to metal parts or objects B23P 11/02); **Non-releasable friction-grip fastenings** (F16B 2/00 takes precedence)
- 5/00 Joining sheets or plates to one another or to strips or bars parallel to them** (by sticking together F16B 11/00; dowel connections F16B 13/00; pins, including deformable elements F16B 19/00; covering of walls E04F 13/00; fastening signs, plates, panels, or boards to a supporting structure, fastening readily-detachable elements, e.g. letters, to signs, plates, panels, or boards, G09F 7/00)
- 5/02 . by means of fastening members using screw-thread (construction of screw-threaded connections F16B 25/00 to F16B 39/00)
- 5/06 . by means of clamps or clips (friction-grip releasable fastenings in general F16B 2/00)
- 5/12 . Fastening strips or bars to sheets or plates, e.g. rubber strips, decorative strips for motor vehicles, by means of clips (friction-grip releasable fastenings in general F16B 2/00; fastening rods or tubular parts to flat surfaces at an angle F16B 9/00; clips for connecting hoses to rigid members F16L 33/02)
- 7/00 Connections of rods or tubes, e.g. of non-circular section, mutually, including resilient connections** (umbrella frames A45B 25/00; welding or soldering of connections B23K; vehicle connections in general B60D; railway couplings B61G; bicycle frames B62K; couplings for transmitting rotation F16D; couplings for tubes conveying fluid F16L)
- 7/04 . Clamping or clipping connections (friction-grip releasable fastenings in general F16B 2/00)
- 7/18 . using screw-thread elements
- 9/00 Connections of rods or tubular parts to flat surfaces at an angle** (friction-grip releasable fastenings in general F16B 2/00; making press-fit connections B23P 11/00, B23P 19/00; fluid-tight connecting of pipes to reservoirs, sheets, or the like F16L, e.g. joining pipes to walls F16L 41/00; supports for pipes, cables or protective tubing F16L 3/00)
- 
- 11/00 Connecting constructional elements or machine parts by sticking or pressing them together, e.g. cold pressure welding** (non-electric welding in general B23K; methods of using adhesives independently of the form of the surfaces joined C09J 5/00)

- 12/00 Jointing of furniture or the like, e.g. hidden from exterior** (F16B 2/00 to F16B 11/00 take precedence; fastening means per se F16B 13/00 to F16B 47/00; wood-working B27)
- 13/00 Dowels or other devices fastened in walls or the like by inserting them in holes made therein for that purpose** (nails F16B 15/00; self-locking pins or bolts in general, stud-and-socket releasable fastenings F16B 21/00; dowels or bolts for railroad sleepers E01B 9/00; means for anchoring structural elements or bulkheads specially adapted to foundation engineering E02D 5/74; bolts or dowels used while laying bricks or casting concrete E04B 1/38; setting anchoring bolts in shafts, tunnels or galleries E21D 20/00; anchoring bolts for shafts, tunnels or galleries E21D 21/00) [5]
- 13/04 . with parts gripping in the hole or behind the reverse side of the wall after inserting from the front (friction-grip releasable fastenings in general F16B 2/00)
- 13/06 . . combined with expanding sleeve

**Fastening means without screw-thread**

- 15/00 Nails; Staples** (surgical staples A61B 17/064; manufacture of nails or staples B21G; railway spikes E01B 9/00)
- 17/00 Fastening means without screw-thread for connecting constructional elements or machine parts by a part of or on one member entering a hole in the other** (construction of bolts, pins, or rivets F16B 19/00; riveting F16B 19/04; means for preventing withdrawal of a pin, spigot, or the like from its operative position, stud-and-socket releasable fastenings F16B 21/00)
- 19/00 Bolts without screw-thread; Pins, including deformable elements** (in screwed connections F16B 29/00); **Rivets** (means for preventing withdrawal F16B 21/00)
- 19/04 . Rivets; Spigots or the like fastened by riveting (lead seals G09F 3/00)
- 21/00 Means without screw-thread for preventing relative axial movement of a pin, spigot, shaft, or the like and a member surrounding it** (riveted or deformable spigots F16B 19/04; for gudgeon pins F16J 1/10); **Stud-and-socket releasable fastenings without screw-thread**

**Fastening means using screw-thread**

- 23/00 Specially-shaped heads of bolts or screws for rotations by a tool**
- 25/00 Screws that form threads in the body into which they are screwed, e.g. wood screws, self-tapping screws** [4]
- 27/00 Bolts, screws, or nuts formed in integral series but easily separable, particularly for use in automatic machines**
- 29/00 Screwed connection with deformation of nut or auxiliary member while fastening** (wall-dowels F16B 13/00; members deformed for locking screws, bolts or nuts F16B 39/00)
- 31/00 Screwed connections specially modified in view of tensile load; Break-bolts** (shape of thread F16B 33/00)
- 33/00 Features common to bolt and nut** (wall-dowels F16B 13/00; thread-forms used as screw-locking device F16B 39/00)

**F16B – F16C**

- 35/00 Screw-bolts; Stay bolts; Screw-threaded studs; Screws; Set screws** (wall-dowels F16B 13/00; thread-cutting screws F16B 25/00)
- 35/04 . with specially-shaped head or shaft in order to fix the bolt on or in an object (locking the bolt against turning in the object by the use of accessory parts F16B 39/00)
- 37/00 Nuts or like thread-engaging members** (wall-dowels F16B 13/00)
- 37/04 . Devices for fastening nuts to surfaces, e.g. sheets, plates
- 37/08 . Quickly-detachable nuts, e.g. consisting of two or more parts; Nuts movable along the bolt after tilting the nut
- 39/00 Locking of screws, bolts, or nuts** (wall-dowels F16B 13/00; locking of bottle closures B65D; locking of rail-fastening bolts for permanent ways E01B 9/00; locking of fastening means for railway fishplates E01B 11/00; locking devices for valves or cocks F16K)
- 41/00 Measures against loss of bolts, nuts, or pins; Measures against unauthorised operation of bolts, nuts, or pins** (seals G09F 3/00)
- 43/00 Washers or equivalent devices; Other devices for supporting bolt-heads or nuts** (circlips F16B 21/00; with special means for locking bolts or nuts F16B 39/00)
- 45/00 Hooks; Eyes** (if the attaching parts or means are concerned, groups F16B 13/00, F16B 15/00, F16B 19/00, F16B 25/00, F16B 35/00, F16B 47/00 take precedence; for hanging pictures or the like A47G 1/16; towing hooks for ships B63B 21/56; for hoisting or hauling purposes B66C; hooks or eyes with integral parts designed to facilitate quick attachment to cables or ropes at any point F16G 11/00)
- 47/00 Suction cups for attaching purposes; Equivalent means using adhesives**

**Note**

In this group, heads of screws or bolts are put on a par with nuts as far as pertains to locking; an object into which a screw is threaded is put on a par with a nut.

**F16C SHAFTS; FLEXIBLE SHAFTS; ELEMENTS OF CRANKSHAFT MECHANISMS; ROTARY BODIES OTHER THAN GEARING ELEMENTS; BEARINGS [5]**

- (1) In this subclass, the following expression is used with the meaning indicated:  
– “rotary bodies other than gearing elements” covers any element which rotates so far as its features are affected only by the fact that it rotates.
- (2) Attention is drawn to the following places:
- |      |       |   |
|------|-------|---|
| A01B | 71/00 | Bearings for agricultural machines  |
| B21B | 31/00 | Adaptation of roll bearings for metal-rolling mills   |
| B23Q | 1/25  | Bearings for movable or adjustable work or tool supports  |
| B61C | 17/00 | Connecting-rods, bearings for driving wheels of railway locomotives                             |
| B61F | 15/00 | Axle-boxes for railway vehicles   |
| B62K | 21/00 | Bearings for steering heads   |
| E06B | 9/17, | Bearings specially adapted for roller shutters or for roller blinds                             |
| E06B | 9/24  |   |
| E21B | 10/08 | Bearings for drill bits   |
| F01C | 21/00 | Arrangement of bearings in rotary-piston machines or engines                                    |
| F01D | 25/16 | Arrangement of bearings in non-positive displacement machines or engines                        |
| F02C | 7/06  | Arrangement of bearings in gas-turbine plants   |
| G01C | 19/00 | Bearings for gyroscopes   |
| G01D | 11/00 | Bearings or suspensions for moving parts of measuring instruments                               |
| G01G | 21/00 | Arrangements of bearings in weighing apparatus  |
| G01R | 1/02  | Arrangements of bearings in instruments for measuring electric variables                        |
| G01R | 11/00 | Arrangements of bearings for apparatus for measuring time integral of electric power or current |
| G02C | 5/22  | Hinges for spectacles   |
| G04B | 31/00 | Bearings for clockwork  |
| H02N | 15/00 | Magnetic levitation devices.  |

**Subclass index**

FLEXIBLE TRANSMISSIONS, SHAFTS,  
AXLES, CRANKS, ECCENTRICS..... 1/00, 3/00  
CROSSHEADS, CONNECTING-RODS ..... 5/00, 7/00,  
9/00  
PIVOTS.....11/00  
ROLLS, DRUMS, DISCS .....13/00

**BEARINGS**

For rotatable parts ..... 13/00,  
17/00 to 27/00  
For linearly-movable parts..... 29/00  
For parts which both rotate and  
move linearly ..... 31/00



For crankshafts or connecting- rods ..... 9/00  
 Not otherwise provided for..... 32/00  
 Supports; parts or accessories..... 27/00, 35/00;  
 33/00, 41/00

Cooling; relieving load.....37/00; 39/00  
 MAKING, ASSEMBLING .....33/00, 43/00  
 CONSTRUCTION OF ROTATABLE BODIES  
 TO RESIST CENTRIFUGAL FORCE..... 15/00

- 1/00 Flexible shafts** (flexible shafts in dental machines for boring or cutting A61C 1/08); **Mechanical means for transmitting movement in a flexible sheathing**
- 1/10 . Means for transmitting linear movement in a flexible sheathing, e.g. "Bowden mechanisms" (guiding-sheathings F16C 1/00)
- 3/00 Shafts** (flexible shafts F16C 1/00; marine propeller shafts, paddle wheel shafts B63H 23/00); **Axles; Cranks; Eccentrics**
- 3/02 . Shafts; Axles
- 3/04 . Crankshafts, eccentric-shafts; Cranks, eccentrics
- 5/00 Crossheads; Constructions of connecting-rod heads or piston-rod connections rigid with crossheads** (piston-rods, i.e. rods rigidly connected to the piston, F16J 7/00)
- 7/00 Connecting-rods or like links pivoted at both ends** (coupling-rods for locomotive driving-wheels B61C; inhibiting shift in gearing during unfavourable conditions F16H 61/16); **Construction of connecting-rod heads** (heads rigid with crossheads F16C 5/00)
- 9/00 Bearings for crankshafts or connecting-rods; Attachment of connecting-rods** (lubrication of connecting-rods in connection with crankshafts F16C 3/04; connections to crossheads F16C 5/00, to pistons F16J 1/10)
- 11/00 Pivots; Pivotal connections** (arrangements of steering linkage connections B62D 7/00)
- 11/04 . Pivotal connections (hinges for doors, windows or wings E05D; rubber springs with stiff outer sleeve and inner sleeve or pin F16F 1/38)
- 11/06 . . Ball-joints; Other joints having more than one degree of angular freedom, i.e. universal joints (for transmitting rotary motion F16D 3/00; supports for apparatus with ball-joint heads F16M 11/02)
- 13/00 Rolls, drums, discs, or the like** (guide rollers in feeding webs B65H 27/00; calender rolls, bearings therefor D21G 1/00; pulleys F16H 55/00; rotary drums or rollers for heat-exchange or heat-transfer apparatus F28F 5/00; special adaptations, see the relevant classes); **Bearings or mountings therefor**
- 13/02 . Bearings
- 15/00 Construction of rotary bodies to resist centrifugal force** (flywheels, correction weights F16F 15/30, F16F 15/00)

**Bearings for rotary parts** (F16C 9/00, F16C 13/02 take precedence; allowing for linear movement also F16C 31/00)

- 17/00 Sliding-contact bearings for exclusively rotary movement** (F16C 32/06 takes precedence; adjustable bearings F16C 23/00, F16C 25/00) [2]
- 17/02 . for radial load only
- 17/03 . . with tiltably-supported segments, e.g. Michell bearings
- 17/04 . for axial load only

- 19/00 Bearings with rolling contact, for exclusively rotary movement** (adjustable bearings F16C 23/00, F16C 25/00)
- 19/02 . with bearing balls essentially of the same size in one or more circular rows
- 19/22 . with bearing rollers essentially of the same size in one or more circular rows, e.g. needle bearings
- 19/49 . Bearings with both balls and rollers
- 21/00 Combinations of sliding-contact bearings with ball or roller bearings, for exclusively rotary movement** (F16C 17/00, F16C 19/00take precedence) [2]
- 23/00 Bearings for exclusively rotary movement adjustable for aligning or positioning** (F16C 27/00 takes precedence)
- 25/00 Bearings for exclusively rotary movement adjustable for wear or play** (F16C 27/00 takes precedence)
- 27/00 Elastic or yielding bearings or bearing supports, for exclusively rotary movement** (with sliding surfaces of rubber or synthetic rubber F16C 33/04; shock-damping bearings for watches or clocks G04B 31/00)
- 29/00 Bearings for parts moving only linearly** (F16C 32/06 takes precedence; incorporated in flexible shafts F16C 1/00) [2]
- 29/04 . Ball or roller bearings
- 29/06 . . in which the rolling bodies circulate partly without carrying load
- 31/00 Bearings for parts which both rotate and move linearly**
- 32/00 Bearings not otherwise provided for**
- 32/04 . using magnetic or electric supporting means [2]
- 32/06 . with moving member supported by a fluid cushion formed, at least to a large extent, otherwise than by movement of the shaft, e.g. hydrostatic air-cushion bearings [2]

#### Details or accessories of bearings

- 33/00 Parts of bearings; Special methods for making bearings or parts thereof** (metal-working or like operations, see the relevant classes)
- 33/02 . Parts of sliding-contact bearings
- 33/04 . . Brasses; Bushes; Linings
- 33/30 . Parts of ball or roller bearings
- 33/38 . . Ball cages
- 33/46 . . Cages for rollers or needles
- 33/58 . . Raceways; Race rings
- 33/62 . . . Selection of substances
- 33/66 . . Special parts or details in view of lubrication
- 33/72 . Sealings (sealings in general F16J)
- 33/76 . . of ball or roller bearings
- 35/00 Rigid support of bearing units; Housings, e.g. caps, covers** (F16C 23/00 takes precedence; elastic or yielding supports F16C 27/00)
- 35/04 . in the case of ball or roller bearings
- 37/00 Cooling of bearings**

39/00 Relieving load on bearings

43/00 Assembling bearings

41/00 Other accessories for bearings

**F16D COUPLINGS FOR TRANSMITTING ROTATION** (gearing for conveying rotation F16H, e.g. fluid gearing F16H 39/00 to F16H 47/00); **CLUTCHES** (dynamo-electric clutches H02K 49/00; clutches using electrostatic attraction H02N 13/00); **BRAKES** (electrodynamic brake systems for vehicles in general B60L; dynamo-electric brakes H02K 49/00) [2]

**Note**

Attention is drawn to the following places:

A01D	69/00	Clutches or brakes of harvesters or mowers for grass or cereals
A61C	1/08	Clutches in dental machines for boring or cutting
B21B	35/00	Drive couplings for metal-rolling mills
B30B	15/00	Brakes specially adapted for presses
B30B	15/00	Clutches specially adapted for presses
B41J	33/52	Braking devices for ribbon-feed devices in selective printing mechanisms
B60K	17/00	Arrangement or location of clutches in vehicles
B61H		Brakes peculiar to rail vehicles
B62B	5/00	Braking mechanisms for hand carts
B62B	9/00	Braking mechanisms for children's carriages or perambulators
B62C	7/00	Braking mechanisms for animal-drawn vehicles
B62L		Cycle brakes
B66D	5/00	Braking devices for lifting or hoisting gear
E21B	17/02	Couplings for drilling rods
H02P	3/00	Brakes for electric motors, generators, dynamo-electric converters
H04L	13/02	Clutches for apparatus for transmission of coded digital information.

**Subclass index****COUPLINGS**

In general .....	1/00
Yielding; impulse; slip .....	3/00; 5/00; 7/00
With safety members .....	9/00
Using a fluid as power-transmitting means .....	31/00, 33/00, 39/00

Using a fluid as power-transmitting means .....	31/00 to 37/00
Freewheels, automatic .....	41/00, 43/00, 45/00
Combinations .....	45/00, 47/00
External control of clutches .....	48/00

**FREEWHEELS OR FREEWHEEL**

CLUTCHES .....	41/00, 45/00
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**CLUTCHES**

Mechanically actuated	
the members being in direct contact .....	11/00, 13/00, 17/00
with separate members .....	15/00
others; combinations .....	19/00; 21/00
details .....	23/00
Non-mechanically actuated	
by fluid .....	25/00, 29/00
magnetically actuated .....	27/00, 29/00
electrically actuated .....	28/00, 29/00

**BRAKES**

Characterised by their function .....	49/00 to 55/00
Using resistance of liquid or air .....	57/00
Automatic .....	59/00
With means for making available for use the energy absorbed .....	61/00
Others .....	63/00
Details .....	65/00, 69/00, 71/00
Monitoring working conditions .....	66/00

**COMBINATIONS OF DIFFERENT**

DEVICES .....	47/00, 67/00
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**Couplings**

- 1/00 Couplings for rigidly connecting two coaxial shafts or other movable machine elements** (attachment of wheels to axles for railway carriages B60B; for attachment of cranks to their shafts F16C 3/04)
- 1/02 . for connecting two abutting shafts or the like
- 1/06 . for attachment of a member on a shaft or on a shaft-end (attachment of marine propellers on shafts B63H 23/00)

- 3/00 Yielding couplings, i.e. with means permitting movement between the connected parts during the drive** (couplings disconnectable simply by axial movement F16D 1/00; slip couplings F16D 7/00; fluid couplings F16D 31/00 to F16D 39/00)
- 3/02 . adapted to specific functions (universal joints, see the appropriate groups)
- 3/12 . . specially adapted for accumulation of energy to absorb shocks or vibration (by making use of fluid elements F16D 3/00)

- 3/16 . Universal joints in which flexibility is produced by means of pivots or sliding or rolling connecting parts
- 3/50 . with the coupling parts connected by one or more intermediate members (F16D 3/16 takes precedence)
- 5/00 Impulse couplings, i.e. couplings that alternately accelerate and decelerate the driven member** (fluid couplings F16D 31/00 to F16D 39/00)
- 7/00 Slip couplings, e.g. slipping on overload, for absorbing shock** (combined with yielding shaft couplings F16D 3/02; fluid slip couplings F16D 31/00 to F16D 35/00)
- 9/00 Couplings with safety member for disconnecting**

**Clutches with mechanically-actuated clutching members; Synchronisation arrangements for clutches**

- 11/00 Clutches in which the members have interengaging parts** (arrangements for synchronisation F16D 23/02; automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
- 13/00 Friction clutches** (arrangements for synchronisation F16D 23/02; automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
  - 13/58 . Details
  - 13/60 . . Clutching elements (friction lining or attachment thereof F16D 69/00)
  - 13/64 . . . Clutch-plates; Clutch-lamellae (brake-plates, brake-lamellae F16D 65/12)
- 15/00 Clutches with wedging balls or rollers or with other wedgeable separate clutching members** (freewheels, freewheel clutches F16D 41/00; automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
- 17/00 Clutches in which the drive is transmitted solely by virtue of the eccentricity of the contacting surfaces of clutch members which fit one around the other** (automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
- 19/00 Clutches with mechanically-actuated clutching members not otherwise provided for** (automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
- 21/00 Systems comprising a plurality of mechanically-actuated clutches** (for synchronisation F16D 23/02; automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
- 23/00 Details of mechanically-actuated clutches not specific for one distinct type; Synchronisation arrangements for clutches**
  - 23/02 . Arrangements for synchronisation (shape or mounting of interengaging parts of clutch members to facilitate engagement F16D 11/00)

**Clutches actuated non-mechanically** [3]

- 25/00 Fluid-actuated clutches** (arrangements for synchronisation F16D 23/02; fluid clutches F16D 31/00 to F16D 39/00; automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00)
  - 25/02 . with means for actuating or keeping engaged by a force derived at least partially from one of the shafts to be connected

- 25/06 . in which the fluid actuates a piston incorporated in the clutch (F16D 25/02 takes precedence)
- 25/08 . with fluid-actuated member not rotating with a clutching member (F16D 25/02 takes precedence)
- 27/00 Magnetically-actuated clutches; Control or electric circuits therefor** (arrangements for synchronisation F16D 23/02; clutches with magnetisable particles F16D 37/00; automatic clutches F16D 43/00 to F16D 45/00; circuits for external control F16D 48/00) [2]
  - 27/10 . with an electromagnet not rotating with a clutching member, i.e. without collecting rings
- 28/00 Electrically-actuated clutches** (arrangements for synchronisation F16D 23/02; clutches actuated directly by means of an electromagnet F16D 27/00; automatic clutches F16D 43/00 to F16D 45/00; external control F16D 48/00) [6]
- 29/00 Clutches or systems of clutches involving both fluid and magnetic or both fluid and electric actuation** [6]

**Couplings or clutches with a fluid or semifluid as power-transmitting means**

- 31/00 Fluid couplings or clutches with pumping sets of the volumetric type, i.e. in the case of liquid passing a predetermined volume per revolution**
  - 31/02 . using pumps with pistons or plungers working in cylinders
- 33/00 Rotary fluid couplings or clutches of the hydrokinetic type** (applicable also to fluid gearing F16H 41/00)
- 35/00 Fluid clutches in which the clutching is predominantly obtained by fluid adhesion** (F16D 37/00 takes precedence)
- 37/00 Clutches in which the drive is transmitted through a medium consisting of small particles, e.g. centrifugally speed-responsive**
- 39/00 Combinations of couplings according to two or more of the groups F16D 31/00 to F16D 37/00**

**Freewheels or freewheel clutches; Automatic clutches**

**Note**

Groups F16D 31/00 to F16D 39/00 take precedence over groups F16D 41/00 to F16D 45/00. [2009.01]

- 41/00 Freewheels or freewheel clutches** (cycle brakes controlled by back-pedalling B62L 5/00)
- 43/00 Internally controlled automatic clutches** (varying the relationship between two coaxial shafts F16D 3/02; clutches in which the drive is transmitted through a medium consisting of small particles F16D 37/00; freewheels, freewheel clutches F16D 41/00; external control of clutches F16D 48/00) [6]
- 45/00 Freewheels or freewheel clutches combined with automatic clutches**

**47/00** Systems of clutches, or clutches and couplings, comprising devices of types grouped under at least two of the following sets of groups: F16D 1/00 to F16D 9/00; F16D 11/00 to F16D 23/00; F16D 25/00 to F16D 29/00; F16D 31/00 to F16D 39/00; F16D 41/00 to F16D 45/00 (freewheels combined with a clutch to lock the driving and driven members of the freewheel F16D 41/00)

**48/00** External control of clutches [6]

#### Note

This group does not cover actuation, which is covered by groups F16D 11/00 to F16D 29/00. [6]

#### Brakes

**49/00** Brakes with a braking member co-operating with the periphery of a drum, wheel-rim, or the like (similar clutches F16D 13/00)

**51/00** Brakes with outwardly-movable braking members co-operating with the inner surface of a drum or the like (similar clutches F16D 13/00)

**53/00** Brakes with braking members co-operating with both the periphery and the inner surface of a drum, wheel-rim, or the like (similar clutches F16D 13/00)

**55/00** Brakes with substantially-radial braking surfaces pressed together in axial direction, e.g. disc brakes (similar clutches F16D 13/00)

55/02 . with axially-movable discs or pads pressed against axially-located rotating members

55/22 . . by clamping an axially-located rotating disc between movable braking members, e.g. movable brake discs or brake pads [5]

55/24 . with a plurality of axially-movable discs, lamellae, or pads, pressed from one side towards an axially-located member

**57/00** Liquid-resistance brakes; Air-resistance brakes

**59/00** Self-acting brakes, e.g. coming into operation at a predetermined speed

**61/00** Brakes with means for making the energy absorbed available for use (F16D 57/00 takes precedence)

**63/00** Brakes not otherwise provided for; Brakes combining more than one of the types of groups F16D 49/00 to F16D 61/00 (brakes with auxiliary members for self-tightening F16D 49/00, F16D 51/00, F16D 55/24)

**65/00** Parts or details of brakes (similar members for clutches F16D 13/58)

65/02 . Braking members; Mounting thereof (friction linings or attachment thereof F16D 69/00)

65/04 . . Bands, shoes or pads; Pivots or supporting members therefor [5]

65/092 . . . for axially-engaging brakes, e.g. disc brakes [5]

65/12 . . Discs; Drums for disc brakes

65/14 . Actuating mechanisms for brakes; Means for initiating operation at a predetermined position (brake control systems, parts thereof B60T)

65/16 . . arranged in or on the brake

65/18 . . . adapted for drawing members together

65/38 . Slack adjusters

**66/00** Arrangements for monitoring working conditions of brakes, e.g. wear or temperature

**67/00** Combinations of couplings and brakes; Combinations of clutches and brakes (F16D 71/00 takes precedence; combinations of couplings and clutches F16D 47/00; conjoint control of brake systems and driveline clutches in vehicles B60W 10/02, B60W 10/18) [2]

**69/00** Friction linings; Attachment thereof; Selection of coating friction substances or surfaces (clutching elements F16D 13/60; braking members F16D 65/02)

69/02 . Composition of linings (chemical aspects, see the relevant classes)

**71/00** Mechanisms for bringing members to rest in a predetermined position (combined with, or controlling, clutches F16D 43/00; means for initiating operation of brakes at a predetermined position F16D 65/14; means for securing members after operation F16B 1/00)

## **F16F SPRINGS; SHOCK-ABSORBERS; MEANS FOR DAMPING VIBRATION**

- (1) This subclass covers:
- springs, shock-absorbers or vibration-dampers;
  - their arrangement in, or adaptation for, particular apparatus, if not provided for in the subclasses covering said apparatus. [5]
- (2) This subclass does not cover the arrangement or adaptation of springs, shock-absorbers or vibration-dampers in, or for, particular apparatus, if provided for in the subclasses concerning the said apparatus, e.g.
- |      |       |   |
|------|-------|---|
| A47C | 23/00 | to Spring mattresses  |
| A47C | 27/00 |   |
| A63C | 5/06  | Vibration dampers in skis   |
| B60G |       | Vehicle suspensions   |
| B60R | 19/24 | Mounting of bumpers on vehicles                                       |
| B61F |       | Rail vehicle suspensions  |
| B61G | 11/00 | Buffers for railway or tramway vehicles                               |
| B62D | 21/15 | Vehicle chassis frames having impact absorbing means                  |
| B62J | 1/00  | Resiliently mounted saddles on cycles                                 |
| B62K | 21/00 | Steering dampers  |
| B63H | 1/00  | Marine propellers having vibration-damping means                      |
| B63H | 21/00 | Anti-vibration mounting of marine propulsion plant in ships           |
| B64C | 25/00 | Arrangement of shock-absorbers or springs in aeroplane alighting gear |

B65D	81/02	Containers, packing elements or packages with shock-absorbing means
D06F	37/20	Resilient mountings in washing machines
D06F	49/00	Resilient mountings in domestic spin-dryers
F03G	1/00	Spring motors
F21V	15/00	Resilient mounting of lighting devices
F41A	25/00	Gun cradles to permit recoil
F41B	5/00	Vibration dampers for archery bows
G01D	11/00	Indicating or recording in connection with measuring
G01G	21/00	Weighing apparatus, e.g. arrangement of shock-absorbers in weighing apparatus
G04B		Clocks, watches
G12B	3/00	Damping of movements in instruments
G21C	7/08	Disposition of shock-absorbing devices for displaceable control elements in nuclear reactors.

### Subclass index

#### SPRINGS

Friction type; fluid type; magnetic  
type..... 1/00, 3/00;  
5/00, 9/00; 6/00

#### VIBRATION-DAMPERS OR SHOCK- ABSORBERS

Friction type; fluid type ..... 7/00, 11/00;  
9/00, 11/00

#### UNITS COMBINING SPRINGS AND VIBRATION-DAMPERS OR SHOCK- ABSORBERS .....

13/00

#### SUPPRESSION OF VIBRATION, BALANCING .....

15/00

- 
- |             |   |              |  |   |
|-------------|---|--------------|--|---|
| <b>1/00</b> | <b>Springs</b> (working with fluid F16F 5/00, F16F 9/00)  | 9/34         | . .  | Special valve constructions (valves in general F16K); Shape or construction of throttling passages  |
| 1/02        | . made of steel or other material having low internal friction (F16F 1/36 takes precedence); Wound, torsion, leaf, cup, ring or the like springs, the material of the spring not being relevant [6]   | 9/36         | . .  | Special sealings, including sealings or guides for piston-rods  |
| 1/04        | . . Wound springs   | 9/43         | . .  | Filling arrangements, e.g. for supply of gas  |
| 1/36        | . made of plastics, e.g. rubber; made of material having high internal friction   | 9/44         | . .  | Means on or in the damper for manual or non-automatic adjustment; such means combined with temperature correction (F16F 9/53, F16F 9/56 take precedence; temperature correction only F16F 9/50) [5,6] |
| 1/38        | . . with a sleeve of elastic material between a rigid outer sleeve and a rigid inner sleeve or pin  | 9/48         | . .  | Arrangements for providing different damping effects at different parts of the stroke (F16F 9/53, F16F 9/56 take precedence) [5,6]  |
| 1/42        | . . characterised by the mode of stressing  | 9/50         | . .  | Special means providing automatic damping adjustment (F16F 9/53, F16F 9/56 take precedence; automatic temperature damping adjustment combined with external adjustment F16F 9/44) [5,6]               |
| 1/44        | . . . loaded mainly in compression  | 9/53         | . .  | Means for adjusting damping characteristics by varying fluid viscosity, e.g. electromagnetically [5]  |
| <b>3/00</b> | <b>Spring units consisting of several springs, e.g. for obtaining a desired spring characteristic</b> (consisting of a stack of similar plastics, e.g. rubber, elements separated by non-elastic intermediate layers F16F 1/36; including fluid springs F16F 5/00, F16F 13/00)                        | 9/54         | . .  | Arrangements for attachment   |
| <b>5/00</b> | <b>Liquid springs in which the liquid works as a spring by compression, e.g. combined with throttling action; Combinations of devices including liquid springs</b>  | 9/56         | . .  | Means for adjusting the length of, or for locking, the spring or damper, e.g. at the end of the stroke [6]  |
| <b>6/00</b> | <b>Magnetic springs; Fluid magnetic springs</b>   | 9/58         | . .  | Stroke limiting stops, e.g. arranged on the piston rod outside the cylinder (F16F 9/48 takes precedence) [6]  |
| <b>7/00</b> | <b>Vibration-dampers; Shock-absorbers</b> (using fluid F16F 5/00, F16F 9/00; specific for rotary systems F16F 15/10)  | <b>11/00</b> | <b>Vibration-dampers or shock-absorbers working with both friction and a damping fluid</b>   |   |
| 7/10        | . using inertia effect  | <b>13/00</b> | <b>Units comprising springs of the non-fluid type as well as vibration-dampers, shock-absorbers, or fluid springs</b> (F16F 5/00 takes precedence) |   |
| 7/12        | . using plastic deformation of members  | 13/02        | . .  | damping by frictional contact between the spring and braking means (frictionally coacting wound springs F16F 3/00)  |
| <b>9/00</b> | <b>Springs, vibration-dampers, shock-absorbers, or similarly-constructed movement-dampers using a fluid or the equivalent as damping medium</b> (F16F 5/00 takes precedence; connection of valves to inflatable elastic bodies B60C 29/00; door-operating appliances with fluid braking systems E05F) | 13/04        | . .  | comprising both a plastics spring and a damper, e.g. a friction damper [6]  |
| 9/02        | . using gas only  |              |  |   |
| 9/10        | . using liquid only; using a fluid of which the nature is immaterial  |              |  |   |
| 9/14        | . . Devices with one or more members, e.g. pistons, vanes, moving to and fro in chambers and using throttling effect  |              |  |   |
| 9/32        | . Details   |              |  |   |

## F16F – F16H

<b>15/00</b>	<b>Suppression of vibrations in systems</b> (vehicle seat suspension devices B60N 2/50); <b>Means or arrangements for avoiding or reducing out-of-balance forces, e.g. due to motion</b> (testing static or dynamic balance of machines or structures G01M 1/00)	15/10	. Suppression of vibrations in rotating systems by making use of members moving with the system (by balancing F16F 15/22; with flywheels acting variably or intermittently F16H)
15/02	. Suppression of vibrations of non-rotating, e.g. reciprocating, systems; Suppression of vibrations of rotating systems by use of members not moving with the rotating system (layered products B32B; suppression of vibration in ships B63)	15/12	. . using elastic members or friction-damping members, e.g. between a rotating shaft and a gyratory mass mounted thereon (F16F 15/16 takes precedence) [6]
15/023	. . using fluid means [6]	15/121	. . . using springs as elastic members, e.g. metallic springs (F16F 15/131 takes precedence) [6]
15/03	. . using electromagnetic means (F16F 9/53 takes precedence) [5]	15/131	. . . the rotating system comprising two or more gyratory masses [6]
15/04	. . using elastic means (single elements or their attachment F16F 1/00 to F16F 13/00) [2]	15/16	. . using a fluid (devices connecting input and output members F16D)
15/06	. . . with metal springs (with rubber springs also F16F 15/08)	15/22	. Compensation of inertia forces
15/08	. . . with rubber springs	15/30	. Flywheels (F16F 15/16 takes precedence; suppression of vibrations in rotating systems using elastic members or friction-damping members moving with the system F16F 15/12; rotary-body aspects in general F16C 13/00, F16C 15/00) [6]

## F16G BELTS, CABLES, OR ROPES, PREDOMINANTLY USED FOR DRIVING PURPOSES; CHAINS; FITTINGS PREDOMINANTLY USED THEREFOR

### Note

Attention is drawn to the following places:

B63B	21/00	Fastening equipment for chains, ropes or the like for ships
B63B	21/00	Adaptations of chains, ropes or the like for ships
B65G	15/30	Endless conveyer belts
B65G	17/30,	Traction chains for conveyers
B65G	19/00	
F16H		Gearings using flexible members
F16H	9/02	Chains specially adapted for gearings with variable ratio
H05F		Preventing or carrying-off electrostatic charges.

### Subclass index

BELTS; BELT FASTENINGS.....	1/00, 5/00; 3/00, 7/00	CHAINS, CHAIN HOOKS .....	13/00, 15/00, 17/00
CABLES OR ROPES; FASTENINGS THEREFOR .....	9/00; 11/00		

<b>1/00</b>	<b>Driving-belts</b> (V-belts F16G 5/00; in the shape of chain links F16G 13/00; conveyer belts B65G)	<b>11/00</b>	<b>Means for fastening cables or ropes to one another or to other objects</b> (cable clamps for suspension bridge cables E01D 19/00); <b>Caps or sleeves for fixing on cables or ropes</b> (attaching ropes or cables to lift cars or cages B66B 7/06, to winch drums or barrels B66D 1/28; rope clamps in earth drilling E21B 19/00)
1/28	. with a contact surface of special shape, e.g. toothed		
<b>3/00</b>	<b>Belt fastenings, e.g. for conveyer belts</b> (for V-belts F16G 7/00)		
<b>5/00</b>	<b>V-belts, i.e. belts of tapered cross-section</b>	<b>13/00</b>	<b>Chains</b> (making thereof B21L)
<b>7/00</b>	<b>V-belt fastenings</b>	<b>15/00</b>	<b>Chain couplings; Shackles; Chain joints; Chain links; Chain bushes</b> (making chain elements B21L)
<b>9/00</b>	<b>Ropes or cables specially adapted for driving, or for being driven by, pulleys or other gearing elements</b>	<b>17/00</b>	<b>Hooks as integral parts of chains</b> (hooks for cranes B66C 1/22)

## F16H GEARING

- (1) Combinations including mechanical gearings are classified in groups F16H 37/00 or F16H 47/00, unless they are provided for in groups F16H 1/00 to F16H 35/00. [2009.01]
- (2) In this subclass, sets of rigidly-connected members are regarded as single members.

- (3) In this subclass, the following terms or expressions are used with the meanings indicated:
- “toothed gearing” includes worm gearing and other gearing involving at least one wheel or sector provided with teeth or the equivalent, except gearing with chains or toothed belts, which is treated as friction gearing;
  - “conveying motion” includes transmitting energy, and means that the applied and resultant motions are of the same kind, though they may differ in, e.g. speed, direction or extent;
  - “rotary” implies that the motion may continue indefinitely.
  - “oscillating” means moving about an axis to an extent which is limited by the construction of the gearing and which may exceed one revolution, the movement being alternately forwards and backwards during continued operation of the gearing;
  - “reciprocating” means moving substantially in a straight line, the movement being alternately forwards and backwards during continued operation of the gearing;
  - “reversing” or “reversal” means that an applied movement in one direction may produce a resultant movement in either of two opposed directions at will;
  - “central gears” includes any gears whose axis is the main axis of the gearing.
- (4) Attention is drawn to the following places:
- |      |       |  |
|------|-------|--|
| A01D | 69/00 | Gearings in harvesters or mowers   |
| A63H | 31/00 | Gearing for toys   |
| B21B | 35/00 | Toothed-wheel gearing for metal-rolling mills  |
| B60K |       | Arrangement of transmissions in vehicles   |
| B61C | 9/00  | Transmissions for railway locomotives  |
| B62D | 3/00  | Vehicle steering gears   |
| B62M |       | Transmissions for cycles   |
| B63H | 23/00 | Transmissions for marine propulsion  |
| B63H | 25/00 | Marine steering gears  |
| F01  | to    | Machines, engines, pumps   |
| F04  |       |  |
| F15B | 15/00 | Gearings associated with fluid-actuated devices  |
| G01D | 5/02  | Gearing used in indicating or recording apparatus in connection with measuring devices |
| H03J | 1/00  | Driving arrangements for tuning resonant circuits                                      |
| H04L | 13/02 | Driving mechanisms for apparatus for transmission of coded digital information.        |

#### Subclass index

#### GEARINGS NOT LIMITED TO ROTARY MOTION

Mechanical gearings

- using levers, links, or cams ..... 21/00 to 25/00
- using intermittently-driving members ..... 27/00 to 31/00
- other gearings; combinations of gearings ..... 19/00, 33/00, 35/00; 37/00
- details ..... 51/00 to 57/00
- Fluid gearing ..... 43/00

#### GEARINGS FOR CONVEYING ROTARY MOTION

Toothed gearings ..... 1/00, 3/00

Using endless flexible members ..... 7/00, 9/00

Other friction gearing ..... 13/00, 15/00

Fluid gearing ..... 39/00, 41/00, 45/00

Using intermittently-driving gearing ..... 29/00

#### CONTROL

of change-speed- or reversing-gearings conveying rotary motion ..... 59/00 to 63/00

#### COMBINATIONS OF GEARINGS; DIFFERENTIAL GEARINGS; OTHER

GEARINGS ..... 47/00; 48/00; 49/00

GENERAL DETAILS OF GEARINGS ..... 57/00

#### Toothed gearings for conveying rotary motion

**1/00 Toothed gearings for conveying rotary motion**  
(specific for conveying rotary motion with variable gear ratio or for reversing rotary motion F16H 3/00)

- 1/02 . without gears having orbital motion
- 1/04 . . involving only two intermeshing members
- 1/28 . with gears having orbital motion
- 1/32 . . in which the central axis of the gearing lies inside the periphery of an orbital gear

**3/00 Toothed gearings for conveying rotary motion with variable gear ratio or for reversing rotary motion**  
(speed-changing or reversing mechanisms F16H 59/00 to F16H 63/00)

- 3/02 . without gears having orbital motion

3/08 . . exclusively or essentially with continuously-meshing gears, that can be disengaged from their shafts

#### Note

In this group, gears which can be put out of mesh are not taken into consideration if they are used for reversal only. [8]

3/44 . using gears having orbital motion

**Gearing for conveying rotary motion by endless flexible members**

- 7/00 Gearing for conveying rotary motion by endless flexible members** (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion F16H 9/00; endless flexible members per se, e.g. belts or chains F16G)
- 7/02 . with belts; with V-belts
  - 7/08 . Means for varying tension of belts, ropes, or chains (pulleys of adjustable construction F16H 55/32)
  - 7/10 . . by adjusting the axis of a pulley
  - 7/12 . . . of an idle pulley
- 9/00 Gearing for conveying rotary motion with variable gear ratio, or for reversing rotary motion, by endless flexible members** (control of change-speed or reversing-gearings conveying rotary motion F16H 59/00 to F16H 63/00; endless flexible members per se, e.g. belts or chains F16G)
- 9/02 . without members having orbital motion
  - 9/26 . with members having orbital motion

**Other friction gearing for conveying rotary motion**

- 13/00 Gearing for conveying rotary motion with constant gear ratio by friction between rotary members** (specific for conveying rotary motion with variable gear ratio or for reversing rotary motion F16H 15/00)
- 15/00 Gearing for conveying rotary motion with variable gear ratio, or for reversing rotary motion, by friction between rotary members** (control of change-speed or reversing-gearings conveying rotary motion F16H 59/00 to F16H 63/00)
- 15/02 . without members having orbital motion
  - 15/04 . . Gearings providing a continuous range of gear ratios
  - 15/06 . . . in which a member A of uniform effective diameter mounted on a shaft may co-operate with different parts of a member B
  - 15/08 . . . . in which the member B is a disc with a flat or approximately-flat friction surface
  - 15/16 . . . . in which the member B has a conical friction surface
  - 15/26 . . . . in which the member B has a spherical friction surface centered on its axis of revolution
  - 15/32 . . . . in which the member B has a curved friction surface formed as a surface of a body of revolution generated by a curve which is neither a circular arc centered on its axis of revolution nor a straight line
- 
- 19/00 Gearings comprising essentially only toothed gears or friction members and not capable of conveying indefinitely-continuing rotary motion** (with intermittently-driving members F16H 27/00 to F16H 31/00; rope or like tackle for lifting or haulage B66D 3/00)

**Gearing for conveying or converting motion by means of levers, links, cams or screw-and-nut mechanisms**

- 21/00 Gearings comprising primarily only links or levers, with or without slides** (F16H 23/00 takes precedence)
- 23/00 Wobble-plate gearings; Oblique-crank gearings**

- 25/00 Gearings comprising primarily only cams, cam-followers and screw-and-nut mechanisms**
- 25/18 . for conveying or interconverting oscillating or reciprocating motions
  - 25/20 . . Screw mechanisms (with automatic reversal F16H 25/00)
  - 25/22 . . . with balls, rollers, or similar members between the co-operating parts; Elements essential to the use of such members
  - 25/24 . . . Elements essential to such mechanisms, e.g. screws, nuts (F16H 25/22 takes precedence)

**Gearings with intermittently-driving members**

- 27/00 Step-by-step mechanisms without freewheel members, e.g. Geneva drives** (rotary gearings with cyclically-varying velocity ratio F16H 35/00; impulse couplings F16D 5/00; clockwork escapements G04B 15/00)
- 29/00 Gearings for conveying rotary motion with intermittently-driving members, e.g. with freewheel action** (freewheels F16D 41/00)
- 31/00 Other gearings with freewheeling members or other intermittently-driving members** (F16H 21/00, F16H 23/00, F16H 25/00 take precedence; gearings involving the use of automatic changing-mechanisms, e.g. cyclically-actuated reversal gearings, see the appropriate groups)
- 
- 33/00 Gearings based on repeated accumulation and delivery of energy**
- 35/00 Gearings or mechanisms with other special functional features**
- 37/00 Combinations of mechanical gearings, not provided for in groups F16H 1/00 to F16H 35/00** (combinations of mechanical gearing with fluid clutches or fluid gearing F16H 47/00; applications of underdrives or overdrives in motor vehicles, combinations with differential gearings in motor vehicles B60K)
- 37/02 . comprising essentially only toothed or friction gearings
  - 37/06 . . with a plurality of driving or driven shafts; with arrangements for dividing torque between two or more intermediate shafts

**Fluid gearing [3]**

- 39/00 Rotary fluid gearing using pumps and motors of the volumetric type, i.e. passing a predetermined volume of fluid per revolution** (control of exclusively fluid gearing F16H 61/38; fluid couplings or clutches with pumping sets of volumetric type F16D 31/00; application to lifting or pushing equipment B66F) [5]
- 41/00 Rotary fluid gearing of the hydrokinetic type** (control of exclusively fluid gearing F16H 61/38; rotary fluid couplings or clutches of the hydrokinetic type F16D 33/00) [5]
- 43/00 Other fluid gearing, e.g. with oscillating input or output [2]**
- 45/00 Combinations of fluid gearings for conveying rotary motion with couplings or clutches** (F16H 41/00 takes precedence; conjoint control of driveline clutches and change-speed gearing in vehicles B60W 10/02, B60W 10/10) [2]



**Note**

Clutches for varying working conditions in fluid torque-converters are regarded as a part of the latter.

- 47/00 Combinations of mechanical gearing with fluid clutches or fluid gearing** (conjoint control of driveline clutches and change-speed gearing in vehicles B60W 10/02, B60W 10/10) [2]

- 48/00 Differential gearings** [6]

- 49/00 Other gearing**

**Details of gearing or mechanisms**

- 51/00 Levers of gearing mechanisms** (shafts, Bowden mechanisms, cranks, eccentrics, bearings, pivotal connections, crossheads, connecting-rods F16C; manipulating levers G05G)
- 53/00 Cams or cam-followers, e.g. rollers for gearing mechanisms** (shafts, Bowden mechanisms, cranks, eccentrics, bearings, pivotal connections, crossheads, connecting-rods F16C; cams specially adapted for reciprocating-piston liquid engines F03C 1/00)
- 55/00 Elements with teeth or friction surfaces for conveying motion; Worms, pulleys or sheaves for gearing mechanisms** (of screw-and-nut gearing F16H 25/00; shafts, Bowden mechanisms, cranks, eccentrics, bearings, pivotal connections, crossheads, connecting-rods F16C; chains, belts F16G; pulley-blocks for lifting or hauling appliances B66D 3/00) [4]
- 55/02 . Toothed members; Worms
- 55/06 . . Use of materials; Use of treatments of toothed members or worms to affect their intrinsic material properties [3]
- 55/17 . . Toothed wheels (worm wheels F16H 55/02; chain wheels F16H 55/02) [3]
- 55/32 . Friction members (friction surfaces F16D 69/00)
- 55/36 . . Pulleys (with features essential for adjustment F16H 55/32)
- 57/00 General details of gearing** (of fluid gearing F16H 39/00 to F16H 43/00; of screw-and-nut gearing F16H 25/00; shafts, Bowden mechanisms, cranks, eccentrics, bearings, pivotal connections, crossheads, connecting-rods F16C)
- 57/02 . Gear-boxes; Mounting gearing therein
- 57/04 . *Features relating to lubrication or cooling (control of lubrication or cooling in hydrostatic gearing F16H 61/40) [1,2010.01]*
- 57/05 . . of chains (for conveyers B65G 45/00)

**Control of gearing conveying rotary motion [5]**

- (1) Attention is drawn to the Notes following the title of subclass B60W.
- (2) In groups F16H 59/00 to F16H 63/00, clutches positioned within a gearbox are considered as comprising part of the gearings. [5]

- (3) In groups F16H 59/00 to F16H 63/00, the following terms or expressions are used with the meaning indicated:
- “final output element” means the final element which is moved to establish a gear ratio, i.e. which achieves the linking between two power transmission means, e.g. reverse idler gear, gear cluster, coupling sleeve, apply piston of a hydraulic clutch;
  - “mechanism” means a kinematic chain consisting either of a single element or alternatively of a series of elements, the position of each point on the kinematic chain being derivable from the position of any other point on the chain, and therefore, for a given position of a point on one of the elements forming the kinematic chain there is only one position for each of the other points on the element or series of elements forming the kinematic chain;
  - “final output mechanism” means the mechanism which includes the final output element;
  - “actuating mechanism” means the mechanism, the movement of which causes the movement of another mechanism by being in mutual contact;
  - “final actuating mechanism” means the mechanism actuating the final output mechanism. [5]
- (4) Combinations of features individually covered by group F16H 61/00 and one or both of groups F16H 59/00 and F16H 63/00 are classified in group F16H 61/00. [5]
- (5) Combinations of features individually covered by groups F16H 59/00 and F16H 63/00 are classified in group F16H 63/00. [5]
- (6) When classifying in groups F16H 59/00 to F16H 63/00, control inputs or types of gearing which are not identified by the classification according to Notes (4) and (5), and which are considered to represent information of interest for search, may also be classified. Such non-obligatory classification should be given as “additional information”, e.g. selected from subgroup F16H 61/66 relating to the type of gearing controlled or from group F16H 59/00 relating to control inputs. [8]
- 59/00 Control inputs to change-speed- or reversing-gearings for conveying rotary motion [5]**
- 59/02 . Selector apparatus [5]
- 59/04 . . Ratio selector apparatus [5]
- 59/08 . . Range selector apparatus [5]
- 59/10 . . . comprising levers [5]
- 59/14 . Inputs being a function of torque or torque demand [5]
- 59/18 . . dependent on the position of the accelerator pedal [5]
- 59/24 . . dependent on the throttle opening [5]
- 59/36 . Inputs being a function of speed [5]
- 59/38 . . of gearing elements [5]
- 59/42 . . . Input shaft speed [5]
- 59/44 . . dependent on machine speed (F16H 59/46 takes precedence) [5]
- 59/46 . . dependent on a comparison between speeds [5]
- 59/48 . Inputs being a function of acceleration [5]
- 59/50 . Inputs being a function of the status of the machine, e.g. position of doors or safety belts [5]
- 59/60 . Inputs being a function of ambient conditions [5]
- 59/68 . Inputs being a function of gearing status [5]
- 59/70 . . dependent on the ratio established [5]
- 59/72 . . dependent on oil characteristics, e.g. temperature, viscosity [5]

<b>61/00</b>	<b>Control functions within change-speed- or reversing-gearings for conveying rotary motion [5]</b>	(2)	The generation or transmission of movements, when part of the final output mechanisms, is classified in group F16H 63/00. [5]
61/02	• characterised by the signals used [5]		
61/04	• Smoothing ratio shift [5]		
61/06	• . by controlling rate of change of fluid pressure [5]	61/28	• . with at least one movement of the final actuating mechanism being caused by a non-mechanical force, e.g. power-assisted [5]
61/08	• . Timing control [5]	61/38	• Control of exclusively fluid gearing [5]
61/10	• Regulating shift hysteresis [5]	61/40	• . hydrostatic (involving modification of the gearing F16H 39/00) [5]
61/12	• <i>Detecting malfunction or potential malfunction, e.g. fail safe (in control of hydrostatic gearing F16H 61/40) [5,2010.01]</i>	61/66	• specially adapted for continuously variable gearings (F16H 61/38 takes precedence; orbital toothed gearings with a secondary drive in order to vary the speed continuously F16H 3/44) [8]
61/14	• Control of torque converter lock-up clutches [5]	61/68	• specially adapted for stepped gearings [8]
61/16	• Inhibiting shift during unfavourable conditions (F16H 61/18 takes precedence) [5]	61/70	• specially adapted for change-speed gearing in group arrangement, i.e. with separate change-speed gear trains arranged in series, e.g. range or overdrive-type gearing arrangements [8]
61/18	• Preventing unintentional or unsafe shift (constructional features of the final output mechanisms F16H 63/30) [5]	<b>63/00</b>	<b>Control outputs to change-speed- or reversing-gearings for conveying rotary motion [5]</b>
61/20	• Preventing gear creeping [5]	63/02	• Final output mechanisms therefor; Actuating means for the final output mechanisms [5]
61/21	• Providing engine brake control [7]	63/08	• . Multiple final output mechanisms being moved by a single common final actuating mechanism [5]
61/22	• Locking (F16H 63/30 takes precedence) [5]	63/30	• . Constructional features of the final output mechanisms [5]
61/24	• Providing feel, e.g. to enable selection [5]		
61/26	• Generation or transmission of movements for final actuating mechanisms [5]		
(1)	The generation or transmission of movements comprising only the selector apparatus, is classified in group F16H 59/00. [5]		

## F16J PISTONS; CYLINDERS; PRESSURE VESSELS IN GENERAL; SEALINGS

### Note

Attention is drawn to the following places:

A47J	27/08	Pressure cookers
E04B	1/68	Sealing building joints
E05C	9/00	Multi-point fastening of wings in general
F01B		Machines or engines in general or of reciprocating type, e.g. cylinders peculiar to steam engines
		F01B 31/00
F02F	1/00	Cylinders for combustion engines
F02F	3/00	Pistons for combustion engines
F04D	29/08	Sealings of non-positive displacement pumps
F17B	1/00	Sealing devices for sliding parts of gas holders of variable capacity
F28F	9/04	Arrangements for sealing elements into header boxes or end plates of heat-exchangers.

### Subclass index

PISTONS, TRUNK PISTONS, OR PLUNGERS; PISTON-RODS.....	1/00; 7/00	CYLINDERS, HOLLOW BODIES .....	10/00
DIAPHRAGMS, BELLOWS, BELLOWS		PRESSURE VESSELS; COVERS .....	12/00; 13/00
PISTONS; PISTON-RINGS.....	3/00; 9/00	SEALINGS.....	15/00

<b>1/00</b>	<b>Pistons; Trunk pistons; Plungers</b> (bellows pistons F16J 3/00; piston-rings or seats therefor F16J 9/00; rotary pistons, e.g. for “Wankel” type engines, F01C; specific for combustion engines, i.e. constructed to withstand high temperature or modified for guiding, igniting, vaporising, or otherwise treating the charge, F02F; pistons specially adapted for reciprocating-piston liquid engines F03C 1/00; for pumps F04B; floats F16K 33/00)	<b>3/00</b>	<b>Diaphragms; Bellows; Bellows pistons</b> (connection of valves to inflatable elastic bodies B60C 29/00; bellows or the like used in instruments G12B 1/00; diaphragms for electromechanical transducers H04R 7/00)
1/10	• Connection to driving members	<b>7/00</b>	<b>Piston-rods, i.e. rods rigidly connected to the piston</b> (connecting-rods or like links pivoted at both ends F16C 7/00)

- 9/00** **Piston-rings, seats therefor; Ring sealings of similar construction in general** (other sealings between pistons and cylinders F16J 3/00, F16J 15/16; tools for mounting or removing piston-rings or the like B25B; piston sealing arrangements on brake master cylinders B60T 11/16) [2,5]
- 9/26 . characterised by the use of particular materials [3]
- 10/00** **Engine or like cylinders** (pressure vessels in general F16J 12/00; cylinders for engines or other apparatus of particular kinds, see the appropriate subclasses, e.g. for combustion engines F02F); **Features of hollow, e.g. cylindrical, bodies in general** [3]
- 12/00** **Pressure vessels in general** (covers therefor F16J 13/00; for particular applications, see the relevant subclasses, e.g. B01J, F17C, G21C) [3]
- 13/00** **Covers or similar closure members for pressure vessels in general** (for engine or like cylinders F16J 10/00; sealings F16J 15/02; covers for box-like containers B65D 43/00; devices for securing or retaining closure members B65D 45/00; closures for containers not otherwise provided for B65D 51/00; manholes, covers for large containers B65D 90/00; gates or closures for large containers B65D 90/00; for vessels for containing or storing compressed, liquefied or solidified gases F17C 13/00; steam boilers F22B)
- 15/00** **Sealings** (sealing arrangements for vehicle windows, windscreens, non-fixed roofs, doors, or similar devices B60J 10/00; sealing or packing elements for container closures B65D 53/00; sealing arrangements in rotary-piston machines or engines F01C 19/00; sealings in non-positive-displacement machines or engines F01D 11/00; arrangements of sealings in combustion engines F02F 11/00; sealing arrangements in rotary-piston pumps F04C 27/00; sealing lead-in or lead-through insulators H01B 17/26) [5]
- 15/02 . between relatively-stationary surfaces (F16J 15/46 takes precedence)
- 15/06 . . with solid packing compressed between sealing surfaces
- 15/08 . . . with exclusively metal packing
- 15/10 . . . with non-metallic packing
- 15/12 . . . . with metal reinforcement or covering
- 15/16 . between relatively-moving surfaces (F16J 15/50 takes precedence; bellows pistons F16J 3/00; piston-rings or ring sealings of similar construction in general F16J 9/00; spindle sealings for valves F16K 41/00) [2]
- 15/18 . . with stuffing-boxes for elastic or plastic packings
- 15/32 . . with elastic sealing lip
- 15/34 . . with slip-ring pressed against a more or less radial face on one member
- 15/36 . . . connected by a diaphragm to the other member
- 15/38 . . . sealed by a packing [2]
- 15/40 . . by means of fluid
- 15/44 . Free-space packings
- 15/46 . with packing ring expanded or pressed into place by fluid pressure, e.g. inflatable packings (connection of valves to inflatable elastic bodies B60C 29/00; specially adapted for tube connections F16L)
- 15/50 . between relatively-movable members, by means of a sealing without relatively-moving surfaces, e.g. fluid-tight sealings for transmitting motion through a wall

## F16K VALVES; TAPS; COCKS; ACTUATING-FLOATS; DEVICES FOR VENTING OR AERATING

- (1) Attention is drawn to the Notes following the titles of class B81 and subclass B81B relating to “micro-structural devices” and “micro-structural systems”. [7]
- (2) Attention is drawn to Note (2) following the title of subclass G05D and also the subdivisions of that subclass, according to which pressure regulators and flow regulators, e.g. flow regulating valves with pressure compensator, even with the whole regulating system contained in a valve, operating with or without auxiliary power, are covered by groups G05D 16/00 or G05D 7/00, respectively. However, details of the valve parts, per se, are classified in the appropriate groups of this subclass. [2]
- (3) Attention is drawn to the following places:
- |      |       |   |
|------|-------|---|
| A47J | 27/08 | Safety devices for pressure cookers   |
| A47J | 31/44 | Dispensing spouts, drain valves or like beverage-making apparatus   |
| A61B | 5/022 | Valves specially adapted for measuring pressure in heart or blood vessels   |
| A61F | 2/24  | Heart valves  |
| A61M | 16/20 | Valves specially adapted for medical respiratory devices  |
| A61M | 39/00 | Tube connectors, tube couplings, valves or branch units specially adapted for medical use in general  |
| A62B | 9/00  | Valves for respiratory apparatus  |
| A62B | 18/00 | Valves for breathing masks or helmets   |
| A62C |       | Fire extinguishers  |
| B05B |       | Nozzles, spray heads or other discharge apparatus for spraying or atomising   |
| B60C | 29/00 | Arrangements of tyre-inflating valves relative to tyres or wheel rims; Connection of valves to wheel rims, tyres or other inflatable elastic bodies |
| B60G | 17/04 | Valves specially adapted for adjusting vehicle fluid-spring characteristics   |
| B60T |       | Valves specially adapted for vehicle brake control systems  |
| B62D | 5/08  | Vehicle power-assisted steering characterised by the type of valve used   |
| B63B | 7/00, | Arrangement of inflating valves for floatable live-saving equipment   |
| B63C | 9/00  |   |

B65D	47/04	Container closures with discharging valves
B65D	83/28,	Nozzles or valves specially adapted for aerosol containers
B65D	83/44	
B65D	90/22	Safety valves for large containers
B65D	90/00	Gates or closures on large containers
B67C	3/02	Flow control devices for bottling liquids
B67D		Dispensing, delivering or transferring liquids
E02B	8/00	Details, e.g. valves, of barrages or weirs
E02B	13/00	Closures for irrigation conduits
E03B	9/00	Arrangement of valves in hydrants
E03D		Flushing valves for water-closets or urinals
E05F	3/00	Valve arrangement in door closers
E21B	21/00	Valve arrangements in drilling-fluid circulation systems
E21B	34/00	Valve arrangements for boreholes or wells
F01B	25/00	Working-fluid valves for controlling machines or engines in general or of positive-displacement type
F01D	17/00	Final actuators for controlling non-positive displacement machines or engines
F01L		Cyclically operated valves for machines or engines
F02D	9/08	Throttle valves for controlling combustion engines
F02K	9/00	Propellant feed valves for rocket-engines
F02M		Carburettors, fuel injection
F02M	59/00	Valves for fuel injection pumps
F04		Pumps
F16F	9/34	Valves for shock absorbers
F16L	29/00,	Pipe joints or quick-acting couplings with fluid cut-off means
F16L	37/28	
F16L	55/00	Arrangement of valves in pipes
F16L	55/04	Valves specially adapted to prevent or minimise the effect of water hammer
F16L	55/26	Launching devices for pigs or moles
F16N	23/00	Check valves for lubrication systems
F17C	13/04	Arrangement of valves in pressure vessels
F22B	37/00	Arrangement of safety valves on steam boilers
F22D	5/00	Application of valves to automatic water-feed in boiler
F23L	13/00	Valves for air supply control to burners
F23Q	2/00	Valves for lighters with gaseous fuel and adjustable flame
F24C	3/12,	Arrangement of valves on stoves or ranges
F24C	5/00	
F24F		Air conditioning; Ventilation
F25B	41/04	Disposition of fluid circulation valves in refrigeration machines
G05D		Controlling non-electric variables
G10B	3/00	Valves for organs
G10D	9/00	Valves for other wind-actuated musical instruments.

### Subclass index

#### CONSTRUCTIONAL TYPES

Lift-valves, gate valves or sliding valves, taps, diaphragm cut-off apparatus.....	1/00 to 7/00
Multiple-way valves.....	11/00
Other constructional types of cut-off apparatus, arrangements for cutting off .....	13/00

#### FUNCTIONAL TYPES

Check valves; safety or equalising valves; arrangements for mixing fluids .....	15/00; 17/00; 11/00
Fluid-delivery valves; valves for preventing drip from nozzles .....	21/00; 23/00

For venting or aerating enclosures ..... 24/00

#### DETAILS OR GENERAL MEANS

Handling or control.....	29/00, 31/00, 39/00, 43/00
Auxiliary means.....	47/00, 49/00
Safety .....	35/00, 37/00
Details: contact between valve members and seats, housings, floats, sealings.....	25/00, 27/00, 33/00, 41/00
Other details .....	51/00

#### SUBJECT MATTER NOT PROVIDED FOR

IN OTHER GROUPS OF THIS SUBCLASS ..... 99/00

**Constructional types****Note**

In groups F16K 1/00 to F16K 13/00, an initial seal breaking or final sealing movement which is different from the opening or closing movement of the valve is not considered in determining the movement to be classified. [2]

- 1/00 Lift valves, i.e. cut-off apparatus with closure members having at least a component of their opening and closing motion perpendicular to the closing faces** (diaphragm valves F16K 7/00)
- 1/16 . with pivoted closure members
  - 1/18 . . with pivoted discs or flaps
  - 1/22 . . . with axis of rotation crossing the valve member, e.g. butterfly valves
  - 1/226 . . . . Shape or arrangement of the sealing
  - 1/32 . Details (details of more general applicability F16K 25/00 to F16K 51/00)
- 3/00 Gate valves or sliding valves, i.e. cut-off apparatus with closing members having a sliding movement along the seat for opening and closing** (F16K 5/00 takes precedence; in barrages or weirs E02B 8/00)
- 3/02 . with flat sealing faces; Packings therefor
- 5/00 Taps or cocks comprising only cut-off apparatus having at least one of the sealing faces shaped as a more or less complete surface of a solid of revolution, the opening and closing movement being predominantly rotary** (taps of the lift-valve type F16K 1/00)
- 5/06 . with plugs having spherical surfaces; Packings therefor
- 7/00 Diaphragm cut-off apparatus, e.g. with a member deformed, but not moved bodily, to close the passage** (container gates or closures operating by deformation of flexible walls B65D 90/00; means for plugging pipes or hoses F16L 55/10)
- 7/12 . with flat, dished, or bowl-shaped diaphragm
- 11/00 Multiple-way valves, e.g. mixing valves; Pipe fittings incorporating such valves; Arrangement of valves and flow lines specially adapted for mixing fluid** [4]
- 11/02 . with all movable sealing faces moving as one unit
  - 11/06 . . comprising only sliding valves
  - 11/065 . . . with linearly sliding closure members [4]
  - 11/10 . with two or more closure members not moving as a unit
- 13/00 Other constructional types of cut-off apparatus** (means for plugging pipes or hoses F16L 55/10); **Arrangements for cutting-off** [4]

**Functional types**

- 15/00 Check valves** (valves specially adapted for inflatable balls A63B 41/00)
- 15/02 . with guided rigid valve members
  - 15/14 . with flexible valve members
- 17/00 Safety valves; Equalising valves** (pressure relief devices for aerosol containers B65D 83/14)
- 17/02 . opening on surplus pressure on one side; closing on insufficient pressure on one side (check valves F16K 15/00)
  - 17/04 . . spring-loaded

- 17/06 . . . with special arrangements for adjusting the opening pressure
  - 17/18 . opening on surplus pressure on either side
  - 17/20 . Excess-flow valves (actuated in consequence of shock or similar extraneous influence F16K 17/36)
  - 17/36 . actuated in consequence of extraneous circumstances, e.g. shock, change of position
- 21/00 Fluid-delivery valves** (specially adapted for aerosol containers B65D 83/44; for liquid handling B67D; for flushing devices for water-closets or the like E03D)
- 23/00 Valves for preventing drip from nozzles**
- 24/00 Devices, e.g. valves, for venting or aerating enclosures** (equalising valves F16K 17/00; arrangement or mounting in pipes or pipe systems F16L 55/07; venting or aerating as an additional function of steam traps or like apparatus F16T; ventilation of rooms, vehicles, see the appropriate subclass, e.g. F24F) [2]

**Details****Note**

Details not provided for in groups F16K 25/00 to F16K 51/00 are classified in groups F16K 1/00 to F16K 24/00.

- 25/00 Details relating to contact between valve members and seats** (movement of valve members other than for opening and closing F16K 29/00; sealing constructions, see the appropriate groups according to the type of valve)
- 27/00 Construction of housings** (methods for welding housings B23K); **Use of materials therefor**
- 27/02 . of lift valves (for reducing the flow resistance of screw-spindle lift-valves F16K 1/00)
  - 27/04 . of sliding valves
  - 27/06 . of taps or cocks
- 29/00 Arrangements for movement of valve members other than for opening or closing the valve, e.g. for grinding-in, for preventing sticking**
- 31/00 Operating means; Releasing devices**
- 31/02 . electric; magnetic
  - 31/04 . . using a motor
  - 31/05 . . . specially adapted for operating hand-operated valves or for combined motor and hand operation
  - 31/06 . . using a magnet
  - 31/08 . . . using a permanent magnet
  - 31/10 . . . with additional mechanism between armature and closure member
  - 31/12 . actuated by fluid (fluid-actuated check valves F16K 15/00; fluid-actuated safety valves F16K 17/00)
  - 31/122 . . the fluid acting on a piston (F16K 31/14, F16K 31/16, F16K 31/36 take precedence) [2]
  - 31/126 . . the fluid acting on a diaphragm, bellows, or the like (F16K 31/14, F16K 31/16, F16K 31/36 take precedence) [2]
  - 31/14 . . for mounting on, or in combination with, hand-actuated valves
  - 31/16 . . with a mechanism, other than pulling- or pushing-rod, between fluid motor and closure member (with float F16K 31/18)

## F16K – F16L

31/18	. . . actuated by a float (floats F16K 33/00; float-actuated valves in steam-traps F16T 1/00, in boilers F22D 5/00)	39/00	Devices for relieving the pressure on the sealing faces
31/36	. . . in which fluid from the conduit is constantly supplied to the fluid motor	41/00	Spindle sealings
31/44	. Mechanical actuating means	43/00	Auxiliary closure means in valves, which in case of repair, e.g. rewashering, of the valve, can take over the function of the normal closure means; Devices for temporary replacement of parts of valves for the same purpose
31/52	. . . with crank, eccentric, or cam	47/00	Means in valves for absorbing fluid energy (for pipes F16L 55/00)
31/60	. . . Handles	49/00	Means in or on valves for heating or cooling (for pipes F16L 53/00; thermal insulation in connection with pipes or pipe systems F16L 59/00)
31/64	. responsive to temperature variation (dependant on excessive temperature F16K 17/36; control of fire-fighting equipment A62C 37/00; devices for preventing bursting of water pipes by freezing E03B 7/00) [4]	51/00	Other details not peculiar to particular types of valves or cut-off apparatus
33/00	Floats for actuation of valves or other apparatus	51/02	. specially adapted for high-vacuum installations [2]
35/00	Means to prevent accidental or unauthorised actuation	99/00	Subject matter not provided for in other groups of this subclass [8]
37/00	Special means in or on valves or other cut-off apparatus for indicating or recording operation thereof, or for enabling an alarm to be given		

## F16L PIPES; JOINTS OR FITTINGS FOR PIPES; SUPPORTS FOR PIPES, CABLES OR PROTECTIVE TUBING; MEANS FOR THERMAL INSULATION IN GENERAL

- (1) In this subclass, the following terms are used with the meanings indicated:
- “pipe” means a conduit of closed cross-section, which is specially adapted to convey fluids, materials or objects;
  - “hose” means a pipe, as defined above, which has flexibility as an essential characteristic. [5]
- (2) Attention is drawn to the following places:
- |      |       |  |
|------|-------|--|
| A61M | 39/00 | Tube connectors, tube couplings or branch units, specially adapted for medical use                                   |
| B05B | 1/14  | Perforated pipes   |
| B63B | 35/00 | Pipe-laying vessels  |
| B64D | 39/00 | Adaptation of hose constructions for refuelling aircraft during flight   |
| B67D | 7/38  | Arrangements of hoses in apparatus for transferring liquids, e.g. fuel, from bulk to vehicles or portable containers |
| E01D | 19/00 | Fastening of pipes or cables to bridges  |
| E03B |       | Water supply installations   |
| E03D | 11/00 | Means for connecting water-closet bowls to the flushing pipe   |
| E03D | 11/00 | Siphons for water-closets  |
| E03F | 3/04  | Pipes or fittings specially adapted to sewers  |
| E04D | 13/04 | Down pipes for roof drainage; Clamping means therefor  |
| E04F | 17/00 | Vertical ducts, channels in buildings, e.g. chimneys   |
| E21F | 1/00  | Air ducts for ventilation of mines or tunnels; Connections therefor  |
| E21F | 17/00 | Suspension devices for tubes or the like in mines or tunnels   |
| F01N |       | Gas flow silencers or exhaust apparatus for machines or engines  |
| F16N | 21/00 | Conduits, junctions for lubrication systems  |
| F17C | 3/00  | Thermal insulation of vessels not under pressure for storing liquified or solidified gases, e.g. Dewar flask         |
| F22B | 37/00 | Water tubes of steam boilers   |
| F23J | 13/00 | Joints, connections for chimneys or flues  |
| F24H | 9/12  | Connecting circulation pipes to heaters  |
| F28F | 9/04  | Arrangements for sealing elements into header boxes or end plates of heat-exchangers                                 |
| G21C | 15/00 | Structural association of coolant tubes with headers or other pipes in nuclear reactors                              |
| H02G | 3/04  | Protective tubing or conduits for electric cables  |
| H02G | 3/30  | Installations of electric cables or lines on walls, floors or ceilings   |
| H02G | 3/36  | Installations of electric cables or lines in walls, floors or ceilings   |

### Subclass index

LAYING OR RECLAIMING PIPES ..... 1/00  
SUPPORTING ..... 3/00, 5/00,  
7/00  
PIPES ..... 9/00, 11/00

### PIPE JOINTS

Constructional kinds  
non-disconnectable..... 13/00  
screw-threaded ..... 15/00

with separate joints: pressing member; sleeve or socket; flanged joints.....	19/00; 21/00; 23/00
bends or siphons.....	43/00
other joints.....	25/00
<b>Functional kinds</b>	
with self-tightening sealings .....	17/00
adjustable or allowing movement.....	27/00
with fluid cut-off means.....	29/00
of quick-acting type .....	37/00
for double-walled or multi-channel pipes.....	39/00

branching pipes, joining pipes to walls.....	41/00
special for hoses .....	31/00, 33/00, 35/00
special for pipes: of plastics; of brittle material .....	47/00; 49/00

#### PIPING UNITS

Cleaning features.....	45/00
Compensation devices.....	51/00
Heating or cooling.....	53/00
Accessories.....	55/00

<b>PROTECTION: AGAINST DAMAGE; CORROSION OR INCRUSTATION; THERMAL INSULATION .....</b>	<b>57/00; 58/00; 59/00</b>
--	----------------------------

- 1/00 Laying or reclaiming pipes; Repairing or joining pipes on or under water** (soldering or welding B23K; lifting-gear and load-engaging elements B66; hydraulic installations, soil drainage E02B; excavations or underwater constructions E02D; machines for digging trenches in combination with pipe-assembly E02F; laying sewer pipes E03F 3/00; in earth boreholes or wells E21B; tunnelling E21D; laying electric, or combined optical and electric, cables H02G; making special pipe joints, see the relevant groups for the joints) [2,5,6]
- 1/024 . Laying or reclaiming pipes on land, e.g. above the ground (F16L 1/12 takes precedence) [5]
- 1/026 . . in or on a frozen surface [6]
- 1/028 . . in the ground (F16L 1/026 takes precedence) [5,6]
- 1/06 . . Accessories therefor, e.g. anchors [5]
- 1/12 . Laying or reclaiming pipes on or under water (buoyant hoses F16L 11/12) [5]
- 1/26 . Repairing or joining pipes on or under water (buoyant hoses F16L 11/12; joints per se F16L 13/00 to F16L 49/00) [5]
- 3/00 Supports for pipes, cables or protective tubing, e.g. hangers, holders, clamps, cleats, clips, brackets** (anchors for holding pipes on or under the ground F16L 1/06; noise absorbers in the form of specially adapted hangers or supports F16L 55/02; arrangements specially adapted for supporting insulated bodies F16L 59/12) [5,7]
- 3/01 . for supporting or guiding the pipes, cables or protective tubing, between relatively movable points, e.g. movable channels (hauling- or hoisting-chains with arrangements for holding electric cables, hoses or the like F16G 13/00) [5]
- 3/02 . partly surrounding the pipes, cables or protective tubing (bands or chains F16L 3/14)
- 3/08 . substantially surrounding the pipe, cable or protective tubing
- 3/10 . . divided, i.e. with two members engaging the pipe, cable or protective tubing
- 3/12 . . comprising a member substantially surrounding the pipe, cable or protective tubing
- 3/14 . Hangers in the form of bands or chains
- 3/16 . with special provision allowing movement of the pipe (F16L 3/01 takes precedence; supporting pipes or cables inside other pipes or sleeves F16L 7/00) [5]
- 3/22 . specially adapted for supporting a number of parallel pipes at intervals [6]
- 3/24 . with special member for attachment to profiled girders

- 5/00 Devices for use where pipes, cables or protective tubing pass through walls or partitions** (installations of electric cables or lines through walls, floors or ceilings H02G 3/22)
- 5/02 . Sealing
- 7/00 Supporting pipes or cables inside other pipes or sleeves, e.g. for enabling pipes or cables to be inserted or withdrawn from under roads or railways without interruption of traffic** (sleeves for supporting pipes, cables or protective tubing, between relatively movable points F16L 3/01) [5]

#### Pipes

- 9/00 Rigid pipes** (finned metal pipes F28F)
- 9/18 . Double-walled pipes; Multi-channel pipes or pipe assemblies (joints therefor F16L 39/00)
- 11/00 Hoses, i.e. flexible pipes** (hose-like supports for pipes, cables or protective tubing, between relatively movable points F16L 3/01; suction-cleaner hoses A47L 9/24) [5]
- 11/04 . made of rubber or flexible plastics
- 11/08 . . with reinforcements embedded in the wall (F16L 11/11 takes precedence) [2]
- 11/11 . . with corrugated wall [2]
- 11/12 . . with arrangements for particular purposes, e.g. specially profiled, with protecting layer, heated, electrically conducting (F16L 11/11 takes precedence) [2]

#### Pipe joints: Hose nipples [2]

- 13/00 Non-disconnectable pipe joints, e.g. soldered, adhesive, or caulked joints** (joints for rigid pipes of plastics F16L 47/00)
- 13/007 . specially adapted for joining pipes of dissimilar materials [5]
- 13/14 . made by plastically deforming the material of the pipe, e.g. by flanging, rolling
- 15/00 Screw-threaded joints** (casing joints used in deep-drilling E21B 17/02; joints sealed primarily by means other than engagement of screw-threads, see the relevant groups characterised by the sealing arrangements); **Forms of screw-threads for such joints**
- 17/00 Joints with packing adapted to sealing by fluid pressure** (compensating devices F16L 51/00)

- 19/00 Joints in which sealing surfaces are pressed together by means of a member, e.g. a swivel nut, screwed on, or into, one of the joint parts** (F16L 17/00 takes precedence; if using bolts or equivalent connecting means F16L 23/00; connecting arrangements or other fittings specially adapted to be made of plastics or to be used with pipes made of plastics F16L 47/00)
- 19/02 . Pipe ends provided with collars or flanges, integral with the pipe or not, pressed together by a screwed member
- 21/00 Joints with sleeve or socket** (F16L 13/00, F16L 17/00, F16L 19/00 take precedence; connecting arrangements or other fittings specially adapted to be made of plastics or to be used with pipes made of plastics F16L 47/00; specially adapted for pipes of brittle material F16L 49/00)
- 21/02 . with elastic sealing rings between pipe and sleeve or between pipe and socket, e.g. with rolling or other prefabricated profiled rings (F16L 21/06, F16L 21/08 take precedence; if adjustability is essential F16L 27/00)
- 21/06 . with a divided sleeve or ring clamping around the pipe ends (flanged joints F16L 23/00; couplings of the quick-acting type F16L 37/00)
- 21/08 . with additional locking means (F16L 21/06 takes precedence; couplings of the quick-acting type F16L 37/00)
- 23/00 Flanged joints** (F16L 13/00, F16L 17/00, F16L 19/00 take precedence; adjustable joints F16L 27/00; for hoses F16L 33/00; couplings of the quick-acting type F16L 37/00; for double-walled or multi-channel pipes, or pipe assemblies F16L 39/00; connecting arrangements or other fittings specially adapted to be made of plastics or to be used with pipes made of plastics F16L 47/00; specially adapted for pipes of brittle material F16L 49/00)
- 25/00 Construction or details of pipe joints not provided for in, or of interest apart from, groups F16L 13/00 to F16L 23/00** (adjustable or allowing movement F16L 27/00; with fluid cut-off means F16L 29/00; quick-acting F16L 37/00; for double-walled or multi-channel pipes F16L 39/00; connecting arrangements or other fittings specially adapted to be made of plastics or to be used with pipes made of plastics F16L 47/00; specially adapted for pipes of brittle material F16L 49/00)
- 27/00 Adjustable joints; Joints allowing movement** (of the quick-acting type F16L 37/00; for double-walled or multi-channel pipes or pipe assemblies F16L 39/00; swivel joints in hose lines used for flushing boreholes E21B 21/00) [5]
- 27/02 . Universal joints, i.e. with mechanical connection allowing angular movement or adjustment of the axes of the parts in any direction
- 27/12 . allowing substantial longitudinal adjustment or movement (by use of screw-thread F16L 15/00)
- 29/00 Joints with fluid cut-off means** (quick-acting joints with cut-off means F16L 37/28)
- 31/00 Arrangements for connecting hoses to one another or to flexible sleeves** (F16L 33/00 takes precedence)

- 33/00 Arrangements for connecting hoses to rigid members** (hand tools for inserting fittings into hoses B25B 27/02); **Rigid hose-connectors, i.e. single members engaging both hoses** (connecting arrangements or other fittings specially adapted to be made of plastics or to be used with pipes made of plastics F16L 47/00)

#### Note

Groups F16L 33/01 and F16L 33/26 take precedence over other subgroups [7]

- 33/01 . specially adapted for hoses having a multi-layer wall [2]
- 33/02 . Hose-clips
- 33/16 . with sealing or securing means using fluid pressure
- 33/18 . characterised by the use of additional sealing means
- 33/20 . Undivided rings, sleeves, or like members contracted on the hose or expanded inside the hose by means of tools; Arrangements using such members
- 33/22 . with means not mentioned in the preceding groups for gripping the hose between inner and outer parts
- 33/24 . with parts screwed directly on or into the hose (F16L 33/22 takes precedence)
- 33/26 . specially adapted for hoses made of metal
- 33/28 . for hoses with one end terminating in a radial flange or collar [5]
- 33/30 . comprising parts inside the hoses only (F16L 33/24 takes precedence) [7]
- 33/32 . comprising parts outside the hoses only (F16L 33/24 takes precedence) [7]
- 33/34 . with bonding obtained by vulcanisation, gluing, melting, or the like [7]
- 35/00 Special arrangements used in connection with end fittings of hoses, e.g. safety or protecting devices**
- 37/00 Couplings of the quick-acting type** (radially-binding sleeves F16L 17/00, F16L 21/06; connecting hoses to rigid members F16L 33/00; connections made automatically when vehicles are brought together B60D, B61G; specially adapted for lubricating devices F16N 21/00)
- 37/28 . with fluid cut-off means
- 39/00 Joints or fittings for double-walled or multi-channel pipes or pipe assemblies**
- 41/00 Branching pipes; Joining pipes to walls** (F16L 39/00 takes precedence; connections not designed for conveying fluid F16B 9/00; joints suitable for connecting together pipe ends, see the relevant groups)
- 41/02 . Branch units, e.g. made in one piece, welded, riveted
- 41/08 . Joining pipes to walls or pipes, the joined pipe axis being perpendicular to the plane of a wall or to the axis of another pipe (F16L 41/02 takes precedence) [2]
- 43/00 Bends; Siphons** (with cleaning apertures F16L 45/00; siphons for water-closets E03D 11/00; siphons in general F04F 10/00)
- 45/00 Pipe units with cleaning aperture and closure therefor**
- 47/00 Connecting arrangements or other fittings specially adapted to be made of plastics or to be used with pipes made of plastics** (packing, for joints, adapted to sealing by fluid pressure F16L 17/00)
- 47/02 . Welded joints; Adhesive joints



**49/00 Connecting arrangements, e.g. joints, specially adapted for pipes of brittle material, e.g. glass, earthenware**

**51/00 Expansion-compensation arrangements for pipe-lines** (telescopic pipes F16L 27/12)

**53/00 Heating or cooling pipes or pipe systems** (preventing freezing of pipes, thawing frozen pipes E03B 7/00; pipe-line systems, pipe-lines F17D)

**55/00 Devices or appurtenances for use in, or in connection with, pipes or pipe systems** (F16L 1/00 to F16L 53/00, F16L 57/00, F16L 59/00 take precedence; repairing or joining pipes on or under water F16L 1/26; nozzles B05B; cleaning of pipes B08B 9/02, e.g. removal of blockages B08B 9/02; devices for preventing bursting of water pipes by freezing E03B 7/00; for domestic plumbing installations E03C 1/00; arrangements for sealing leaky tubes or conduits of heat-exchangers F28F 11/00)

- 55/02 . Energy absorbers; Noise absorbers (in valves F16K 47/00)
- 55/04 . Devices damping pulsations or vibrations in fluids
- 55/07 . Arrangement or mounting of devices, e.g. valves, for venting or aerating or draining (arrangement of draining devices in water-supply systems E03B 7/00; apparatus for draining F16K, F16T; venting or aerating devices per se F16K 24/00) [2]
- 55/09 . Air-conditioning, e.g. de-watering, in pneumatic systems (in general F24)
- 55/10 . Means for stopping flow in pipes or hoses (F16L 29/00, F16L 37/28 take precedence; for covering leaks F16L 55/16; valves F16K) [1,7]
- 55/16 . Devices for covering leaks in pipes or hoses, e.g. hose-menders [1,7]
- 55/162 . . from inside the pipe (specially adapted for bends, branch units, branching pipes, or the like F16L 55/16) [5,7]
- 55/18 . Appliances for use in repairing pipes (F16L 55/10 takes precedence)
- 55/24 . Preventing accumulation of dirt or other matter in pipes, e.g. by traps, by strainers
- 55/26 . Pigs or moles, i.e. devices movable in a pipe or conduit with or without self-contained propulsion means (tunnel railway systems B61B 13/10; conveying articles through pipes or tubes, e.g. tube mail systems, B65G 51/00) [5]

**Note**

Pigs or moles specially adapted for particular applications are classified in the relevant places for the applications, e.g.

- stopping flow from or in pipes or hoses F16L 55/10;
- repairing pipes F16L 55/18;

- applying liquids or other fluent materials to the inside of tubes B05C 7/00;
- cleaning pipes or tubes or systems of pipes or tubes B08B 9/02;
- welding or cutting B23K 37/02;
- earth drilling E21B;
- cleaning chimneys F23J 3/00;
- cleaning internal or external surfaces of heat-exchange or heat-transfer conduits F28G;
- measuring, testing G01;
- inspection of vessels in nuclear reactors G21C 17/003;
- inspection or maintenance of pipe-lines or tubes in nuclear installations G21C 17/017;
- installing electric, or combined optical and electric, cables or lines H02G. [5]

**57/00 Protection of pipes or objects of similar shape against external or internal damage or wear** (supporting of pipes inside other pipes or sleeves F16L 7/00; used in connection with end fittings of hoses F16L 35/00; protection of pipes or pipe fittings against corrosion or incrustation F16L 58/00; protection thereof during transport B65D, e.g. B65D 59/00)

**58/00 Protection of pipes or pipe fittings against corrosion or incrustation** (supporting of pipes inside other pipes or sleeves F16L 7/00; compound tubes F16L 9/00; cleaning pipes or tubes B08B 9/02)

- 58/02 . by means of internal or external coatings (coatings for thermal insulation F16L 59/00; methods or machines for applying coatings, see the relevant places, e.g. B28B 21/00) [2]

**59/00 Thermal insulation in general** (heat, sound insulation in buildings E04B; heat insulation of steam engines F01B 31/00; heat insulation in rotary piston machines or engines F01C 21/00; heat insulation of pumps F04C 29/04; thermal insulation of pressure vessels F17C 1/00; vessels not under pressure, with provision for insulation F17C 3/00)

- 59/02 . Shape or form of insulating materials, with or without coverings integral with the insulating materials (chemical aspects, see the relevant classes)
- 59/04 . Arrangements using dry fillers, e.g. using slag wool
- 59/06 . Arrangements using an air layer or vacuum
- 59/08 . Means for preventing radiation, e.g. with metal foil
- 59/10 . Bandages or covers for the protection of the insulation, e.g. against the influence of the environment or against mechanical damage (integral with insulating materials F16L 59/02)
- 59/12 . Arrangements for supporting insulation from the wall or body insulated, e.g. by means of spacers between pipe and heat-insulating material; Arrangements specially adapted for supporting insulated bodies

**F16M FRAMES, CASINGS, OR BEDS, OF ENGINES OR OTHER MACHINES OR APPARATUS, NOT SPECIFIC TO AN ENGINE, MACHINE, OR APPARATUS PROVIDED FOR ELSEWHERE; STANDS OR SUPPORTS**

**Note**

Attention is drawn to the following places:

- B21B 31/00 Metal-rolling stand frames
- G01D 11/00 Supports specially adapted for indicating or recording instruments.

**Subclass index**

## FRAMES, CASINGS, OR BEDS

Displaceable .....3/00  
 For engines, machines, or apparatus ..... 1/00, 5/00

Foundations; details .....9/00; 7/00

STANDS OR SUPPORTS ..... 11/00, 13/00

**1/00** Frames or casings of engines, machines, or apparatus; Frames serving as machinery beds [2]  
**3/00** Portable or wheeled frames or beds, e.g. for emergency power-supply aggregates, compressor sets (construction of vehicles in general B60 to B62)  
**5/00** Engine beds, i.e. means for supporting engines or machines on foundations  
**7/00** Details of attaching or adjusting engine beds, frames, or supporting-legs on foundation or base; Attaching non-moving engine parts, e.g. cylinder blocks (elastic or equivalent mounting for absorbing vibrations F16F, especially F16F 15/04)  
**9/00** Special layout of foundations with respect to machinery to be supported (foundations for machinery E02D 27/32)

**11/00** Stands or trestles as supports for apparatus or articles placed thereon (without heads F16M 13/00; easels or stands for blackboards or the like A47B 97/00; show-stands A47F 7/00; for workmen E04G 1/00; supporting, suspending for lighting devices F21V 21/00; special modifications for particular apparatus or articles, see the appropriate subclasses)  
 11/02 . Heads  
 11/20 . Undercarriages with or without wheels  
**13/00** Other supports for positioning apparatus or articles (heads thereof F16M 11/02; adapted to be stuck in the ground A45F 3/00); Means for steadying hand-held apparatus or articles  
 13/02 . for supporting on, or attaching to, an object, e.g. tree, gate, window-frame, cycle  
 13/04 . for supporting on, or holding steady relative to, a person, e.g. by chains  
 13/06 . also serviceable for other purposes, e.g. to be used as spade, chair, ski-stick

**F16N LUBRICATING****Note**

Attention is drawn to the following places, which cover lubrication of specific apparatus or in particular processes:

A01D	69/00	Harvesters
B21B	25/00	Mandrels for metal tube rolling mills
B21B	27/06	Rolls for metal rolling mills
B21D	37/00	Tools for machines for working metal without removing material
B21J	3/00	Forging or pressing
B22D	11/07	Moulds for continuous casting of metals
B23C	5/00	Milling cutters
B23D	59/00	Metal saws
B23Q	11/10,	Machine tools
B23Q	11/12	
B25D	17/00	Portable power-driven percussive tools
B26B	19/38	Hair-clippers or dry-shavers
B27B	13/00	Band saw blades for wood or the like
B60R	17/00	Vehicles
B61B	12/00	Cable systems for railways
B61C	17/00	Railway locomotives
B61F	17/00	Axle-boxes of rail vehicles
B61K	3/00	Rail or wheel flanges of railways
B62D	55/08	Endless-track units for vehicles
B62J	31/00	Cycles
B65G	45/00	Conveyers
B66B	7/12	Ropes, cables or guides of elevators
D01H	7/02	Spindles of machines for spinning or twisting threads or fibres
D04B	35/00	Knitting machines
D05B	71/00	Sewing machines
D05C	13/00	Embroidering machines
E01B	7/00	Switches for railways
E05B	17/00	Locks
E05D	11/00	Hinges
E21B	10/08	Roller bits for earth drilling
F01C	21/00	Rotary-piston or oscillating-piston machines or engines
F01D	25/00	Non-positive-displacement machines
F01M		Machines or engines in general
F02C	7/06	Gas-turbine plants
F02F	1/18	Cylinders of combustion engines

F04B	39/02	Pumps for liquids
F04C	29/02	Rotary-piston or oscillating-piston pumps for liquids
F04D	29/04	Non-positive-displacement pumps
F16C	1/00	Flexible shafts
F16C	33/04	Sliding-contact bearings
F16C	33/66	Ball or roller bearings
F16F	1/02	Springs
F16H	57/04	Transmissions
F41A	29/00	Smallarms or ordnance
G04B	31/00	Clocks
H01R	39/00	Rotary current collectors, distributors or interrupters

### **Subclass index**

MODIFICATIONS OF APPARATUS OR MACHINES TO ENSURE LUBRICATION .....	1/00
LUBRICATION DEVICES	
Stationary; mobile; manual.....	7/00, 11/00; 9/00; 3/00, 5/00
Lubricating-pumps.....	13/00
Details: reservoirs; conduits; check valves .....	19/00; 21/00; 23/00

EQUIPMENT FOR DISTRIBUTION, PROPORTIONING, SAFETY, CONTROL, CLEANING .....	23/00 to 33/00
HANDLING OF LUBRICANTS, STORAGE .....	33/00 to 39/00
SPECIAL LUBRICATION .....	15/00, 17/00
SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS .....	99/00

### **Lubrication devices or arrangements for oil or grease**

<b>1/00</b>	<b>Constructional modifications of parts of machines or apparatus for the purpose of lubrication</b>
<b>3/00</b>	<b>Devices for supplying lubricant by manual action</b>
<b>5/00</b>	<b>Apparatus with hand-positioned nozzle supplied with lubricant under pressure (F16N 3/00 takes precedence)</b>
<b>7/00</b>	<b>Arrangements for supplying oil or unspecified lubricant from a stationary reservoir or the equivalent in or on the machine or member to be lubricated</b>
<b>9/00</b>	<b>Arrangements for supplying oil or unspecified lubricant from a moving reservoir or the equivalent (also usable with a stationary reservoir F16N 7/00)</b>
<b>11/00</b>	<b>Arrangements for supplying grease from a stationary reservoir or the equivalent in or on the machine or member to be lubricated; Grease cups (lubricating-pumps F16N 13/00)</b>

<b>13/00</b>	<b>Lubricating-pumps (oil cans with pump F16N 3/00)</b>
<b>15/00</b>	<b>Lubrication with substances other than oil or grease; Lubrication characterised by the use of particular lubricants in particular apparatus or conditions (F16N 17/00 takes precedence; lubricating compositions, selection of particular substances as lubricants in general C10M; lubrication specially adapted to machines or apparatus provided for in a single other class, <u>see</u> the relevant class for the machine or apparatus)</b>
<b>17/00</b>	<b>Lubrication of machines or apparatus working under extreme conditions (additives to lubricating oil or lubricating grease C10M)</b>

### **Details of lubricators or lubrication systems**

<b>19/00</b>	<b>Lubricant containers for use in lubricators or lubrication systems</b>
<b>21/00</b>	<b>Conduits; Junctions; Fittings for lubrication apertures</b>
<b>23/00</b>	<b>Special adaptations of check valves</b>
<b>25/00</b>	<b>Distributing equipment (combined with oil pump F16N 13/00)</b>
<b>27/00</b>	<b>Proportioning devices</b>
<b>29/00</b>	<b>Special means in lubricating arrangements or systems providing for the indication or detection of undesired conditions; Use of devices responsive to conditions in lubricating arrangements or systems (constructions of apparatus outside the lubricating arrangements or systems, <u>see</u> the relevant classes)</b>
<b>31/00</b>	<b>Means for collecting, retaining, or draining-off lubricant in or on machines or apparatus</b>
<b>33/00</b>	<b>Mechanical arrangements for cleaning lubricating equipment; Special racks or the like for use in draining lubricant from machine parts</b>

### **Care of lubricants**

<b>35/00</b>	<b>Storage of lubricants in engine-rooms or the like</b>
<b>37/00</b>	<b>Equipment for transferring lubricant from one container to another</b>
<b>39/00</b>	<b>Arrangements for conditioning of lubricants in the lubricating system (cleaning of lubricating oil, lubricating compositions C10M)</b>
<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass [8]</b>

## F16P SAFETY DEVICES IN GENERAL

**Note**

Attention is drawn to the following places:

A01D	75/00	Harvesters or mowers
A01F	21/00	Threshing machines or baling presses
B02C	23/00	Crushing or disintegrating machines
B21B	33/00	Rolling of metal
B21D	55/00	Working sheet metal or tubes, rods or profiles without essentially removing material
B23B	25/00	Turning-machines
B23Q	11/00	Machine tools
B24B	55/00	Grinding or polishing machines
B25D	17/00	Portable power-driven percussive tools
B25J	19/06	Manipulators
B26D	7/00	Cutting machines
B27G	19/00	Wood saws
B65B	57/00	Packaging machines or apparatus
B65G	43/00	Conveyers
B65H	26/00	Web-advancing mechanisms
B65H	63/00	Handling or winding of thin or filamentary material
D01G	31/00	Treatment of fibres
D01H	13/14	Spinning or twisting
D05B	83/00	Sewing machines
F21V	25/00	Lighting devices.

**Devices protecting or preventing injuries to people**

- 1/00** Safety devices independent of the control or operation of any machine (protective devices for the eyes or ears, worn on the body or carried in the hand, A61F 9/00, A61F 11/00)

- 3/00** Safety devices acting in conjunction with the control or operation of a machine; Control arrangements requiring the simultaneous use of two or more parts of the body (F16P 5/00 takes precedence)

- 5/00** Emergency means for rendering ineffective a coupling conveying reciprocating movement if the motion of the driven part is prematurely resisted

- 7/00** Emergency devices preventing damage to a machine or apparatus (F16P 1/00, F16P 3/00, F16P 5/00 take precedence; indicating means, see the appropriate classes)

**F16S CONSTRUCTIONAL ELEMENTS IN GENERAL; STRUCTURES BUILT-UP FROM SUCH ELEMENTS, IN GENERAL****Note**

This subclass does not cover similar elements and structures, restricted to use in the building art, which are covered by subclass E04C.

- 
- 1/00** **Sheets, panels, or other members of similar proportions; Constructions comprising assemblies of such members** (built-up gratings F16S 3/00; layered products B32B)

**Note**

In this group, the members may be generally flat or curved, but they may depart from such shape in detail over part or all of their area, e.g. they may be corrugated, ribbed, flanged; ribs, flanges, or the like may be separately formed.

- 3/00** **Elongated members, e.g. profiled members; Assemblies thereof; Gratings or grilles** (gratings or grilles formed from a sheet or the like F16S 1/00; frames for doors, windows or the like E06B 1/00, E06B 3/00)

- 5/00** **Other constructional members not restricted to an application fully provided for in a single class**

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**F16T STEAM TRAPS OR LIKE APPARATUS FOR DRAINING-OFF LIQUIDS FROM ENCLOSURES PREDOMINANTLY CONTAINING GASES OR VAPOURS**

- 1/00** **Steam traps or like apparatus for draining-off liquids from enclosures predominantly containing gases or vapours, e.g. gas lines, steam lines, containers**

**F17     STORING OR DISTRIBUTING GASES OR LIQUIDS** (water supply E03B)

**F17B     GAS-HOLDERS OF VARIABLE CAPACITY** (self-acting gas cut-off devices A47J 27/56, G05D; flame traps A62C 4/00; gas mixers B01F, F16K 11/00, G05D 11/00; construction or assembling of bulk storage containers employing civil-engineering techniques E04H 7/00; gas compressors F04; valves F16K; damping pulsations in valves or pipes F16K, F16L; pipes F16L; stopping devices for gas mains F16L 55/10; vessels adapted for storing compressed, liquefied, or solidified gases F17C; gas distribution systems F17D 1/00; detecting leakage F17D 5/00, G01M; supervising or alarm devices F17D 5/00, G08B; control of combustion in burners F23N; gas flow or pressure regulators G05D)

**1/00     Gas-holders of variable capacity** (large containers in general B65D 88/00; storing fluids in natural or artificial cavities or chambers in the earth B65G 5/00)

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**F17C     VESSELS FOR CONTAINING OR STORING COMPRESSED, LIQUEFIED, OR SOLIDIFIED GASES; FIXED-CAPACITY GAS-HOLDERS; FILLING VESSELS WITH, OR DISCHARGING FROM VESSELS, COMPRESSED, LIQUEFIED, OR SOLIDIFIED GASES** (storing fluids in natural or artificial cavities or chambers in the earth B65G 5/00; construction or assembling of bulk storage containers employing civil-engineering techniques E04H 7/00; variable-capacity gas-holders F17B; liquefaction or refrigeration machines, plants, or systems F25)

**Subclass index**

VESSLS UNDER PRESSURE; VESSELS	FILLING; DISCHARGING.....	5/00, 6/00;
NOT UNDER PRESSURE; DETAILS .....		7/00, 9/00
1/00; 3/00;	USE OF GAS-SOLVENTS OR GAS-	
13/00	ABSORBENTS .....	11/00

**1/00     Pressure vessels, e.g. gas cylinder, gas tank, replaceable cartridge** (pressurised apparatus for purposes other than storage, see the relevant subclasses such as A62C, B05B; associated with vehicles, see the appropriate subclass of classes B60 to B64; pressure vessels in general F16J 12/00)

**3/00     Vessels not under pressure**

**5/00     Methods or apparatus for filling pressure vessels with liquefied, solidified, or compressed gases** (adding propellants to aerosol containers B65B 31/00)

**Note**

This group covers:

- the filling of vessels for storage of compressed or liquefied gases;
- the filling of pressurised apparatus insofar as it is not covered by a single other subclass, e.g. A62C, B05B.

**6/00     Methods or apparatus for filling vessels not under pressure with liquefied or solidified gases [3]**

**7/00     Methods or apparatus for discharging liquefied, solidified, or compressed gases from pressure vessels, not covered by another subclass**

**9/00     Methods or apparatus for discharging liquefied or solidified gases from vessels not under pressure**

**11/00     Use of gas-solvents or gas-sorbents in vessels**

**13/00     Details of vessels or of the filling or discharging of vessels**

13/04     . Arrangement or mounting of valves (valves per se F16K)

13/08     . Mounting arrangements for vessels

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**F17D     PIPE-LINE SYSTEMS; PIPE-LINES** (pumps or compressors F04; fluid dynamics F15D; valves or the like F16K; pipes, laying pipes, supports, joints, branches, repairing, work on the entire line, accessories F16L; steam traps or the like F16T; fluid-pressure electric cables H01B 9/00)

**Note**

In this subclass, the following expression is used with the meaning indicated:

- “pipe-line systems” means systems described in flow sheets as well as arrangements of co-operating elements, the elements per se being covered by the relevant subclasses.

- 1/00 Pipe-line systems** (conveying articles or materials through a pipe-line by means of a fluid carrier B65G 51/00, B65G 53/00; dispensing, delivering or transferring liquids B67D; apparatus or devices for transferring liquids from bulk storage containers or reservoirs into vehicles or into portable containers, e.g. for retail sale purposes, B67D 7/00; conveying material which has been excavated by a dredger or soil shifter through a pipe-line E02F 7/00; sewer pipe-line systems E03F 3/00; preventing freezing by heating F16L 53/00; thermal insulation of pipe-lines F16L 59/00; central heating systems F24D) [2]
- 3/00 Arrangements for supervising or controlling working operations**
- 5/00 Protection or supervision of installations** (arrangements for protecting foundations E02D 31/00; protecting pipes from damage or internal or external wear F16L 57/00, against corrosion or scale F16L 58/00; investigation of the fluid-tightness of structures G01M 3/00) [2]

**LIGHTING; HEATING****F21 LIGHTING** (electric aspects or elements, see section H, e.g. electric light sources H01J, H01K, H05B)**Note**

Attention is drawn to Note III of Section H, and in particular that subclass H05B covers electrical aspects of the same technical subjects that are covered by class F21.

**F21H INCANDESCENT MANTLES; OTHER INCANDESCENT BODIES HEATED BY COMBUSTION** (arrangements thereof F21V 36/00; burners F23D)

- |  |  |
|--|--|
| <b>1/00</b> Incandescent mantles; Selection of imbibition liquids therefor | <b>3/00</b> Manufacturing incandescent mantles; Treatment prior to use, e.g. burning-off; Machines for manufacturing |
|  | <b>5/00</b> Solid incandescent bodies (incandescent mantles F21H 1/00)   |
|  | <b>7/00</b> Other incandescent bodies [2009.01]  |

**F21K LIGHT SOURCES NOT OTHERWISE PROVIDED FOR**

- 2/00** Light sources using luminescence (luminescent materials C09K 11/00; selection of luminescent materials for light screens F21V 9/00; using excitation by radioactivity G21H 3/00, H01J 65/00; transforming the wavelength of the light of gas- or vapour-discharge lamps by luminescence H01J 61/38; electroluminescent light sources H05B 33/00) [2,7]
- 5/00** Light sources using charges of combustible material, e.g. illuminating flash devices (explosive or thermic compositions C06B; fireworks F42B 4/00; photographic flash units G03B 15/03) [3,5]
- 99/00** Subject matter not provided for in other groups of this subclass [2010.01]

**F21L LIGHTING DEVICES OR SYSTEMS THEREOF, BEING PORTABLE OR SPECIALLY ADAPTED FOR TRANSPORTATION** (burners F23D) [1,7]

- (1) This subclass covers devices or systems designed or specially adapted to be carried, e.g. by hand, or otherwise transported from place to place, e.g. on wheeled supports, in order to provide illumination as and where required. [7]
- (2) This subclass does not cover devices or systems intended for fixed installation, e.g. vehicle lighting, or for use essentially at a permanent location, which are covered by subclass F21S. [7]
- (3) Non-electric lighting devices are classified in groups F21L 17/00 to F21L 26/00 only if a special adaptation related to the use of a non-electric light source is of interest. [2009.01]

**Subclass index****ELECTRIC DEVICES**

Systems .....2/00

with self-contained batteries or cells.....4/00

with built-in generators .....13/00

without self-contained power source.....14/00

**NON-ELECTRIC DEVICES**

Torches, flares; lanterns ..... 17/00; 19/00

Pocket-lamps; miners' hand-lamps.....21/00; 23/00

Other portable lighting devices or systems thereof ..... 26/00

COMBINATIONS OF ELECTRIC AND NON-ELECTRIC DEVICES ..... 27/00



<b>2/00</b>	<b>Systems of electric lighting devices</b> (systems employing both electric and non-electric light sources or exchangeable light sources F21L 27/00) [7]	<b>21/00</b>	<b>Non-electric pocket-lamps, e.g. lamps producing sparks</b>
<b>4/00</b>	<b>Electric lighting devices with self-contained electric batteries or cells</b> [7]	<b>23/00</b>	<b>Non-electric hand-lamps for miners</b>
<b>13/00</b>	<b>Electric lighting devices with built-in electric generators</b> (with solar cells F21L 4/00) [1,7]	<b>26/00</b>	<b>Non-electric portable lighting devices, or systems thereof, not provided for in groups F21L 17/00 to F21L 23/00</b> [8]
<b>14/00</b>	<b>Electric lighting devices without a self-contained power source, e.g. for mains connection</b> [7]	<b>27/00</b>	<b>Lighting devices or systems, employing combinations of electric and non-electric light sources; Replacing or exchanging electric light sources with non-electric light sources or <u>vice versa</u> in lighting devices or systems</b>
<b>17/00</b>	<b>Non-electric torches; Non-electric flares</b>		
<b>19/00</b>	<b>Lanterns, e.g. hurricane lamps or candle lamps</b> (candle holders F21V 35/00)		

**F21S NON-PORTABLE LIGHTING DEVICES OR SYSTEMS THEREOF** (burners F23D) [1,7]

- (1) This subclass covers devices or systems intended for fixed installation, e.g. vehicle lighting, or for use at a permanent location, e.g. free-standing floor- or table-lamps. [7]
- (2) This subclass does not cover devices or systems specially adapted for transportation, which are covered by subclass F21L. [7]
- (3) Non-electric lighting devices or systems are classified in groups F21S 11/00 to F21S 15/00 only if a special adaptation related to the use of a non-electric light source is of interest. [2009.01]

**Subclass index**

**ELECTRIC DEVICES**

Systems .....	2/00
String or strip of light sources .....	4/00
Free-standing .....	6/00
Fixed installation .....	8/00
Built-in power supply .....	9/00
Producing varying lighting effects .....	10/00

**NON-ELECTRIC DEVICES**

Using daylight .....	11/00
Light source: Point-like or of unspecified shape .....	13/00
Other devices .....	15/00

**COMBINATIONS OF ELECTRIC AND**

<b>NON-ELECTRIC DEVICES</b> .....	19/00
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<b>2/00</b>	<b>Systems of lighting devices, not provided for in main groups F21S 4/00 to F21S 10/00 or F21S 19/00, e.g. of modular construction</b> [7]	<b>9/00</b>	<b>Lighting devices with a built-in power supply; Systems employing lighting devices with a built-in power supply</b>
<b>4/00</b>	<b>Lighting devices or systems using a string or strip of light sources</b> [7]	<b>10/00</b>	<b>Lighting devices or systems producing a varying lighting effect</b> [7]
<b>6/00</b>	<b>Lighting devices intended to be free-standing</b> (F21S 9/00, F21S 10/00 take precedence) [7]	<b>11/00</b>	<b>Non-electric lighting devices or systems using daylight</b>
<b>8/00</b>	<b>Lighting devices intended for fixed installation</b> (F21S 9/00, F21S 10/00 take precedence; using a string or strip of light sources F21S 4/00) [7]	<b>13/00</b>	<b>Non-electric lighting devices or systems employing a point-like light source</b> (candle holders F21V 35/00); <b>Non-electric lighting devices or systems employing a light source of unspecified shape</b>
8/02	• of recess-mounted type, e.g. downlighters (F21S 8/10 takes precedence) [7]	<b>15/00</b>	<b>Non-electric lighting devices or systems employing light sources not covered by main groups F21S 11/00, F21S 13/00 or F21S 19/00</b>
8/04	• intended only for mounting on a ceiling or like overhead structure (F21S 8/02 takes precedence) [7]	<b>19/00</b>	<b>Lighting devices or systems employing combinations of electric and non-electric light sources; Replacing or exchanging electric light sources with non-electric light sources or <u>vice versa</u></b>
8/08	• with a standard [7]		
8/10	• specially adapted for vehicles [7]		

**F21V FUNCTIONAL FEATURES OR DETAILS OF LIGHTING DEVICES OR SYSTEMS THEREOF; STRUCTURAL COMBINATIONS OF LIGHTING DEVICES WITH OTHER ARTICLES, NOT OTHERWISE PROVIDED FOR [1,7]**

- (1) Groups F21V 1/00 to F21V 14/00 cover details of those parts involved in light emission or distribution. Groups F21V 15/00 to F21V 31/00 cover details of those parts not so involved. [2009.01]
- (2) Details of non-electric lighting devices or systems are classified in groups F21V 35/00 to F21V 37/00 only if a special adaptation related to the use of a non-electric light source is of interest. [2009.01]

**Subclass index**

**DETAILS OF PARTS INVOLVED IN LIGHT EMISSION OR DISTRIBUTION**

Shades; globes; refractors; reflectors .....	1/00; 3/00; 5/00; 7/00
Light guides .....	8/00
Light filters .....	9/00
Other screens .....	11/00
Combinations of elements .....	13/00
Changing characteristics or distribution of the light .....	14/00

**DETAILS OF PARTS NOT INVOLVED IN LIGHT EMISSION OR DISTRIBUTION**

Fastening .....	17/00; 19/00
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Arrangements for supporting or suspending .....	21/00
Arrangements of electric circuit elements .....	23/00
Cable stowing .....	27/00
Protection; safety; cooling; tightness .....	15/00; 25/00; 29/00; 31/00
Combinations with other articles .....	33/00
Candle holders .....	35/00
Arrangements of mantles or burners .....	36/00
Details of combustion lighting .....	37/00

SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS .....	99/00
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<b>1/00</b>	<b>Shades for light sources</b>	<b>17/00</b>	<b>Fastening of component parts of lighting devices, e.g. shades, globes, refractors, reflectors, filters, screens, grids or protective cages (of light sources or light holders F21V 19/00; gas-tight or water-tight arrangements F21V 31/00)</b>
<b>3/00</b>	<b>Globes; Bowls; Cover glasses (with refracting properties F21V 5/00; with reflecting properties F21V 7/00)</b>		
<b>5/00</b>	<b>Refractors for light sources</b>	<b>19/00</b>	<b>Fastening of light sources or lamp holders (fastening electric light source solely by the coupling device H01R 33/00)</b>
<b>7/00</b>	<b>Reflectors for light sources</b>	19/02	• with provision for adjustment, e.g. for focusing (changing the characteristics or distribution of the light emitted by adjustment of parts F21V 14/00) [1,7]
<b>8/00</b>	<b>Use of light guides, e.g. fibre optic devices, in lighting devices or systems (light guides <u>per se</u>, structural details of arrangements with other optical elements G02B 6/00) [4]</b>	19/04	• with provision for changing light source, e.g. turret
<b>9/00</b>	<b>Light filters (coloured shades F21V 1/00); Selection of luminescent materials for light screens (luminescent materials <u>per se</u> C09K 11/00; electroluminescent light sources <u>per se</u> H05B 33/00)</b>	<b>21/00</b>	<b>Supporting, suspending, or attaching arrangements for lighting devices (F21V 17/00, F21V 19/00 take precedence); Hand grips [1,7]</b>
<b>11/00</b>	<b>Screens not covered by groups F21V 1/00, F21V 3/00, F21V 7/00 or F21V 9/00</b>	21/002	• making direct electrical contact, e.g. by piercing (F21V 21/34 takes precedence) [7]
<b>13/00</b>	<b>Producing particular characteristics or distribution of the light emitted by means of a combination of elements specified in two or more of main groups F21V 1/00 to F21V 11/00 (changing the characteristics or distribution of the light emitted by adjustment of parts F21V 14/00) [1,7]</b>	21/005	• for several lighting devices in an end-to-end arrangement, i.e. light tracks [7]
<b>14/00</b>	<b>Changing the characteristics or distribution of the light emitted by adjustment of parts (reflectors with provision for adjusting the curvature F21V 7/00; light filters with provision for variation of colour or intensity F21V 9/00; screens using iris-type diaphragms F21V 11/00; adjustable mountings for lighting devices F21V 21/14) [7]</b>	21/008	• Suspending from a cable or suspension line [7]
<b>15/00</b>	<b>Protecting lighting devices from damage (cooling or heating arrangements F21V 29/00; gas-tight or water-tight arrangements F21V 31/00)</b>	21/02	• Wall, ceiling, or floor bases; Fixing pendants or arms to the bases (F21V 21/08 takes precedence; bases for movable standing lamps F21V 21/06)
		21/06	• Bases for movable standing lamps; Fixing standards to the bases (F21V 21/08 takes precedence)
		21/08	• Devices for easy attachment to a desired place
		21/10	• Pendants, arms or standards; Fixing lighting devices to pendants, arms or standards (adjustable mounting F21V 21/14)
		21/13	• Spring-loaded poles fixed at both ends [7]
		21/14	• Adjustable mountings
		21/34	• Supporting elements displaceable along a guiding element

- 21/36 . Hoisting or lowering devices, e.g. for maintenance (F21V 21/14 takes precedence)
- 21/40 . Hand grips [7]
- 23/00 Arrangement of electric circuit elements in or on lighting devices**
- 23/02 . the elements being transformers or impedances
- 23/04 . the elements being switches (safety devices F21V 25/00)
- 25/00 Safety devices structurally associated with lighting devices** (gas-tight or water-tight arrangements F21V 31/00)
- 27/00 Cable-stowing arrangements structurally associated with lighting devices, e.g. reels**
- 29/00 Cooling or heating arrangements** (reflectors specially adapted for cooling F21V 7/00; cooling of air-treatment systems with air-flow over lighting fixtures F24F 3/044; lighting fixtures combined with outlets for air-treatment systems F24F 13/06; cooling of projectors G03B 21/16; cooling arrangements structurally associated with electric lamps H01J 61/02, H01K 1/00) [1,7]
- 31/00 Gas-tight or water-tight arrangements**
- 33/00 Structural combinations of lighting devices with other articles, not otherwise provided for** [1,7]
- 35/00 Candle holders**
- 36/00 Arrangements of mantles or other incandescent bodies on burners** (attaching to lamp parts F21V 19/00)
- 37/00 Details of lighting devices employing combustion as light source, not otherwise provided for** [1,7]
- 99/00 Subject matter not provided for in other groups of this subclass** [8]

**F22 STEAM GENERATION** (chemical or physical apparatus for generating gases B01J; chemical generation of gas, e.g. under pressure, Section C; removal of combustion products or residues, e.g. cleaning of the combustion contaminated surfaces of tubes of boilers, F23J; generating combustion products of high pressure or high velocity F23R; water heaters not for steam generation F24H, F28; cleaning of internal or external surfaces of heat-transfer conduits, e.g. water tubes of boilers, F28G)

**Note**

In this class, the following term is used with the meaning indicated:

- “steam” covers also other condensable vapours, e.g. mercury, diphenyl, diphenyl oxide.

**F22B METHODS OF STEAM GENERATION; STEAM BOILERS** (steam engine plants where engine aspects predominate F01K; domestic central-heating systems using steam F24D; heat exchange or heat transfer in general F28; generation of vapour in the cores of nuclear reactors G21)

**Note**

This subclass covers only methods of, or apparatus for, the generation of steam under pressure for heating or power purposes.

**Subclass index**

METHODS FOR STEAM GENERATION .....	1/00, 3/00	
STEAM BOILERS		horizontal; horizontally-inclined; combined horizontally-inclined and vertical; vertical or steeply-inclined .....
General characteristics		15/00; 17/00; 19/00; 21/00
having drum; having furnace tube; having fire tube; having combined fire tube and water tube; having fire-box .....	5/00; 7/00; 9/00; 11/00; 13/00	
having water tubes		formed of sets of spaced double-walled water tubes or of return tubes; water tubes with internally-arranged flue tubes .....
auxiliary tubes .....	11/00	23/00; 25/00
		Special characteristics..... 27/00, 29/00
		Modifications or arrangements; details of general application..... 31/00; 37/00
		PLANTS; CONTROL SYSTEMS..... 33/00; 35/00

**1/00 Methods of steam generation characterised by form of heating method** (use of solar heat F24J 2/00; jackets or other cooling means in which steam is generated and which serve for cooling other apparatus, see the subclasses for such apparatus)

**3/00 Other methods of steam generation; Steam boilers not provided for in other groups of this subclass**

**5/00 Steam boilers of drum type, i.e. without internal furnace or fire tubes, the boiler body being contacted externally by flue gas**

**7/00 Steam boilers of furnace-tube type, i.e. the combustion of fuel being performed inside one or more furnace tubes built-in in the boiler body**

**9/00 Steam boilers of fire-tube type, i.e. the flue gas from a combustion chamber outside the boiler body flowing through tubes built-in in the boiler body**

**11/00 Steam boilers of combined fire-tube type and water-tube type, i.e. steam boilers of fire-tube type having auxiliary water tubes**

**13/00 Steam boilers of fire-box type, i.e. the combustion of fuel being performed in a chamber or fire-box with subsequent flue(s) or fire tube(s), both chamber or fire-box and flues or fire tubes being built-in in the boiler body**

**15/00 Water-tube boilers of horizontal type, i.e. the water-tube sets being arranged horizontally**

**17/00 Water-tube boilers of horizontally-inclined type, i.e. the water-tube sets being inclined slightly with respect to the horizontal plane**

**19/00 Water-tube boilers of combined horizontally-inclined type and vertical type, i.e. water-tube boilers of horizontally-inclined type having auxiliary water-tube sets in vertical or substantially-vertical arrangement**

**21/00 Water-tube boilers of vertical or steeply-inclined type, i.e. the water-tube sets being arranged vertically or substantially vertically**

**23/00 Water-tube boilers built-up from sets of spaced double-walled water tubes of return type in unilateral abutting connection with a boiler drum or with a header box, i.e. built-up from Field water tubes comprising an inner tube arranged within an outer unilaterally-closed tube**

**25/00 Water-tube boilers built-up from sets of water tubes with internally-arranged flue tubes, or fire tubes, extending through the water tubes**

**27/00 Instantaneous or flash steam boilers**

- 29/00 **Steam boilers of forced-flow type**
- 31/00 **Modifications of boiler construction, or of tube systems, dependent on installation of combustion apparatus; Arrangements or dispositions of combustion apparatus** (steam generation characterised by heating method F22B 1/00; combustion apparatus per se F23)

- 35/00 **Control systems for steam boilers** (regulation or control of steam power plants F01K 7/00; for regulating feed-water supply F22D; for controlling superheat temperature F22G 5/00; control of combustion F23N)

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**Steam-generation plants; Control systems**

- 33/00 **Steam-generation plants, e.g. comprising steam boilers of different types in mutual association** (arrangements or dispositions of steam-generation plants in marine vessels B63H 21/00)

- 37/00 **Component parts or details of steam boilers** (venting devices F16K 24/00; steam traps or like apparatus F16T; construction of tube walls of boiler furnaces F23M 5/00)

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**F22D PREHEATING, OR ACCUMULATING PREHEATED, FEED-WATER; FEED-WATER SUPPLY; CONTROLLING WATER LEVEL; AUXILIARY DEVICES FOR PROMOTING WATER CIRCULATION WITHIN BOILERS** (chemical treatment of water, e.g. purification, C02F; enclosed heat-exchange apparatus in general F28D; controlling in general G05)

- 1/00 **Feed-water heaters, e.g. preheaters**
- 3/00 **Accumulators for preheated water**

- 5/00 **Controlling water feed or water level; Automatic water feeding or water-level regulators** (steam traps F16T; measuring or indicating instruments G01; for indicating water level G01F; level control in general G05D 9/00)

- 7/00 **Auxiliary devices for promoting water circulation** (adaptation of boilers for promoting water circulation F22B 37/00)

- 11/00 **Feed-water supply not provided for in other main groups**

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**F22G SUPERHEATING OF STEAM** (steam-separating arrangements in boilers F22B 37/00)

- 1/00 **Steam superheating characterised by heating method** (exothermal chemical reactions not involving a supply of free oxygen gas, apparatus or devices for using the heat therefrom F24J)
- 3/00 **Steam superheaters characterised by constructional features; Details or component parts thereof** (general aspects of enclosed heat-exchangers F28D)

- 5/00 **Controlling superheat temperature** (control systems for steam boilers F22B; regulating or controlling in general G05)

- 7/00 **Steam superheaters characterised by location, arrangement, or disposition**

## F23 COMBUSTION APPARATUS; COMBUSTION PROCESSES

### Note

In this class, the following terms or expressions are used with the meanings indicated:

- “combustion” means the direct combination of oxygen gas, e.g. in air, and a burnable substance. Any other heat-producing combination of chemical substances, e.g. hydrogen peroxide and methane, iron oxide and aluminium, is covered by section C or by subclass F24J;
- “combustion chamber” means a chamber in which fuel is burned to establish a self-supporting fire or flame and which surrounds that fire or flame;
- “burner” means a device by which fluent fuel is passed to a combustion space where it burns to produce a self-supporting flame;
- “air” means a mixture of gases containing free oxygen and able to promote or support combustion.

**F23B METHODS OR APPARATUS FOR COMBUSTION USING ONLY SOLID FUEL** (for combustion of fuels that are solid at room temperatures, but burned in melted form, e.g. candle wax, C11C 5/00, F23C, F23D; using solid fuel suspended in air F23C, F23D 1/00; using solid fuel suspended in liquids F23C, F23D 11/00; using solid fuel and fluent fuel simultaneously or alternately F23C, F23D 17/00)

- (1) This subclass only covers combustion wherein the main body of fuel is either essentially stationary during combustion or mechanically transported, as opposed to pneumatically transported or suspended in air, during combustion. [8]
- (2) In this subclass, the first place priority rule is applied, i.e. at each hierarchical level, classification is made in the first appropriate place. [8]
- (3) In this subclass, methods are classified in the groups that cover the apparatus used. Methods that are not related to a particular type of apparatus are classified in group F23B 90/00. [8]

### Subclass index

#### COMBUSTION APPARATUS

Combinations of two or more combustion chambers ..... 10/00  
 Specially adapted for portability or transportability ..... 20/00  
 Functional types ..... 30/00 to 60/00  
 Returning solid combustion residues to the combustion chamber ..... 70/00

Creating a distinct flow path for flue gases or for non-combusted gases given off by the fuel ..... 80/00

COMBUSTION METHODS NOT RELATED TO A PARTICULAR TYPE OF APPARATUS ..... 90/00  
 SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS ..... 99/00

<b>10/00</b>	<b>Combustion apparatus characterised by the combination of two or more combustion chambers [8]</b>	<b>50/00</b>	<b>Combustion apparatus in which the fuel is fed into or through the combustion zone by gravity, e.g. from a fuel storage situated above the combustion zone [8]</b>
<b>20/00</b>	<b>Combustion apparatus specially adapted for portability or transportability [8]</b>	50/02	the fuel forming a column, stack or thick layer with the combustion zone at its bottom [8]
<b>30/00</b>	<b>Combustion apparatus with driven means for agitating the burning fuel; Combustion apparatus with driven means for advancing the burning fuel through the combustion chamber [8]</b>	50/12	the fuel being fed to the combustion zone by free fall or by sliding along inclined surfaces, e.g. from a conveyer terminating above the fuel bed [8]
30/02	with movable, e.g. vibratable, fuel-supporting surfaces; with fuel-supporting surfaces that have movable parts [8]	<b>60/00</b>	<b>Combustion apparatus in which the fuel burns essentially without moving [8]</b>
<b>40/00</b>	<b>Combustion apparatus with driven means for feeding fuel into the combustion chamber [8]</b>	60/02	with combustion air supplied through a grate [8]
40/02	the fuel being fed by scattering over the fuel-supporting surface [8]	<b>70/00</b>	<b>Combustion apparatus characterised by means for returning solid combustion residues to the combustion chamber [8]</b>
40/04	the fuel being fed from below through an opening in the fuel-supporting surface [8]		
40/06	the fuel being fed along the fuel-supporting surface [8]		

<b>80/00</b>	<b>Combustion apparatus characterised by means creating a distinct flow path for flue gases or for non-combusted gases given off by the fuel [8]</b>	<b>90/00</b>	<b>Combustion methods not related to a particular type of apparatus [8]</b>
80/02	· by means for returning flue gases to the combustion chamber or to the combustion zone [8]	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass [8]</b>
80/04	· by means for guiding the flow of flue gases, e.g. baffles [8]		

## **F23C METHODS OR APPARATUS FOR COMBUSTION USING FLUENT FUEL (burners F23D)**

### **Note**

In this subclass, methods are classified in the groups that cover the apparatus used. [8]

### **Subclass index**

COMBUSTION APPARATUS SPECIALLY ADAPTED FOR COMBUSTION OF TWO OR MORE TYPES OF FUEL .....	1/00
COMBINATIONS OF TWO OR MORE COMBUSTION CHAMBERS .....	6/00
FUNCTIONAL TYPES OF COMBUSTION APPARATUS	
Fluidised bed combustion .....	10/00
Catalytic combustion .....	13/00
Resonant combustion .....	15/00

COMBUSTION APPARATUS CHARACTERISED BY SUBSYSTEMS	
Combustion chambers .....	3/00
Arrangement or mounting of burners .....	5/00
Air supply .....	7/00
Arrangements for returning flue gases or combustion products .....	9/00
SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS .....	99/00

<b>1/00</b>	<b>Combustion apparatus specially adapted for combustion of two or more kinds of fuel simultaneously or alternately, at least one kind of fuel being fluent</b> (combustion apparatus characterised by the combination of two or more combustion chambers F23C 6/00; pilot flame igniters F23Q 9/00) [1,7,8]	<b>10/00</b>	<b>Apparatus in which combustion takes place in a fluidised bed of fuel or other particles [7]</b>
<b>3/00</b>	<b>Combustion apparatus characterised by the shape of the combustion chamber</b> (F23C 15/00 takes precedence) [1,7,8]	10/01	· in a fluidised bed of catalytic particles [8]
<b>5/00</b>	<b>Combustion apparatus characterised by the arrangement or mounting of burners [1,7,8]</b>	<b>13/00</b>	<b>Apparatus in which combustion takes place in the presence of catalytic material</b> (in a fluidised bed of catalytic particles F23C 10/01; radiant gas burners using catalysis for flameless combustion F23D 14/18) [8]
<b>6/00</b>	<b>Combustion apparatus characterised by the combination of two or more combustion chambers [3,7,8]</b>	13/02	· characterised by arrangements for starting the operation, e.g. for heating the catalytic material to operating temperature [8]
<b>7/00</b>	<b>Combustion apparatus characterised by arrangements for air supply</b> (inlets for fluidisation air F23C 10/00) [1,7,8]	13/04	· characterised by the arrangement of two or more catalytic elements in series connection [8]
<b>9/00</b>	<b>Combustion apparatus characterised by arrangements for returning combustion products or flue gases to the combustion chamber</b> (fluidised bed combustion apparatus with means for recirculation of particles entrained from the bed F23C 10/00; fluidised bed combustion apparatus with devices for removal and partial reintroduction of material from the bed F23C 10/00) [1,7,8]	13/06	· in which non-catalytic combustion takes place in addition to catalytic combustion, e.g. downstream of a catalytic element [8]
		13/08	· characterised by the catalytic material [8]
		<b>15/00</b>	<b>Apparatus in which combustion takes place in pulses influenced by acoustic resonance in a gas mass [8]</b>
		<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass [8]</b>

**F23D BURNERS** (generating combustion products of high pressure or high velocity F23R)**Subclass index**

BURNERS FOR PULVERULENT FUEL.....	1/00	BURNERS FOR COMBUSTION OF A GAS .....	14/00
BURNERS FOR COMBUSTION OF A LIQUID		BURNERS FOR COMBUSTION OF GASEOUS OR LIQUID OR PULVERULENT FUEL .....	17/00
Using capillary action.....	3/00	ASSEMBLIES OF TWO OR MORE BURNERS.....	23/00
Using fuel evaporation; direct spraying action .....	5/00; 11/00	OTHER BURNERS .....	99/00
Using fuel impingement on a surface.....	7/00, 9/00		

**1/00 Burners for combustion of pulverulent fuel**  
(arrangement or mounting of burners F23C 5/00)

**Combustion of a liquid**

**3/00 Burners using capillary action**

**5/00 Burners in which liquid fuel evaporates in the combustion space, with or without chemical conversion of evaporated fuel**

**7/00 Burners in which drops of liquid fuel impinge on a surface**

**9/00 Burners in which a stream of liquid fuel impinges intermittently on a hot surface**

**11/00 Burners using a direct spraying action of liquid droplets or vaporised liquid into the combustion space** (spraying in general B05B, B05D)

11/10 . the spraying being induced by a gaseous medium, e.g. water vapour

11/24 . by pressurisation of the fuel before a nozzle through which it is sprayed by a substantial pressure reduction into a space

11/36 . Details

11/40 . . Mixing tubes; Burner heads

**14/00 Burners for combustion of a gas, e.g. of a gas stored under pressure as a liquid [4]**

14/02 . Premix gas burners, i.e. in which gaseous fuel is mixed with combustion air upstream of the combustion zone [4]

14/04 . . induction type, e.g. Bunsen burner [4]

14/12 . Radiant burners [4]

14/18 . . using catalysis for flameless combustion [4]

14/46 . Details [4]

14/48 . . Nozzles (for spraying or coating B05B) [4]

14/72 . . Safety devices, e.g. operative in case of failure of gas supply (protection or supervision of pipe-line systems F17D 5/00) [4]

**Other burners**

**17/00 Burners for combustion simultaneously or alternately of gaseous or liquid or pulverulent fuel**

**23/00 Assemblies of two or more burners** (gas burners with provision for a retention flame F23D 14/00; arrangement or mounting of burners F23C 5/00; for industrial furnaces F27)

**99/00 Subject matter not provided for in other groups of this subclass [2010.01]**

**F23G CREMATION FURNACES; CONSUMING WASTE OR LOW GRADE FUELS BY COMBUSTION****Subclass index**

CREMATION .....	1/00	Adaptation for specific waste or fuels .....	7/00
CONSUMING WASTE OR LOW-GRADE FUELS BY COMBUSTION		Details; Accessories .....	5/44
Processes; Functional types of apparatus.....	5/00	Control or safety arrangements.....	5/50

**1/00 Methods or apparatus specially adapted for cremation of human or animal carcasses**

**5/00 Methods or apparatus, e.g. incinerators, specially adapted for combustion of waste or low-grade fuels [4]**

5/02 . including pretreatment [4]

5/027 . . pyrolysing or gasifying (pyrolysis of sludge C02F 11/00; destructive distillation of carbonaceous materials C10B 53/00) [4]

5/08 . including supplementary heating [4]

5/14 . . including secondary combustion [4]

5/16 . . . in a separate combustion chamber [4]

5/20 . with combustion in rotating or oscillating drums [4]

5/24 . with combustion in a vertical, substantially cylindrical, combustion chamber [4]

5/30 . with combustion in a fluidised bed [4]

5/32 . in which the waste or low-grade fuel is subjected to a whirling movement, e.g. cyclonic incinerators [4]

5/34 . in which the waste or low-grade fuel is burnt in a pit or arranged in a heap for combustion [4]



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| <p>5/36 . with combustion in a conical combustion chamber, e.g. "teepee" incinerators (F23G 5/20 takes precedence) [4]</p> <p>5/38 . having multi-hearth arrangements [4]</p> <p>5/40 . Portable or mobile apparatus [4]</p> <p>5/44 . Details; Accessories [4]</p> <p>5/46 . . Recuperation of heat [4]</p> <p>5/48 . . Preventing corrosion [4]</p> <p>5/50 . Control or safety arrangements [4]</p> | <p><b>7/00 Methods or apparatus, e.g. incinerators, specially adapted for combustion of specific waste or low grade fuels, e.g. chemicals</b> (F23G 1/00 takes precedence; incinerator closets A47K 11/00; oxidation of sludge C02F 11/06; incinerating radioactive waste G21F 9/00) [4,8]</p> <p>7/04 . of waste liquors, e.g. sulfite liquors [4]</p> <p>7/05 . of waste oils [4]</p> <p>7/06 . of waste gases or noxious gases, e.g. exhaust gases (exhaust apparatus for engines with means for rendering the exhaust innocuous, e.g. by thermal or catalytic conversion, F01N 3/08; combustion of uncombusted material from primary combustion within apparatus for combustion of solid or fluent fuel F23B, F23C) [4]</p> <p>7/12 . of plastics, e.g. rubber [4]</p> |
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**F23H GRATES** (inlets for fluidisation air for fluidised bed combustion apparatus F23C 10/00); **CLEANING OR RAKING GRATES**

**Subclass index**

GRATES		Other types .....	13/00
With solid bars; with hollow bars.....	1/00; 3/00	Details.....	17/00
Double; inclined; revolving or rocking; travelling.....	5/00; 7/00; 9/00; 11/00	CLEANING ARRANGEMENTS FOR GRATES, MOVING FUEL ALONG GRATE.....	15/00

<b>1/00 Grates with solid bars</b> (double grates F23H 5/00)	<b>13/00 Grates not covered by any of groups F23H 1/00 to F23H 11/00</b>
<b>3/00 Grates with hollow bars</b>	
<b>5/00 Double grates</b>	<b>15/00 Cleaning arrangements for grates</b> (not forming part of the grate F23J 1/00); <b>Moving fuel along grate</b> (rocking grates modified for moving fuel F23H 9/00; for travelling grates F23H 11/00)
<b>7/00 Inclined grates</b> (inclined travelling grates F23H 11/00)	
<b>9/00 Revolving grates; Rocking grates</b> (F23H 7/00 takes precedence)	<b>17/00 Details of grates</b>
<b>11/00 Travelling grates</b>	

**F23J REMOVAL OR TREATMENT OF COMBUSTION PRODUCTS OR COMBUSTION RESIDUES; FLUES** (precipitating dust from flue gases B01D; composition of fuels C10; combustion apparatus for consuming smoke or fumes, e.g. exhaust gases, F23G 7/06)

- (1) This subclass covers also the cleaning of surfaces of furnace tubes, flame tubes, water tubes, flues or the like of boilers, heat-exchange or heat-transfer conduits, which surfaces are contaminated by combustion products or combustion residues.
- (2) This subclass does not cover the cleaning of surfaces of boilers, heat exchange or heat-transfer conduits contaminated by other than combustion products or combustion residues, which is covered by subclass F28G.

**Subclass index**

REMOVAL OF SOLID COMBUSTION PRODUCTS OR RESIDUES	FLUES, FITTINGS FOR CHIMNEYS OR FLUES .....	11/00, 13/00
From combustion chamber .....	SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS .....	99/00
From places beyond the fire .....		
TREATMENT OF COMBUSTION PRODUCTS OR RESIDUES		
Supply of chemicals; preventing solidification; Treating smoke or fumes.....		7/00; 9/00; 15/00

<b>1/00</b>	<b>Removing ash, clinker, or slag from combustion chambers</b> (devices for removal of material from the bed of fluidised bed combustion apparatus F23C 10/00)	<b>11/00</b>	<b>Devices for conducting smoke or fumes, e.g. flues</b> (heat insulation therefor E04B 1/94; chimneys E04H 12/00; removing cooking fumes from domestic stoves or ranges F24C 15/20) [5]
1/02	. Apparatus for removing ash, clinker, or slag from ash-pits, e.g. by employing trucks or conveyers, by employing suction devices	<b>13/00</b>	<b>Fittings for chimneys or flues</b> (staying, stiffening E04H; means for facilitating climbing E06C; draught-inducing apparatus associated with chimneys or flues F23L)
1/04	. Hand tools, e.g. rakes, prickers, tongs	<b>15/00</b>	<b>Arrangements of devices for treating smoke or fumes</b> (such devices <i>per se</i> , methods for treating smoke or fumes, <i>see</i> the relevant places for the treatment, e.g. B01D 53/00)
1/06	. Mechanically-operated devices, e.g. clinker pushers (forming part of the grate F23H)	15/02	. of purifiers, e.g. for removing noxious material (traps for solid residues F23J 3/00) [6]
1/08	. Liquid slag removal [3]	15/06	. of coolers [6]
<b>3/00</b>	<b>Removing solid residues from passages or chambers beyond the fire, e.g. from flues by soot blowers</b>	15/08	. of heaters [6]
<b>7/00</b>	<b>Arrangement of devices for supplying chemicals to fire</b> (supplying chemicals to fire C10L)	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b> [8]
<b>9/00</b>	<b>Preventing premature solidification of molten combustion residues</b>		

**F23K FEEDING FUEL TO COMBUSTION APPARATUS** (fuel feeders specially adapted for fluidised bed combustion apparatus F23C 10/00; regulating or controlling combustion F23N)

<b>1/00</b>	<b>Preparation of lump or pulverulent fuel in readiness for delivery to combustion apparatus</b> (filtration B01D; mixing B01F; pulverising B02C; drying F26B)	<b>3/00</b>	<b>Feeding or distributing of lump or pulverulent fuel to combustion apparatus</b> (conveying in general B65G)
		<b>5/00</b>	<b>Feeding or distributing other fuel to combustion apparatus</b>
		5/02	. Liquid fuel [5]

**F23L AIR SUPPLY; DRAUGHT-INDUCING; SUPPLYING NON-COMBUSTIBLE LIQUID OR GAS** (air-supply arrangements for combustion apparatus using fluent fuel, e.g. fluidised bed combustion apparatus, F23C; dampers or throat restrictors for open fire-places F24; air inlet valves for open fire fronts F24)

**Subclass index**

**AIR SUPPLY**

Passages for: primary air; secondary air .....	1/00; 9/00
Valves or dampers	
construction.....	13/00
arrangements: before the fire;	
after the fire.....	3/00; 11/00

Blast-producing apparatus before the fire; heating of air for combustion .....	5/00; 15/00
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<b>SUPPLYING NON-COMBUSTIBLE LIQUIDS OR GASES, OTHER THAN AIR, TO THE FIRE</b> .....	7/00
<b>DRAUGHT-INDUCING</b> .....	17/00
<b>SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS</b> .....	99/00

<b>1/00</b>	<b>Passages or apertures for delivering primary air for combustion</b>	<b>11/00</b>	<b>Arrangements of valves or dampers after the fire</b>
<b>3/00</b>	<b>Arrangements of valves or dampers before the fire</b>	<b>13/00</b>	<b>Construction of valves or dampers for controlling air supply or draught</b> (in general F16K)
<b>5/00</b>	<b>Blast-producing apparatus before the fire</b>	<b>15/00</b>	<b>Heating of air supplied for combustion</b>
<b>7/00</b>	<b>Supplying non-combustible liquids or gases, other than air, to the fire, e.g. oxygen, steam</b>	<b>17/00</b>	<b>Inducing draught</b>
<b>9/00</b>	<b>Passages or apertures for delivering secondary air for completing combustion of fuel</b>	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b> [8]

**F23M CONSTRUCTIONAL DETAILS OF COMBUSTION CHAMBERS, NOT OTHERWISE PROVIDED FOR** (construction or support of tube walls for steam boilers F22B; generating combustion products of high pressure or high velocity F23R)

<b>3/00</b>	<b>Firebridges</b> (baffles not confining the fire F23M 9/00)	<b>9/00</b>	<b>Baffles or deflectors for air or combustion products; Flame shields</b>
<b>5/00</b>	<b>Casings; Linings; Walls</b> (casings, linings, or walls of heat-treatment chambers of ovens, kilns, or retorts F27D)	<b>11/00</b>	<b>Safety arrangements</b> (by controlling combustion F23N 5/24)
<b>7/00</b>	<b>Doors specially adapted for combustion chambers</b> (in general E06B; for flues or smoke-boxes F23J 13/00)	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass [2010.01]</b>

**F23N REGULATING OR CONTROLLING COMBUSTION** (control devices specially adapted for combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/00; condition responsive controls for regulating combustion in domestic stoves with open fires for solid fuel F24B 1/00)

<b>1/00</b>	<b>Regulating fuel supply</b>	5/14	. . . using thermo-sensitive resistors
1/02	. . . conjointly with air supply	5/16	. . . using noise-sensitive detectors
1/08	. . . conjointly with another medium, e.g. boiler water	5/18	. . . using detectors sensitive to rate of flow of air or fuel
<b>3/00</b>	<b>Regulating air supply or draught</b> (conjointly with fuel supply F23N 1/00)	5/20	. . . with a time programme acting through electrical means, e.g. using time-delay relays
<b>5/00</b>	<b>Systems for controlling combustion</b> (F23N 1/00, F23N 3/00 take precedence)	5/22	. . . with a time programme acting through mechanical means, e.g. using cams
5/02	. . . using devices responsive to thermal changes or to thermal expansion of a medium	5/24	. . . Preventing development of abnormal or undesired conditions, i.e. safety arrangements (F23N 5/02 to F23N 5/18 take precedence)
5/08	. . . using light-sensitive elements	5/26	. . . Details
5/12	. . . using ionisation-sensitive elements, i.e. flame rods		

**F23Q IGNITION** (devices for igniting matches A24F; explosive or thermic compositions C06B; chemical igniters C06C; devices or installations peculiar to internal-combustion engines, except glowing plugs, F02P); **EXTINGUISHING DEVICES**

#### Subclass index

IGNITERS	Other .....	13/00
Mechanical .....	REMOTE IGNITION .....	21/00
Using electric sparks .....	TESTING .....	23/00
Incandescent .....	LIGHTERS CONTAINING FUEL .....	2/00, 3/00, 7/00
With pilot flame .....	EXTINGUISHING DEVICES .....	25/00
By catalysis .....		

<b>1/00</b>	<b>Mechanical igniters</b> (lighters containing fuel F23Q 2/00; matches C06F)	<b>9/00</b>	<b>Pilot flame igniters</b>
<b>2/00</b>	<b>Lighters containing fuel, e.g. for cigarettes</b>	<b>11/00</b>	<b>Arrangement of catalytic igniters</b> (catalytic igniters <u>per se</u> C06C)
<b>3/00</b>	<b>Igniters using electrically-produced sparks</b> (spark-plugs H01T 13/00)	<b>13/00</b>	<b>Igniters not otherwise provided for</b>
<b>5/00</b>	<b>Make-and-break ignition, i.e. with spark generated between electrodes by breaking contact therebetween</b> (specially adapted for internal-combustion engines F02P 15/00)	<b>21/00</b>	<b>Devices for effecting ignition from a remote location</b>
<b>7/00</b>	<b>Incandescent ignition; Igniters using electrically-produced heat, e.g. lighters for cigarettes; Electrically-heated glowing plugs</b>	<b>23/00</b>	<b>Testing of ignition installations</b> (peculiar to internal-combustion engines F02P 17/00; testing of sparking plugs G01M 19/02)
		<b>25/00</b>	<b>Extinguishing devices, e.g. for blowing-out or snuffing candle flames</b> (for cigarettes A24F)

**F23R GENERATING COMBUSTION PRODUCTS OF HIGH PRESSURE OR HIGH VELOCITY, E.G. GAS-TURBINE COMBUSTION CHAMBERS** (chemical aspects of gas production C06D 5/00; gas-turbine plants characterised by the arrangement of the combustion chamber in the plant F02C 3/00; arrangement of afterburners in jet-propulsion plants F02K 3/00; combustion chambers of rocket engine plants F02K 9/00; using such products for specific purposes, see the relevant classes for the purposes)

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|---|--|
| <b>3/00 Continuous combustion chambers using liquid or gaseous fuel [3]</b>   | 3/30 . . comprising fuel prevapourising devices [3]  |
| 3/02 . characterised by the air-flow or gas-flow configuration (reverse-flow combustion chambers F23R 3/00; cyclone or vortex type combustion chambers F23R 3/00) [3] | 3/34 . . Feeding into different combustion zones [3]   |
| 3/04 . . Air inlet arrangements [3]   | <b>5/00 Continuous combustion chambers using solid or pulverulent fuel</b> (fluidised bed combustion apparatus specially adapted for operation at superatmospheric pressures F23C 10/00) [3] |
| 3/28 . characterised by the fuel supply (burners F23D) [3]  | <b>7/00 Intermittent or explosive combustion chambers [3]</b>  |

**F24 HEATING; RANGES; VENTILATING** (protecting plants by heating in gardens, orchards, or forests A01G 13/06; baking ovens and apparatus A21B; cooking devices other than ranges A47J; forging B21J, B21K; specially adapted for vehicles, see the relevant subclasses of classes B60 to B64; combustion apparatus in general F23; drying F26B; ovens in general F27; electric heating elements or arrangements H05B)

### Note

In this class, the following terms are used with the meanings indicated:

- “stove” includes apparatus which may have an open fire, e.g. fireplace;
- “range” means an apparatus for cooking having elements that perform different cooking operations or cooking and heating operations.

**F24B DOMESTIC STOVES OR RANGES FOR SOLID FUELS; IMPLEMENTS FOR USE IN CONNECTION WITH STOVES OR RANGES [6]**

- |   |   |
|---|---|
| <p><b>1/00 Stoves or ranges</b></p> <p><b>3/00 Heaters not covered by group F24B 1/00, e.g. charcoal brazier</b> (for cooking A47J 27/00 to A47J 37/00)</p> <p><b>5/00 Combustion-air or flue-gas circulation in or around stoves or ranges</b> (stoves with open fires with air-handling means F24B 1/00) [4]</p> <p><b>7/00 Stoves, ranges, or flue-gas ducts, with additional provisions for convection heating</b> (stoves with open fires characterised by use of heat exchange means F24B 1/00; air heaters having heat generating means F24H 3/00) [4]</p> | <p><b>9/00 Stoves, ranges, or flue-gas ducts, with additional provisions for heating water</b> (F24B 1/00 takes precedence) [3,4]</p> <p><b>13/00 Details solely applicable to stoves or ranges burning solid fuels</b> (component parts or accessories for stoves with open-fires F24B 1/00; removing ash, clinker or slag from combustion chambers F23J 1/00; removing solid residues from passages or chambers beyond the fire F23J 3/00; joints or connections for chimneys or flues F23J 13/00; mouths or inlet holes for chimneys or flues F23J 13/00; means for supervising combustion F23M 11/00) [4]</p> <p><b>15/00 Implements for use in connection with stoves or ranges</b> (ash sieves B07B; firelighters C10L 11/00; removal of ashes F23J; other devices for igniting F23Q) [6]</p> |
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**F24C OTHER DOMESTIC STOVES OR RANGES; DETAILS OF DOMESTIC STOVES OR RANGES, OF GENERAL APPLICATION** (radiator stoves of the fluid-circulating type F24H)

### Subclass index

STOVES OR RANGES, NOT RESTRICTED TO SOLID FUEL

- General characteristics..... 1/00
- With single kind of fuel or energy supply ..... 3/00 to 9/00
- With more than one, or unspecified kind of fuel or energy supply..... 1/00

- With additional means for heating water ..... 13/00
- With self-cleaning provisions ..... 14/00
- Combinations of stoves or ranges ..... 11/00

DETAILS OF STOVES OR RANGES IN GENERAL..... 15/00

- |   |  |
|---|--|
| <p><b>1/00 Stoves or ranges in which the fuel or energy supply is not restricted to solid fuel or to a type covered by a single one of groups F24C 3/00 to F24C 9/00; Stoves or ranges in which the type of fuel or energy supply is not specified</b> (combinations of two or more stoves or ranges each having a different kind of fuel or energy supply F24C 11/00)</p> <p><b>3/00 Stoves or ranges for gaseous fuels</b></p> <p>3/08 . Arrangement or mounting of burners (burners <u>per se</u> F23D)</p> <p>3/12 . Arrangement or mounting of control or safety devices (control valves F16K; safety devices for burners F23D 14/72; regulating or controlling combustion F23N)</p> | <p><b>5/00 Stoves or ranges for liquid fuels</b></p> <p><b>7/00 Stoves or ranges heated by electric energy</b> (electric heating elements or arrangements H05B)</p> <p>7/02 . using microwaves (heating using microwaves in general H05B 6/64)</p> <p>7/04 . with heat radiated directly from the heating element (F24C 7/10 takes precedence)</p> <p>7/08 . Arrangement or mounting of control or safety devices (switches H01H; circuit arrangements for electric heating H05B)</p> <p>7/10 . with special adaptation for travelling, e.g. collapsible</p> |
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9/00	<b>Stoves or ranges heated by a single type of energy supply not covered by groups F24C 3/00 to F24C 7/00 or subclass F24B</b> (using the heat from an exothermal reaction not involving a supply of free oxygen gas, using solar energy F24J)	15/08	• Foundations or support plates; Legs or pillars; Casings; Wheels (F24C 15/10 takes precedence)
11/00	<b>Combinations of two or more stoves or ranges, e.g. each having a different kind of energy supply</b>	15/10	• Tops, e.g. hot plate; Rings (F24C 15/12, F24C 15/14 take precedence)
13/00	<b>Stoves or ranges with additional provisions for heating water [3]</b>	15/12	• Side rests; Side plates; Cover lids; Splash guards; Racks outside ovens, e.g. for drying plates
14/00	<b>Stoves or ranges having self-cleaning provisions, e.g. continuous or catalytic cleaning, electrostatic cleaning [3]</b>	15/14	• Spillage trays or grooves
15/00	<b>Details</b>	15/16	• Shelves, racks, or trays inside ovens; Supports therefor
15/02	• Doors specially adapted for stoves or ranges (in general E06B; for combustion chambers F23M)	15/20	• Removing cooking fumes (parts, details or accessories of cooking-vessels for withdrawing or condensing cooking vapours from such vessels A47J 36/00) [5]
		15/32	• Arrangements of ducts for hot gases, e.g. in or around baking ovens

**F24D DOMESTIC- OR SPACE-HEATING SYSTEMS, E.G. CENTRAL HEATING SYSTEMS; DOMESTIC HOT-WATER SUPPLY SYSTEMS; ELEMENTS OR COMPONENTS THEREFOR** (preventing corrosion C23F; water supply in general E03; using steam or condensate extracted or exhausted from steam engine plants for heating purposes F01K 17/00; steam traps F16T; domestic stoves or ranges F24B, F24C; water or air heaters having heat generating means F24H; combined heating and refrigeration systems F25B; heat exchange apparatus or elements F28; removing furring F28G)

#### Note

In this subclass, the following expression is used with the meaning indicated:

- “central heating system” means a system in which heat is generated or stored at central sources and is distributed by means of a transfer fluid to the spaces or areas to be heated. [5]

#### Subclass index

CENTRAL HEATING SYSTEMS	Other systems.....	12/00
With heat-transfer fluid: steam; hot water; hot air or exhaust gas; other fluid.....	OTHER DOMESTIC- OR SPACE-HEATING SYSTEMS	
1/00; 3/00; 5/00; 7/00	Electric; Other.....	13/00; 15/00
Combinations.....	DOMESTIC HOT-WATER SUPPLY .....	17/00
9/00	DETAILS.....	19/00
District heating systems .....		
10/00		
By heat storage .....		
11/00		

#### Central heating systems

- 1/00 **Steam central heating systems** (F24D 10/00, F24D 11/00 take precedence)
- 3/00 **Hot-water central heating systems** (F24D 10/00, F24D 11/00 take precedence)
- 3/10 • Feed-line arrangements, e.g. providing for heat-accumulator tanks, expansion tanks
- 3/12 • Tube and panel arrangements for ceiling, wall, or underfloor heating (electric underfloor heating F24D 13/02; special adaptations of floors for incorporating ducts, e.g. for heating or ventilating, E04B 5/48; building elements of block or other shape for the construction of parts of buildings characterised by special adaptations, e.g. serving for locating conduits, E04C 1/00; building elements of relatively thin form for the construction of parts of buildings with special adaptations for auxiliary purposes, e.g. serving for locating conduits, E04C 2/52) [4]
- 5/00 **Hot-air central heating systems** (F24D 10/00, F24D 11/00 take precedence; air conditioning F24F); **Exhaust-gas central heating systems**

- 7/00 **Central heating systems employing heat-transfer fluids not covered by groups F24D 1/00 to F24D 5/00, e.g. oil, salt, gas** (F24D 10/00, F24D 11/00 take precedence)
- 9/00 **Central heating systems employing combinations of heat-transfer fluids covered by two or more of groups F24D 1/00 to F24D 7/00** (F24D 10/00, F24D 11/00 take precedence)
- 10/00 **District heating systems [5]**
- 11/00 **Central heating systems using heat accumulated in storage masses** (self-contained storage heating units F24D 15/00; storage masses, see the relevant subclasses)
- 12/00 **Other central heating systems**

#### Other domestic- or space-heating systems

- 13/00 **Electric heating systems** (electric water or air heaters F24H)
- 13/02 • solely using resistance heating, e.g. underfloor heating

**15/00 Other domestic- or space-heating systems**

**17/00 Domestic hot-water supply systems** (combined with domestic- or space-heating systems F24D 1/00 to F24D 15/00)

17/02 . using heat pumps [5]

**19/00 Details** (of water or air heaters F24H 9/00; of heat-exchange or heat-transfer apparatus, of general application F28F) [3]

**F24F AIR-CONDITIONING; AIR-HUMIDIFICATION; VENTILATION; USE OF AIR CURRENTS FOR SCREENING** (devices for ventilating greenhouses A01G; animal husbandry A01K, e.g. controlling humidity in incubators A01K 41/00; disinfecting or sterilising of air A61L; devices for reconditioning breathing air in sealed rooms or for ventilating gasproof shelters A62B; filtering, washing or drying of gases B01D; mixing gases with vapours or liquids in general B01F 3/00; spraying B05B, B05D; removing dirt or fumes from areas where they are produced B08B 15/00; ventilation, air-conditioning, or cooling, specially adapted for vehicles, see the relevant vehicle places, e.g. B60H, B61D 27/00; production of ozone C01B 13/10; chimneys or flues E04F 17/00, E04H 12/00, F23J 11/00, F23L 17/00; air ducts or conduits E04F 17/00, F16L; ventilation in doors or windows E06B 7/02; fans, blowers F04; noise-absorbing in pipes or pipe systems F16L; tops for chimneys or ventilating shafts F23L; cooling F25; details of heat-exchange or heat-transfer apparatus, of general application F28F; apparatus for generating ions to be introduced into non-enclosed gases, e.g. the atmosphere, H01T 23/00)

- (1) In this subclass:
- air-humidification as auxiliary treatment in air-conditioning, i.e. in units wherein the air is also either cooled or heated, is covered by groups F24F 1/00 or F24F 3/12; [3]
  - air-humidification per se, e.g. "room humidifiers", is covered by group F24F 6/00. [3]
- (2) In this subclass, the following terms or expressions are used with the meanings indicated:
- "air-conditioning" means the supply of air to rooms or spaces by means which provide for the treatment of the air in at least two of the following ways:
    - heating –cooling –any other kind of treatment, e.g. humidification;
  - "ventilation" means the supply of air to, or its extraction from, rooms or spaces, and systems for circulating air within rooms or spaces, but does not cover the mere treatment of air being supplied to, extracted from, or circulated within, rooms or spaces.
- (3) Processes using enzymes or micro-organisms in order to:
- (i) liberate, separate or purify a pre-existing compound or composition, or to
  - (ii) treat textiles or clean solid surfaces of materials
- are further classified in subclass C12S. [5]

**Subclass index**

AIR-CONDITIONING	SCREENING BY AIR CURRENTS..... 9/00
Room units; central systems; other systems or apparatus ..... 1/00; 3/00; 5/00	COMMON DETAILS
AIR-HUMIDIFICATION ..... 6/00	Control, safety ..... 11/00
VENTILATION ..... 7/00	Use of energy recovery systems ..... 12/00
	Other details ..... 13/00

**Air-conditioning**

- |   |   |
|---|---|
| <p><b>1/00 Room units for air-conditioning, e.g. receiving primary air from a central station</b></p> <p>1/01 . in which secondary air is induced by injector action of the primary air (F24F 1/02 takes precedence) [3]</p> <p>1/02 . self-contained, i.e. with all apparatus for treatment installed in a common casing</p> <p>1/04 . . Arrangements for portability</p> <p><b>3/00 Air-conditioning systems in which conditioned primary air is supplied from one or more central stations to distributing units in the rooms or spaces where it may receive secondary treatment; Apparatus specially designed for such systems</b> (room units F24F 1/00; construction of heat-exchangers F28)</p> <p>3/02 . characterised by the pressure or velocity of the primary air (F24F 3/044 takes precedence) [3]</p> <p>3/044 . Systems in which all treatment is given in the central station, i.e. all-air systems [3]</p> | <p>3/06 . characterised by the arrangements for the supply of heat-exchange fluid for the subsequent treatment of primary air in the room units (F24F 3/02 takes precedence)</p> <p>3/12 . characterised by the treatment of the air otherwise than by heating and cooling (F24F 3/02, F24F 3/06 take precedence; apparatus for the individual treatment, <u>see</u> the appropriate subclasses for the treatments)</p> <p>3/16 . . by purification, e.g. by filtering; by sterilisation; by ozonisation</p> <p><b>5/00 Air-conditioning systems or apparatus not covered by group F24F 1/00 or F24F 3/00</b></p> <hr/> <p><b>6/00 Air-humidification [3]</b></p> <p>6/02 . by evaporation of water in the air [3]</p> <p>6/12 . by forming water dispersions in the air [3]</p> <p>6/18 . by injection of steam into the air [3]</p> |
|---|---|

**F24F – F24H****7/00 Ventilation**

- 7/007 . with forced flow (using ducting systems F24F 7/06) [3]
- 7/013 . . using wall or window fans, displacing air through the wall or window [3]
- 7/02 . Roof ventilation (F24F 7/007 takes precedence; ventilation of roof coverings E04D) [3,6]
- 7/04 . with ducting systems
- 7/06 . . with forced air circulation, e.g. by fan
- 7/08 . . . with separate ducts for supplied and exhausted air [3]
- 7/10 . . . with air supply, or exhaust, through perforated wall, floor or ceiling (outlet members for directing or distributing air F24F 13/06) [3]

**9/00 Use of air currents for screening, e.g. air curtain (air curtains for vehicles B60J 9/00)****Common features or details**

- 11/00 Control or safety systems or apparatus** (control valves *per se* F16K) [3]
- 11/02 . Arrangement or mounting of control or safety devices
- 11/04 . . solely for controlling the rate of air-flow (F24F 11/08 takes precedence)
- 11/06 . . solely for controlling the supply of heating or cooling fluids for secondary treatment (F24F 11/08 takes precedence)
- 11/08 . . for controlling the primary treatment of air

**12/00 Use of energy recovery systems in air conditioning, ventilation or screening** (with both heat and humidity transfer between supplied and exhausted air F24F 3/12; heat-exchange in general F28) [4]**13/00 Details common to, or for air-conditioning, air-humidification, ventilation or use of air currents for screening**

- 13/02 . Ducting arrangements
- 13/04 . . Air-mixing units (F24F 13/06 takes precedence; mixing gases in general B01F 3/00)
- 13/06 . . Outlets for directing or distributing air into rooms or spaces, e.g. ceiling air diffuser
- 13/08 . Air-flow control members, e.g. louvres, grilles, flaps, guide plates (F24F 7/013, F24F 13/06 take precedence; roof ventilation F24F 7/02) [3]
- 13/10 . . movable, e.g. damper (F24F 13/18 takes precedence; valves in general F16K)
- 13/14 . . . built-up of tilting members, e.g. louvre
- 13/15 . . . . with parallel simultaneously tiltable lamellae [3]
- 13/18 . . specially adapted for insertion in flat panels, e.g. in door or window-pane
- 13/32 . Supports for air-conditioning, air-humidification or ventilation units [6]

**F24H FLUID HEATERS, E.G. WATER OR AIR HEATERS, HAVING HEAT-GENERATING MEANS, IN GENERAL** (heat-transfer, heat-exchange or heat-storage materials C09K 5/00; tube furnaces for thermal non-catalytic cracking C10G 9/00; devices, e.g. valves, for venting and aerating enclosures F16K 24/00; steam traps or like apparatus F16T; steam generation F22; combustion apparatus F23; domestic stoves or ranges F24B, F24C; domestic- or space-heating systems F24D; furnaces, kilns, ovens, retorts F27; heat-exchangers F28; electric heating elements or arrangements H05B)

- (1) The distinguishing feature of the air heaters covered by this subclass is that the heat is predominantly released to the air by convection, mostly by forced circulation of the air. The domestic stoves or ranges covered by subclass F24B, F24C may also be fired or electric air heaters but they release their heat to a considerable extent by radiation and only to some extent by natural convection. [3]
- (2) In this subclass, the following terms or expressions are used with the meanings indicated:
  - “water” includes other liquids and means always the liquid to be heated; [3]
  - “air” includes other gases or gas mixtures and means always the gas to be heated; [3]
  - “furnace tubes” means tubes inside the heater wherein combustion is performed; [3]
  - “fire tubes” means tubes inside the heater through which flue-gases flow from a combustion chamber located outside the tubes; [3]
  - “heater” means apparatus including both heat generating means and means for transferring the generated heat to water or air. [3]
- (3) All storage heaters are classified in group F24H 7/00. [3]

**Subclass index**

WATER HEATERS.....1/00  
 AIR HEATERS; STORAGE HEATERS..... 3/00; 7/00  
 FLUID HEATERS USING HEAT PUMPS .....4/00  
 COMBINATIONS OF WATER AND AIR  
 HEATERS .....6/00

FLUID HEATERS FOR EXTRACTING  
 LATENT HEAT FROM FLUE GASES ..... 8/00  
 DETAILS ..... 9/00



- 1/00 Water heaters having heat generating means, e.g. boiler, flow-heater, water-storage heater** (F24H 7/00, F24H 8/00 take precedence; details F24H 9/00; steam boilers F22B; domestic stoves or ranges with additional provisions for heating water F24B 9/00, F24C 13/00) [5]
- 1/06 . Portable or mobile, e.g. collapsible
  - 1/08 . Packaged or self-contained boilers, i.e. water heaters with control devices and pump in a single unit
  - 1/10 . Continuous-flow heaters, i.e. heaters in which heat is generated only while the water is flowing, e.g. with direct contact of the water with the heating medium (F24H 1/48 takes precedence) [5]
  - 1/12 . . in which the water is kept separate from the heating medium
  - 1/18 . Water-storage heaters (F24H 1/48 takes precedence; combined with water-heating stoves for central heating F24H 1/22) [5]
  - 1/20 . . with immersed heating elements, e.g. electric elements or furnace tubes
  - 1/22 . Water heaters other than continuous-flow or water-storage heaters, e.g. water heaters for central heating (F24H 1/48 takes precedence) [5]
  - 1/46 . Water heaters having plural combustion chambers [2,5]
  - 1/48 . Water heaters for central heating incorporating heaters for domestic water [5]
- 3/00 Air heaters having heat generating means** (F24H 7/00, F24H 8/00 take precedence; details F24H 9/00; domestic stoves or ranges with additional provisions for convection heating of air F24B, F24C) [5]
- 3/02 . with forced circulation (F24H 3/12 takes precedence)
  - 3/04 . . the air being in direct contact with the heating medium, e.g. electric heating element
  - 3/12 . with additional heating arrangements
- 4/00 Fluid heaters using heat pumps [5]**
- 6/00 Combined water and air heaters** (F24H 8/00 takes precedence) [5]
- 7/00 Storage heaters, i.e. heaters in which the energy is stored as heat in masses for subsequent release** (domestic stoves or ranges with additional heat storage masses F24B 1/00, F24C 15/00)
- 8/00 Fluid heaters having heat-generating means specially adapted for extracting latent heat from flue gases by means of condensation [5]**
- 9/00 Details**
- 9/02 . Casings; Cover lids; Ornamental panels
  - 9/06 . Arrangement of mountings or supports
  - 9/12 . Connecting heaters to circulation pipes (pipe joints in general F16L)
  - 9/14 . Connecting different sections, e.g. in water heaters (in radiators F28F 9/26)
  - 9/16 . Arrangements for water drainage (valves for drainage F16K, e.g. F16K 21/00; in pipes or pipe systems in general F16L 55/00; in domestic-or space-heating systems F24D 19/00)
  - 9/18 . Arrangement or mounting of grates, burners, or heating elements (burners F23D; grates F23H; electric heating elements H05B)
  - 9/20 . Arrangement or mounting of control or safety devices (control valves F16K; safety devices for burners F23D; combustion control devices F23N; of systems comprising a heater, see the relevant subclasses, e.g. of control heating systems F24D 19/00; automatic switching for electric heating apparatus H05B 1/02)

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**F24J PRODUCTION OR USE OF HEAT NOT OTHERWISE PROVIDED FOR** (materials therefor C09K 5/00; engines or other mechanisms for producing mechanical power from heat, see the relevant classes, e.g. F03G for using natural heat)

**Note**

Processes using enzymes or micro-organisms in order to:

- (i) liberate, separate or purify a pre-existing compound or composition, or to
  - (ii) treat textiles or clean solid surfaces of materials
- are further classified in subclass C12S. [5]

- 1/00 Apparatus or devices using heat produced by exothermal chemical reactions other than by combustion** (for cooking-vessels A47J 36/24; self-heating compresses A61F 7/02; materials for the production of heat or cold undergoing non-reversible chemical reactions, other than by combustion, when used C09K 5/00)
- 2/00 Use of solar heat, e.g. solar heat collectors** (distillation or evaporation of water using solar energy C02F 1/14; roof covering aspects of energy collecting devices E04D 13/18; devices for producing mechanical power from solar energy F03G 6/00; semi-conductor devices specially adapted for converting solar energy into electrical energy H01L 25/00, H01L 31/00; semiconductor devices including arrays of solar cells using heat energy H01L 31/058; generators in which light radiation is directly converted into electrical energy H02N 6/00) [4,5]
- 2/02 . Solar heat collectors with support for article heated, e.g. stoves, ranges, crucibles, furnaces or ovens using solar heat [4]
  - 2/04 . Solar heat collectors having working fluid conveyed through collector [4]
  - 2/06 . . having concentrating elements (optical elements or systems per se G02B) [4]

## F24J

- 2/36 . Rollable or foldable collector units [4]
- 2/38 . employing tracking means (F24J 2/02, F24J 2/06 take precedence; rotary supports or mountings therefor F24J 2/00; direction-finders for determining the direction from which electromagnetic waves are being received G01S 3/78; control of position or direction G05D 3/00) [4]

- 2/40 . Control arrangements [4]
- 2/42 . Solar heat systems not otherwise provided for [4]

### 3/00 Other production or use of heat, not derived from combustion (use of solar heat F24J 2/00)

## F25 REFRIGERATION OR COOLING; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT PUMP SYSTEMS; MANUFACTURE OR STORAGE OF ICE; LIQUEFACTION OR SOLIDIFICATION OF GASES

**F25B REFRIGERATION MACHINES, PLANTS, OR SYSTEMS; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT PUMP SYSTEMS** (heat-transfer, heat-exchange or heat-storage materials, e.g. refrigerants, or materials for the production of heat or cold by chemical reactions other than by combustion C09K 5/00; pumps, compressors F04; use of heat pumps for domestic or space-heating or for domestic hot-water supply F24D; air-conditioning, air-humidification F24F; fluid heaters using heat pumps F24H)

### Note

Attention is drawn to Note (2) following the title of subclass F24F. [5]

### Subclass index

MODE OF OPERATION	Heat pumps..... 30/00
Compression type	Using special energy source..... 27/00
characterised by the cycle..... 1/00, 13/00	DETAILS, ARRANGEMENTS, OR
characterised by the arrangement	COMPONENTS
self-contained rotary; with several evaporation circuits; with several condenser circuits; with cascade operation ..... 3/00; 5/00; 6/00; 7/00	Components: boilers, analysers, rectifiers; boiler-absorbers; absorbers, adsorbers; evaporators, condensers; subcoolers, desuperheaters, superheaters ..... 33/00; 35/00; 37/00; 39/00; 40/00
characterised by the refrigerant ..... 9/00	Arrangements
using turbines ..... 11/00	compressor arrangement; fluid circulation; separating or purifying gases ..... 31/00; 41/00; 43/00
Sorption type ..... 15/00, 17/00	for charging or discharging refrigerant; for combating corrosion or deposits ..... 45/00; 47/00
Other types having a single mode of operation, using: evaporation without recovery; electric or magnetic effects; other effect ..... 19/00; 21/00; 23/00	Mounting of control and safety devices ..... 49/00
Combinations: of above modes of operation; of heating and refrigerating ..... 25/00; 29/00	

### Compression machines, plant, or systems

- |  |  |
|--|--|
| <p><b>1/00 Compression machines, plant or systems with non-reversible cycle</b> (F25B 3/00, F25B 5/00, F25B 6/00, F25B 7/00, F25B 9/00 take precedence) [5]</p> <p>1/02 . with compressor of reciprocating-piston type (F25B 1/10 takes precedence)</p> <p>1/04 . with compressor of rotary type (F25B 1/10 takes precedence)</p> <p>1/06 . with compressor of jet type, e.g. using liquid under pressure (F25B 1/10 takes precedence)</p> <p>1/10 . with multi-stage compression (with cascade operation F25B 7/00)</p> <p><b>3/00 Self-contained rotary compression machines, i.e. with compressor, condenser, and evaporator rotating as a single unit</b></p> <p><b>5/00 Compression machines, plant, or systems, with several evaporator circuits, e.g. for varying refrigerating capacity</b> (with cascade operation F25B 7/00)</p> <p><b>6/00 Compression machines, plant, or systems, with several condenser circuits</b> [5]</p> | <p><b>7/00 Compression machines, plant, or systems, with cascade operation, i.e. with two or more circuits, the heat from the condenser of one circuit being absorbed by the evaporator of the next circuit</b> (F25B 9/00 takes precedence)</p> <p><b>9/00 Compression machines, plant, or systems, in which the refrigerant is air or other gas of low boiling point</b></p> <p>9/02 . using Joule-Thompson effect; using vortex effect</p> <p>9/06 . using expanders (F25B 9/10 takes precedence) [5]</p> <p>9/08 . using ejectors (F25B 9/10 takes precedence) [5]</p> <p>9/10 . with several cooling stages [5]</p> <p>9/12 . using 3He-4He dilution [5]</p> <p>9/14 . characterised by the cycle used, e.g. Stirling cycle [5]</p> <p><b>11/00 Compression machines, plant, or systems, using turbines, e.g. gas turbines</b></p> <p>11/02 . as expanders (F25B 9/06 takes precedence) [5]</p> <p><b>13/00 Compression machines, plant, or systems, with reversible cycle</b> (defrosting cycles F25B 47/02)</p> |
|--|--|

**Sorption machines, plant, or systems**

- 15/00** Sorption machines, plant, or systems, operating continuously, e.g. absorption type
- 15/02 . without inert gas (F25B 15/12, F25B 15/14, F25B 15/16 take precedence)
- 15/10 . with inert gas (F25B 15/12, F25B 15/14, F25B 15/16 take precedence)
- 15/12 . with resorber (F25B 15/14 takes precedence)
- 15/14 . using osmosis
- 15/16 . using desorption cycle
- 17/00** Sorption machines, plant, or systems, operating intermittently, e.g. absorption or adsorption type

**Machines, plant, or systems, with a single mode of operation, not covered by groups F25B 1/00 to F25B 17/00**

- 19/00** Machines, plant, or systems, using evaporation of a refrigerant but without recovery of the vapour
- 21/00** Machines, plant, or systems, using electric or magnetic effects
- 21/02 . using Peltier effect; using Nernst-Ettinghausen effect (thermoelectric elements H01L 35/00, H01L 37/00)
- 23/00** Machines, plant, or systems, with a single mode of operation not covered by groups F25B 1/00 to F25B 21/00, e.g. using selective radiation effect
- 
- 25/00** Machines, plant, or systems, using a combination of modes of operation covered by two or more of the groups F25B 1/00 to F25B 23/00 (combinations of two or more modes of operation covered by a single main group, see the relevant group)
- 27/00** Machines, plant, or systems, using particular sources of energy (F25B 30/00 takes precedence)
- 27/02 . using waste heat, e.g. from internal-combustion engines
- 29/00** Combined heating and refrigeration systems, e.g. operating alternately or simultaneously [5]
- 30/00** Heat pumps [5]

**Note**

When classifying heat pump circuits or systems, groups F25B 1/00 to F25B 25/00 and F25B 29/00 take precedence over group F25B 30/00. [5]

**Component parts or details**

- 31/00** Compressor arrangements (compressors per se F04)

- 33/00** Boilers; Analysers; Rectifiers (boiler-absorbers F25B 35/00)
- 35/00** Boiler-absorbers, i.e. boilers usable for absorption or adsorption
- 37/00** Absorbers; Adsorbers (boiler-absorbers F25B 35/00; separating processes involving the treatment of liquids with solid sorbents B01D 15/00; separation of gases or vapours by adsorption B01D 53/02; separation of gases or vapours by absorption B01D 53/14; investigating using adsorption or absorption G01N 30/00)
- 39/00** Evaporators; Condensers
- 39/02 . Evaporators
- 39/04 . Condensers
- 40/00** Subcoolers, desuperheaters or superheaters [5]
- 41/00** Fluid-circulation arrangements, e.g. for transferring liquid from evaporator to boiler (pumps per se, sealings therefor F04)
- 41/04 . Disposition of valves (valves per se F16K)
- 41/06 . Flow restrictors, e.g. capillary tubes; Disposition thereof
- 43/00** Arrangements for separating or purifying gases or liquids (in analysers or rectifiers F25B 33/00); Arrangements for vaporising the residuum of liquid refrigerant, e.g. by heat (F25B 40/00 takes precedence) [5]
- 43/02 . for separating lubricants from the refrigerant
- 43/04 . for withdrawing non-condensable gases
- 45/00** Arrangements for charging or discharging refrigerant
- 47/00** Arrangements for preventing or removing deposits or corrosion, not provided for in another subclass
- 47/02 . Defrosting cycles [5]
- 49/00** Arrangement or mounting of control or safety devices (testing refrigerators G01M; control in general G05)
- 49/02 . for compression type machines, plant or systems [5]

**F25C** **PRODUCTION, WORKING, STORING OR DISTRIBUTION OF ICE** (frozen sweets, including ice-cream, their production A23G 9/00; concentrating solutions by removing frozen solvents B01D 9/00; purification of water by freezing C02F 1/22; refrigeration machines, plants, or systems F25B; solidification of gases or gaseous mixtures F25J; freeze-drying F26B) [2]

**Note**

In this subclass, the following term is used with the meaning indicated:

- “ice” means any frozen liquid and also covers frozen semiliquids or pasty substances. [2]

- 1/00 Production of ice** (F25C 3/00 takes precedence)
- 1/04 . by using stationary moulds
- 1/08 . by immersing freezing chambers or plates into water
- 1/10 . by using rotating or otherwise moving moulds (F25C 1/08 takes precedence)
- 1/12 . by freezing water on cooled surfaces, e.g. to form slabs
- 1/18 . of a particular transparency or translucency, e.g. by injecting air
- 1/22 . Construction of moulds; Filling devices therefor (metering by volume in general G01F)
- 3/00 Methods or apparatus specially adapted for the production of ice or snow for winter sports or similar recreational purposes, e.g. for sporting installations; Production of artificial snow** (foundations or pavings for artificial surfaces for outdoor or indoor practice of snow or ice sports E01C 13/00; working on surfaces of snow or ice in order to make them suitable for traffic or sporting purposes E01H 4/00)
- 5/00 Working, storing or distribution of ice**

**F25D REFRIGERATORS; COLD ROOMS; ICE-BOXES; COOLING OR FREEZING APPARATUS NOT COVERED BY ANY OTHER SUBCLASS** (refrigerated showcases A47F 3/04; thermally-insulated vessels for domestic use A47J 41/00; refrigerated vehicles, see the appropriate subclasses of classes B60 to B64; containers with thermal insulation in general B65D 81/38; heat-transfer, heat-exchange or heat-storage materials, e.g. refrigerants, or materials for the production of heat or cold by chemical reactions other than by combustion C09K 5/00; thermally-insulated vessels for liquefied or solidified gases F17C; air-conditioning or air-humidification F24F; refrigeration machines, plants, or systems F25B; cooling of instruments or comparable apparatus without refrigeration G12B; cooling of engines or pumps, see the relevant classes)

- (1) Devices associated with refrigerating machinery are classified in groups F25D 11/00 to F25D 16/00. **[2009.01]**
- (2) In this subclass, the following term is used with the meaning indicated:
- “device” means an enclosed space to be cooled; such devices being associated either with refrigerating machinery, e.g. in a refrigerator, or with other cold sources, e.g. in an ice-box.
- (3) Attention is drawn to Note (2) following the title of subclass F24F. **[5]**

#### Subclass index

##### DEVICES NOT ASSOCIATED WITH REFRIGERATING MACHINERY

- Using cold air or water; other cold materials or bodies ..... 1/00; 3/00
- Using endothermic chemical reactions, or evaporation without recovery ..... 5/00; 7/00
- Other devices, combinations ..... 9/00

##### DEVICES ASSOCIATED WITH REFRIGERATING MACHINERY: SELF-CONTAINED MOVABLE; STATIONARY; OTHER.....

11/00; 13/00;  
15/00

In combination with a cooling mode not associated with refrigerating

machinery ..... 16/00

##### STRUCTURAL PARTS OR ARRANGEMENTS, OF GENERAL APPLICATION: DEFROSTING; GENERAL FEATURES; HANDLING OF ARTICLES TO BE COOLED .....

21/00; 23/00;  
25/00

##### CIRCULATING COOLING FLUID OR GAS;

LIGHTING ..... 17/00; 27/00

##### ARRANGEMENT OR MOUNTING: OF REFRIGERATION UNITS; OF CONTROL OR SAFETY DEVICES.....

19/00; 29/00

OTHER APPARATUS..... 31/00

#### Devices not associated with refrigerating machinery

- 1/00 Devices using naturally-cold air or water**
- 3/00 Devices using other cold materials; Devices using cold-storage bodies**
- 3/10 . using liquefied gases, e.g. liquid air
- 5/00 Devices using endothermic chemical reactions, e.g. using frigorific mixtures**
- 7/00 Devices using evaporation effects without recovery of the vapour** (butter or cheese dishes with cooling devices A47G 19/00)

- 9/00 Devices not associated with refrigerating machinery and not covered by groups F25D 1/00 to F25D 7/00; Combinations of devices covered by two or more of the groups F25D 1/00 to F25D 7/00**

#### Devices associated with refrigerating machinery

- 11/00 Self-contained movable devices associated with refrigerating machinery, e.g. domestic refrigerators**
- 11/02 . with cooling compartments at different temperatures
- 11/04 . specially adapted for storing deep-frozen articles (F25D 11/02 takes precedence)
- 13/00 Stationary devices associated with refrigerating machinery, e.g. cold rooms**

<b>15/00</b>	<b>Devices associated with refrigerating machinery not covered by group F25D 11/00 or F25D 13/00, e.g. non-self-contained movable devices</b>	21/08	• • by electric heating
		21/14	• Collecting or removing condensed and defrost water; Drip trays
<b>16/00</b>	<b>Devices using a combination of a cooling mode associated with refrigerating machinery with a cooling mode not associated with refrigerating machinery [5]</b>	<b>23/00</b>	<b>General constructional features</b> (F25D 21/00 takes precedence)
		23/02	• Doors; Covers (F25D 23/08 takes precedence)
		23/04	• • with special compartments, e.g. butter conditioners
		23/06	• Walls (F25D 23/08 takes precedence; containers with thermal insulation B65D 81/38) [4]
		23/08	• Parts formed wholly or mainly of plastics materials
		23/10	• Arrangements for mounting in particular locations, e.g. for built-in type, for corner type
		23/12	• Arrangements of compartments additional to cooling compartments; Combinations of refrigerators with other equipment, e.g. stove
		<b>25/00</b>	<b>Charging, supporting, or discharging the articles to be cooled</b>
		25/02	• by shelves
		<b>27/00</b>	<b>Lighting arrangements</b> (in general F21)
		<b>29/00</b>	<b>Arrangement or mounting of control or safety devices</b>
		<b>31/00</b>	<b>Other cooling or freezing apparatus</b>
<b>17/00</b>	<b>Arrangements for circulating cooling fluids; Arrangements for circulating gas, e.g. air, within refrigerated spaces [3]</b>		
17/04	• for circulating gas, e.g. by natural convection [3]		
17/06	• • by forced circulation		
17/08	• • • using ducts		
<b>19/00</b>	<b>Arrangement or mounting of refrigeration units with respect to devices</b>		
19/02	• plug-in type		
19/04	• with more than one refrigeration unit		
<b>21/00</b>	<b>Defrosting; Preventing frosting; Removing condensed or defrost water</b> (removing ice or water from heat-exchange apparatus in general F28F 17/00; heating arrangements specially adapted for transparent or reflecting areas H05B 3/84)		
21/06	• Removing frost (defrosting cycles F25B 47/02)		

**F25J LIQUEFACTION, SOLIDIFICATION, OR SEPARATION OF GASES OR GASEOUS MIXTURES BY PRESSURE AND COLD TREATMENT** (cryogenic pumps F04B 37/00; gas storage vessels, gas-holders F17; filling vessels with, or discharging from vessels, compressed, liquefied, or solidified gases F17C; refrigeration machines, plants, or systems F25B)

<b>1/00</b>	<b>Processes or apparatus for liquefying or solidifying gases or gaseous mixtures</b>	3/04	• • for air
		3/06	• by partial condensation (F25J 3/08 takes precedence; by rectification F25J 3/02)
<b>3/00</b>	<b>Processes or apparatus for separating the constituents of gaseous mixtures involving the use of liquefaction or solidification</b>	3/08	• Separating gaseous impurities from gases or gaseous mixtures (cold traps B01D 8/00)
3/02	• by rectification, i.e. by continuous interchange of heat and material between a vapour stream and a liquid stream (F25J 3/08 takes precedence)	<b>5/00</b>	<b>Arrangements of cold-exchangers or cold-accumulators in separation or liquefaction plants</b> (heat-exchangers F28C, F28D, F28F)

**F26 DRYING**

**F26B DRYING SOLID MATERIALS OR OBJECTS BY REMOVING LIQUID THEREFROM** (drying devices for combines A01D 41/00; racks for drying fruit or vegetables A01F 25/00; drying foodstuffs A23; drying hair A45D 20/00; body-drying implements A47K 10/00; drying household articles A47L; drying gases or vapours B01D; chemical or physical processes for dewatering or like separating liquids from solids B01D 43/00; centrifugal apparatus B04; drying ceramics C04B 33/00; drying yarns or fabrics in association with some other form of treatment D06C; drying frames for laundry without heating or positive air circulation, domestic laundry-or spin-driers, wringing or hot pressing laundry D06F; furnaces, kilns, ovens F27)

**Note**

Processes using enzymes or micro-organisms in order to:

- (i) liberate, separate or purify a pre-existing compound or composition, or to
  - (ii) treat textiles or clean solid surfaces of materials
- are further classified in subclass C12S. [5]

**Subclass index****PROCESSES FOR DRYING**

Preliminary treatment ..... 1/00  
Processes: with heat; without heat;  
by combination of both types ..... 3/00; 5/00;  
7/00

**MACHINES OR APPARATUS FOR DRYING**

With articles to be dried at rest or  
locally agitated, domestic airing ..... 9/00  
With non-progressive movement ..... 11/00

With progressive movement: for  
fabrics or yarns; for articles and  
compact batches; for material not in  
compact batches ..... 13/00; 15/00;  
17/00

Other kinds ..... 19/00

Combinations using at least two of  
the above kinds ..... 20/00

**ARRANGEMENTS OR DETAILS OF  
GENERAL APPLICATIONS**

Arrangements for air or gas for  
drying; heating ..... 21/00; 23/00  
Other details ..... 25/00

**Processes for drying**

- 1/00 Preliminary treatment of solid materials or objects to facilitate drying**
- 3/00 Drying solid materials or objects by processes involving the application of heat** (in specific machines or apparatus F26B 9/00 to F26B 19/00)
  - 3/02 . by convection, i.e. heat being conveyed from a heat source to the materials or objects to be dried by a gas or vapour, e.g. air
  - 3/32 . by development of heat within the materials or objects to be dried (by using ultrasonic vibration F26B 5/00)
- 5/00 Drying solid materials or objects by processes not involving the application of heat** (separating liquids from solids by straining B01D; replacing liquids in wet solids by other liquids, e.g. water by spirit, B01D 12/00; drying by electrophoresis B01J)
  - 5/04 . by evaporation or sublimation of moisture under reduced pressure, e.g. in a vacuum
- 7/00 Drying solid materials or objects by processes using a combination of processes not covered by a single one of groups F26B 3/00 or F26B 5/00**

- 11/00 Machines or apparatus for drying solid materials or objects with movement which is non-progressive**
- 13/00 Machines or apparatus for drying fabrics, fibres, yarns, or other materials in long lengths, with progressive movement**
  - 13/10 . Arrangements for feeding, heating, or supporting materials; Regulating movement, tension, or position of materials (heating processes F26B 3/00)
- 15/00 Machines or apparatus for drying objects with progressive movement; Machines or apparatus with progressive movement for drying batches of material in compact form** (F26B 13/00, F26B 17/00 take precedence; conveyers in general B65G)
- 17/00 Machines or apparatus for drying materials in loose, plastic, or fluidised form, e.g. granules, staple fibres, with progressive movement** (F26B 13/00 takes precedence)
  - 17/12 . with movement performed solely by gravity
- 19/00 Machines or apparatus for drying solid materials or objects not covered by groups F26B 9/00 to F26B 17/00**
- 20/00 Combinations of machines or apparatus covered by two or more of groups F26B 9/00 to F26B 19/00**

**Machines or apparatus for drying**

- 9/00 Machines or apparatus for drying solid materials or objects at rest or with only local agitation; Domestic airing cupboards**
  - 9/06 . in stationary drums or chambers

**Details of general application**

- 21/00 Arrangements for supplying or controlling air or gases for drying solid materials or objects** (air-conditioning or ventilation in general F24F)
- 21/02 . Circulating air or gases in closed cycles, e.g. wholly within the drying enclosure (F26B 21/14 takes precedence)
  - 21/06 . Controlling, e.g. regulating, parameters of gas supply (F26B 21/14 takes precedence)
  - 21/14 . using gases or vapours other than air or steam

**23/00 Heating arrangements** (using heated air or gases F26B 21/00)

**25/00 Details of general application not covered by group F26B 21/00 or F26B 23/00** (loading, conveying, or unloading in general B65G)

- 25/06 . Chambers, containers, or receptacles
- 25/22 . Controlling the drying process in dependence on liquid content of solid materials or objects



**F27 FURNACES; KILNS; OVENS; RETORTS** (specially adapted for a purpose covered by a single other class and specifically mentioned in that class, see the class in question, e.g. bakery ovens A21B, glass melting furnaces C03B, coke or gas-making apparatus C10B, C10J, apparatus for cracking hydrocarbons C10G, blast furnaces C21B, converters for making steel C21C, furnaces for heat treatment of metal C21D; furnaces for electroslag or arc remelting of metals C22B 9/00; enamelling ovens C23D; combustion apparatus F23; electric heating H05B) **[4]**

- (1) This class covers:
- furnaces, kilns, ovens, retorts, open sintering apparatus and other similar apparatus for heat treatment of materials or articles, and details or accessories therefor, in general;
  - the arrangement of electrical heating elements in or on furnaces.
- (2) This class does not cover:
- combustion apparatus per se, i.e. apparatus for direct combination of oxygen gas and a burnable substance; **[7]**
  - electrical heating elements per se;
  - processes carried on within the furnaces.
- (3) In this class, the following term is used with the meaning indicated:
- “furnaces” covers kilns, ovens, or retorts.

**F27B FURNACES, KILNS, OVENS, OR RETORTS IN GENERAL; OPEN SINTERING OR LIKE APPARATUS**

**Note**

Attention is drawn to the references and Notes following the title of class F27 and the Note (3) of section H.

**Subclass index**

FURNACES WITH STATIONARY CHARGE	STATIONARY FURNACES WITH MECHANICALLY-MOVED CHARGE
Shaft furnaces ..... 1/00	..... 9/00
Horizontal furnaces..... 3/00, 5/00	ROTARY FURNACES.....7/00, 13/00
Bell-type furnaces.....11/00	OTHER FURNACES; COMBINATIONS .....15/00, 17/00; 19/00
With progression of heating ..... 13/00	OPEN SINTERING OR LIKE APPARATUS .....21/00
Crucible furnaces, tank furnaces ..... 14/00	

- |   |   |
|---|---|
| <p><b>1/00 Shaft or like vertical or substantially vertical furnaces</b> (for preheating, burning, calcining or cooling lime, magnesia or dolomite C04B 2/00)</p> <p><b>3/00 Hearth-type furnaces, e.g. of reverberatory type</b> (F27B 9/00 to F27B 15/00, F27B 21/00 take precedence); <b>Electric arc furnaces [4]</b></p> <p>3/08 . heated electrically, e.g. electric arc furnaces, with or without any other source of heat</p> <p>3/10 . Details, accessories, or equipment, e.g. dust-collectors, peculiar to hearth-type furnaces</p> <p>3/20 . . Arrangements of heating devices</p> <p><b>5/00 Muffle furnaces; Retort furnaces; Other furnaces in which the charge is held completely isolated</b> (F27B 9/00 takes precedence)</p> <p><b>7/00 Rotary-drum furnaces, i.e. horizontal or slightly inclined</b></p> <p>7/20 . Details, accessories, or equipment peculiar to rotary-drum furnaces</p> <p><b>9/00 Furnaces through which the charge is moved mechanically, e.g. of tunnel type</b> (F27B 7/00 takes precedence); <b>Similar furnaces in which the charge moves by gravity</b></p> <p>9/30 . Details, accessories, or equipment peculiar to furnaces of these types</p> | <p><b>11/00 Bell-type furnaces</b> (for treating metal strips or wire C21D 9/54)</p> <p><b>13/00 Furnaces with both stationary charge and progression of heating, e.g. of ring type, of type in which segmental kiln moves over stationary charge</b></p> <p><b>14/00 Crucible or pot furnaces; Tank furnaces [4]</b></p> <p><b>15/00 Fluidised-bed furnaces; Other furnaces using or treating finely-divided materials in dispersion</b> (combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/00)</p> <p><b>17/00 Furnaces of a kind not covered by any of groups F27B 1/00 to F27B 15/00</b> (structural combinations of furnaces F27B 19/00)</p> <p><b>19/00 Combinations of different kinds of furnaces that are not all covered by any single one of main groups F27B 1/00 to F27B 17/00</b></p> <p><b>21/00 Open or uncovered sintering apparatus; Other heat-treatment apparatus of like construction</b></p> |
|---|---|

**F27D DETAILS OR ACCESSORIES OF FURNACES, KILNS, OVENS, OR RETORTS, IN SO FAR AS THEY ARE OF KINDS OCCURRING IN MORE THAN ONE KIND OF FURNACE** (combustion apparatus F23)

**Note**

Attention is drawn to the references and Notes following the title of class F27 and Note (3) of section H.

**Subclass index**

CONSTRUCTIONAL FEATURES .....	1/00	ARRANGEMENTS OF ELECTRIC	
HANDLING AND SUPPORTING CHARGE.....	3/00, 5/00, 15/00	HEATING ELEMENTS.....	11/00
PREHEATING CHARGE; COOLING; USING		ARRANGEMENTS OF CONTROL AND	
WASTE HEAT OR GASES.....	13/00; 9/00, 15/00; 17/00	SAFETY DEVICES .....	19/00, 21/00
		OTHER FEATURES; OTHER DETAILS.....	7/00; 25/00, 27/00, 99/00

<b>1/00</b>	<b>Casings; Linings; Walls; Roofs</b> (refractory materials C04B; firebridges for combustion chambers F23M 3/00)	<b>9/00</b>	<b>Cooling of furnaces or of charges therein</b> (F27D 1/00, F27D 3/00 take precedence)
1/02	. Crowns; Roofs	<b>11/00</b>	<b>Arrangement of elements for electric heating in or on furnaces</b> (electric heating <u>per se</u> H05B)
1/04	. characterised by the form of the bricks or blocks used	11/08	. Heating by electric discharge, e.g. arc discharge
1/10	. Monolithic linings; Supports therefor	<b>13/00</b>	<b>Apparatus for preheating charges; Arrangements for preheating charges</b>
1/12	. incorporating cooling arrangements (constructions of tube assemblies in general F28)	<b>15/00</b>	<b>Handling or treating discharged material; Supports or receiving chambers therefor</b>
1/14	. Supports for linings (F27D 1/10 takes precedence)	<b>17/00</b>	<b>Arrangement for using waste heat</b> (heat-exchangers <u>per se</u> F28); <b>Arrangement for using, or disposing of, waste gases</b> (removing fumes in general B08B 15/00)
1/16	. Making or repairing linings	<b>19/00</b>	<b>Arrangement of controlling devices</b>
1/18	. Door frames; Doors, lids, removable covers	<b>21/00</b>	<b>Arrangement of monitoring devices; Arrangements of safety devices</b>
<b>3/00</b>	<b>Charging; Discharging; Manipulation of charge</b> (conveying systems characterised by their application for specified purposes not otherwise provided for B65G 49/00; moving charge through a furnace F27B 9/00)	<b>25/00</b>	<i>Devices for removing incrustations</i> [2010.01]
3/12	. Travelling or movable supports or containers for the charge	<b>27/00</b>	<i>Stirring devices for molten material</i> (F27D 3/14 takes precedence) [2010.01]
3/14	. Charging or discharging liquid or molten material	<b>99/00</b>	<i>Subject matter not provided for in other groups of this subclass</i> [2010.01]
<b>5/00</b>	<b>Supports, screens, or the like for the charge within the furnace</b> (travelling or movable supports F27D 3/12)		
<b>7/00</b>	<b>Forming, maintaining, or circulating atmospheres in heating chambers</b>		

**F28 HEAT EXCHANGE IN GENERAL** (heat-transfer, heat-exchange or heat-storage materials C09K 5/00; arrangement or mounting of heat-exchangers in air-conditioning, air-humidification or ventilation F24F 13/00)

- (1) In this class, the following expressions are used with the meanings indicated:
- “heat exchange” means the heating or cooling of a fluid or fluent solid by direct or indirect contact with a heated or cooled fluid or fluent solid;
  - “heat transfer” means the heating or cooling of a fluid or fluent solid by direct contact with a heated or cooled surface or body.
- (2) Apparatus using heat exchange or heat transfer (as defined in Note (1) above) for specific purposes is classified either in subclass F28B or in the appropriate subclasses of, for example, classes F22, F24, F25, F26, or F27; if no such other subclass is appropriate, such apparatus is classified in subclass F28C or F28D.

**F28B STEAM OR VAPOUR CONDENSERS** (condensation of vapours B01D 5/00; condensation during pretreatment of gases prior to electrostatic precipitation of dispersed particles B03C 3/00; steam engine plants having condensers F01K; liquefaction of gases F25J; details of heat-exchange or heat-transfer arrangements of general application F28F)

- |  |   |
|--|---|
| <p><b>1/00</b> Condensers in which the steam or vapour is separated from the cooling medium by walls, e.g. surface condenser</p> <p><b>3/00</b> Condensers in which the steam or vapour comes into direct contact with the cooling medium</p> <p><b>5/00</b> Condensers employing a combination of the methods covered by groups F28B 1/00 and F28B 3/00; Other condensers</p> | <p><b>7/00</b> Combinations of two or more condensers, e.g. provision of reserve condenser</p> <p><b>9/00</b> Auxiliary systems, arrangements, or devices</p> <p><b>11/00</b> Controlling arrangements with features specially adapted for condensers</p> |
|--|---|

**F28C HEAT-EXCHANGE APPARATUS, NOT PROVIDED FOR IN ANOTHER SUBCLASS, IN WHICH THE HEAT-EXCHANGE MEDIA COME INTO DIRECT CONTACT WITHOUT CHEMICAL INTERACTION** (safety devices in general F16P; fluid heaters having heat generating means F24H; with an intermediate heat-transfer medium coming into direct contact with heat-exchange media F28D 15/00 to F28D 19/00; details of heat-exchange apparatus of general application F28F)

- 1/00** Direct-contact trickle coolers, e.g. cooling towers (building construction E04H 5/00; enclosed spaces cooled by trickle F25; component parts of trickle coolers F28F 25/00)
- 3/00** Other direct-contact heat-exchange apparatus

**F28D HEAT-EXCHANGE APPARATUS, NOT PROVIDED FOR IN ANOTHER SUBCLASS, IN WHICH THE HEAT-EXCHANGE MEDIA DO NOT COME INTO DIRECT CONTACT** (fluid heaters having heat generating means and heat transferring means F24H; furnaces F27; details of heat-exchange apparatus of general application F28F); **HEAT STORAGE PLANTS OR APPARATUS IN GENERAL** [4]

#### Subclass index

HEAT-EXCHANGE APPARATUS WITHOUT INTERMEDIATE HEAT-TRANSFER MEDIA OR BODIES

- With stationary conduit assemblies
- for only one medium using:
    - mass of fluid; trickle or film;
    - the cooling effect of evaporation..... 1/00; 3/00; 5/00
  - for both media: by tubular conduits; by plate-like conduits..... 7/00; 9/00
- With moving conduit assemblies.....11/00

- With fluidised bed ..... 13/00
- HEAT-EXCHANGE APPARATUS WITH INTERMEDIATE HEAT-TRANSFER MEDIA OR BODIES
- With the intermediate medium in closed tubes passing into or through the conduit walls ..... 15/00
  - In which the intermediate medium or body is contacted successively by the other media .....17/00, 19/00
- HEAT STORAGE PLANTS OR APPARATUS ..... 20/00
- OTHER HEAT-EXCHANGE APPARATUS ..... 21/00

- 1/00** Heat-exchange apparatus having stationary conduit assemblies for one heat-exchange medium only, the media being in contact with different sides of the conduit wall, in which the other heat-exchange medium is a large body of fluid, e.g. domestic or motor car radiators (F28D 5/00 takes precedence)
- 1/02 . with the heat-exchange conduits immersed in the body of fluid
- 1/04 . . with tubular conduits
- 3/00** Heat-exchange apparatus having stationary conduit assemblies for one heat-exchange medium only, the media being in contact with different sides of the conduit wall, in which the other heat-exchange medium flows in a continuous film, or trickles freely, over the conduits (F28D 5/00 takes precedence)
- 5/00** Heat-exchange apparatus having stationary conduit assemblies for one heat-exchange medium only, the media being in contact with different sides of the conduit wall, using the cooling effect of natural or forced evaporation
- 7/00** Heat-exchange apparatus having stationary tubular conduit assemblies for both heat-exchange media, the media being in contact with different sides of a conduit wall
- 7/10 . the conduits being arranged one within the other, e.g. concentrically
- 9/00** Heat-exchange apparatus having stationary plate-like or laminated conduit assemblies for both heat-exchange media, the media being in contact with different sides of a conduit wall

- 11/00** Heat-exchange apparatus employing moving conduits
- 13/00** Heat-exchange apparatus using a fluidised bed

**Heat-exchange apparatus employing intermediate heat-transfer media or bodies [3]**

- 15/00** Heat-exchange apparatus with the intermediate heat-transfer medium in closed tubes passing into or through the conduit walls
- 15/02 . in which the medium condenses and evaporates, e.g. heat-pipes [4]
- 15/04 . . with tubes having a capillary structure [6]
- 15/06 . . Control arrangements therefor [6]
- 17/00** Regenerative heat-exchange apparatus in which a stationary intermediate heat-transfer medium or body is contacted successively by each heat-exchange medium, e.g. using granular particles
- 19/00** Regenerative heat-exchange apparatus in which the intermediate heat-transfer medium or body is moved successively into contact with each heat-exchange medium
- 20/00** Heat storage plants or apparatus in general (specially adapted for particular applications, see the relevant places, e.g. F24D 15/00); **Regenerative heat-exchange apparatus not covered by groups F28D 17/00 or F28D 19/00 [4]**
- 20/02 . using latent heat [6]
- 
- 21/00** Heat-exchange apparatus not covered by any of the groups F28D 1/00 to F28D 20/00 [4]

**F28F DETAILS OF HEAT-EXCHANGE OR HEAT-TRANSFER APPARATUS, OF GENERAL APPLICATION** (water or air traps, air venting F16)

**Subclass index**

**DETAILS AND THEIR ARRANGEMENTS**

- Elements for heat exchange or transfer and assemblies thereof
- tubular; plate-like; for movement; others ..... 1/00; 3/00; 5/00; 7/00
- auxiliary supports for elements; sealing..... 9/00; 11/00
- Casings and header boxes .....9/00
- Preventing deposits or corrosion..... 17/00, 19/00

Special features of heat-exchange apparatus

- characterised by the selection of: constructional material; intermediate heat-exchange material..... 21/00; 23/00
- component parts of trickle coolers ..... 25/00

- MODIFYING HEAT-TRANSFER; CONTROL OF APPARATUS..... 13/00; 27/00**
- SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS ..... 99/00**

- 1/00 Tubular elements; Assemblies of tubular elements** (specially adapted for movement F28F 5/00)
- 1/02 . Tubular elements of cross-section which is non-circular (F28F 1/08, F28F 1/10 take precedence)
- 1/06 . . crimped or corrugated in cross-section
- 1/08 . Tubular elements crimped or corrugated in longitudinal section
- 1/10 . Tubular elements or assemblies thereof with means for increasing heat-transfer area, e.g. with fins, with projections, with recesses (crimped or corrugated elements F28F 1/06, F28F 1/08)
- 1/12 . . the means being only outside the tubular element

- 1/24 . . . and extending transversely (F28F 1/38 takes precedence)
- 1/32 . . . the means having portions engaging further tubular elements
- 1/38 . . . and being staggered to form tortuous fluid passages
- 3/00 Plate-like or laminated elements; Assemblies of plate-like or laminated elements** (specially adapted for movement F28F 5/00)
- 3/08 . Elements constructed for building-up into stacks, e.g. capable of being taken apart for cleaning

<b>5/00</b>	<b>Elements specially adapted for movement</b> (arrangements for moving the elements, <u>see</u> the appropriate subclass for the apparatus concerned)	<b>17/00</b>	<b>Removing ice or water from heat-exchange apparatus</b>
<b>7/00</b>	<b>Elements not covered by group F28F 1/00, F28F 3/00, or F28F 5/00</b>	<b>19/00</b>	<b>Preventing the formation of deposits or corrosion, e.g. by using filters</b>
<b>9/00</b>	<b>Casings; Header boxes; Auxiliary supports for elements; Auxiliary members within casings</b>	<b>21/00</b>	<b>Constructions of heat-exchange apparatus characterised by the selection of particular materials</b>
9/007	. Auxiliary supports for elements [6]	<b>23/00</b>	<b>Features relating to the use of intermediate heat-exchange materials, e.g. selection of compositions</b> (heat-transfer, heat-exchange or heat-storage materials C09K 5/00)
9/02	. Header boxes; End plates	<b>25/00</b>	<b>Component parts of trickle coolers</b> (arrangements for increasing heat transfer F28F 13/00; controlling arrangements F28F 27/00)
9/04	. . Arrangements for sealing elements into header boxes or end plates (joining pipes to walls in general F16L 41/00)	<b>27/00</b>	<b>Control arrangements or safety devices specially adapted for heat-exchange or heat-transfer apparatus</b>
9/22	. Arrangements for directing heat-exchange media into successive compartments, e.g. arrangements of guide plates	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass [8]</b>
9/26	. Arrangements for connecting different sections of heat-exchange elements, e.g. of radiators (connecting different sections in water heaters F24H 9/14)		
<b>11/00</b>	<b>Arrangements for sealing leaky tubes or conduits</b> (stopping flow from or in pipes in general F16L 55/10)		
<b>13/00</b>	<b>Arrangements for modifying heat transfer, e.g. increasing, decreasing</b> (F28F 1/00 to F28F 11/00 take precedence)		

**F28G** **CLEANING OF INTERNAL OR EXTERNAL SURFACES OF HEAT-EXCHANGE OR HEAT-TRANSFER CONDUITS, E.G. WATER TUBES OF BOILERS** (cleaning pipes or tubes in general B08B 9/02; devices or arrangements for removing water, minerals, or sludge from boilers while the boiler is in operation, or which remain in position while the boiler is in operation, or are specifically adapted to boilers without any other utility F22B 37/00; removal or treatment of combustion products or combustion residues F23J; removing ice from heat-exchange apparatus F28F 17/00)

#### Subclass index

APPLIANCES FOR CLEANING: NON-  
ROTARY; ROTARY; OTHERS; DETAILS ..... 1/00; 3/00;  
13/00; 15/00

CLEANING PROCESSES BY: DISTORTION;  
VIBRATION; FLUSHING OR WASHING;  
COMBUSTION; OTHERS ..... 5/00; 7/00;  
9/00; 11/00; 13/00  
COMBINATION OF PROCESSES ..... 13/00

<b>1/00</b>	<b>Non-rotary, e.g. reciprocated, appliances</b> (F28G 3/00 takes precedence)	<b>11/00</b>	<b>Cleaning by combustion processes, e.g. using squibs, using travelling burners</b>
<b>3/00</b>	<b>Rotary appliances</b>	<b>13/00</b>	<b>Appliances or processes not covered by groups F28G 1/00 to F28G 11/00; Combinations of appliances or processes covered by groups F28G 1/00 to F28G 11/00</b>
<b>5/00</b>	<b>Cleaning by distortion</b> (by vibration F28G 7/00)	<b>15/00</b>	<b>Details</b> (measuring thickness of deposit G01B)
<b>7/00</b>	<b>Cleaning by vibration</b>		
<b>9/00</b>	<b>Cleaning by flushing or washing, e.g. with chemical solvents</b> (appliances using jets of fluid for removing debris F28G 1/00, F28G 3/00)		

## WEAPONS; BLASTING

### F41 WEAPONS

- (1) This class covers also means for practice and training which may have aspects of simulation, e.g. in apparatus for so-called “military games”, although simulators are generally covered by class G09. [4]
- (2) In this class, the following terms or expressions are used with the meanings indicated:
- “smallarm” means a firearm which is generally held with one or both hands for firing, but this term also includes a light machine-gun which may be supported on a tripod or the like during firing; [5]
  - “gun” means any weapon having a barrel and a trigger or firing mechanism for projecting a missile; it may be a piece of ordnance or a smallarm. It may use combustible or explosive propellant charges, air pressure, electromagnetism or other propulsive forces; [5]
  - “revolver-type gun” means a gun having a revolving drum magazine, the chambers of which are used successively as firing chamber; [5]
  - “revolver” means a revolver-type pistol; [5]
  - “semi-automatic firearm” means a firearm from which one shot is fired after actuation of the trigger and which then returns to a condition for firing a subsequent shot upon renewed actuation of the trigger;
  - “automatic firearm” means a firearm which will continue firing so long as the initial firing pressure is maintained on the trigger;
  - “sighting” means bringing into visual coincidence a direction defined by a so-called “sighting” device with the direction of a target;
  - “aiming” means bringing a weapon to a direction differing from the sighting direction by corrections in order that the projectile may hit the target;
  - “laying” means setting a weapon in the correct position for hitting a target.
- (3) Attention is drawn to the definitions of “projectile”, “missile” and “rocket” given in Note (2) following the title of class F42. [4]

### F41A FUNCTIONAL FEATURES OR DETAILS COMMON TO BOTH SMALLARMS AND ORDNANCE, E.G. CANNONS; MOUNTINGS FOR SMALLARMS OR ORDNANCE [5]

- (1) This subclass covers those features or details which are considered to be of a kind generally applicable to, or to be concerned with intrinsic functions common to, both smallarms and ordnance. [5]
- (2) Such features or details are classified in this subclass, even if they are stated to be applied only to smallarms or only to ordnance. [5]
- (3) Attention is drawn to the definitions given in Note (2) following the title of class F41. [5]

#### Subclass index

KINDS OF PROPULSION .....	1/00	FIRING OR TRIGGER MECHANISMS,	
BREECH MECHANISMS .....	3/00	COCKING .....	19/00
UNLOCKING MECHANISMS.....	5/00	BARRELS, GUN TUBES, MUZZLE	
GUN RECHARGERS, EXTERNALLY		ATTACHMENTS .....	21/00
POWERED GUNS .....	7/00	GUN MOUNTINGS, e.g. on vehicles .....	23/00
FEEDING OR LOADING, MAGAZINES .....	9/00	Permitting recoil .....	25/00
ASSEMBLY FEATURES, MODULAR		Permitting elevation or traversing .....	27/00
CONCEPTS, ARTICULATED OR		CLEANING OR LUBRICATING .....	29/00
COLLAPSIBLE GUNS .....	11/00	TESTING .....	31/00
COOLING, HEATING, VENTILATING,		ADAPTATIONS FOR TRAINING .....	33/00
BLOWING TROUGH.....	13/00	OTHER ACCESSORIES OR DETAILS.....	35/00
EXTRACTORS, EJECTORS .....	15/00	SUBJECT MATTER NOT PROVIDED FOR	
SAFETY ARRANGEMENTS.....	17/00	IN OTHER GROUPS OF THIS SUBCLASS .....	99/00

**1/00 Missile propulsion characterised by the use of explosive or combustible propellant charges** (projecting missiles without use of explosive or combustible propellant charge F41B; launching rockets or torpedoes F41F 3/00; missile self-propulsion F42B 15/00) [5]

**3/00 Breech mechanism, e.g. locks** (for revolving-cannon guns F41F 1/00) [5]

**5/00 Mechanisms or systems operated by propellant charge energy for automatically opening the lock** [5]

**7/00 Auxiliary mechanisms for bringing the breech-block or bolt or the barrel to the starting position before automatic firing** (operating handles or levers F41A 3/00); **Drives for externally-powered guns** (revolving-cannon guns F41F 1/00); **Remote-controlled gun chargers** [5]

- 9/00 Feeding or loading of ammunition** (adaptations for feeding or loading missiles from magazines in air guns F41B 11/00); **Magazines; Guiding means for the extracting of cartridges** (cartridge extractors or ejectors F41A 15/00) [5]
- 11/00 Assembly or disassembly features; Modular concepts; Articulated or collapsible guns** (F41A 3/00, F41A 19/00, F41A 21/00, F41A 25/00 take precedence) [5]
- 13/00 Cooling or heating systems** (barrels or gun tubes with fins or ribs F41A 21/00); **Blowing-through of gun barrels; Ventilating systems** [5]
- 15/00 Cartridge extractors, i.e. devices for pulling cartridges or cartridge cases at least partially out of the cartridge chamber; Cartridge ejectors, i.e. devices for throwing the extracted cartridges or cartridge cases free of the gun** (F41A 9/00 takes precedence) [5]
- 17/00 Safety arrangements, e.g. safeties** [5]
- 19/00 Firing or trigger mechanisms; Cocking mechanisms** [5]
- 21/00 Barrels; Gun tubes; Muzzle attachments; Barrel mounting means** (F41A 25/00 takes precedence; barrel attachments for firing grenades or riot-control ammunition from smallarms F41C 27/00; sighting devices F41G 1/00) [5]
- 23/00 Gun mountings, e.g. on vehicles; Disposition of guns on vehicles** (F41A 25/00, F41A 27/00 take precedence) [5]
- 25/00 Gun mountings permitting recoil or return to battery, e.g. gun cradles; Barrel buffers or brakes** (recoilless guns F41A 1/00) [5]
- 27/00 Gun mountings permitting traversing or elevating movement, e.g. gun carriages** [5]
- 29/00 Cleaning or lubricating arrangements** (injecting fluids into barrels or cartridge chambers F41A 13/00) [5]
- 31/00 Testing arrangements** (testing mounts F41A 23/00) [5]
- 33/00 Adaptations for training** (adaptations of barrels for recoil reinforcement F41A 21/00); **Gun simulators** (teaching or practice apparatus for gun-aiming or gun-laying F41G 3/00) [5]
- 35/00 Accessories or details not otherwise provided for** [5]
- 99/00 Subject matter not provided for in other groups of this subclass** [8]

**F41B WEAPONS FOR PROJECTING MISSILES WITHOUT USE OF EXPLOSIVE OR COMBUSTIBLE PROPELLANT CHARGE; WEAPONS NOT OTHERWISE PROVIDED FOR** (projectiles for fishing, e.g. fish-spears, A01K 81/00; sports implements for throwing A63B 65/00, e.g. boomerangs; stationary apparatus for projecting sports balls, e.g. tennis balls, A63B 69/40; throwing or slinging toys A63H 33/00, knives, axes B26B; projectiles or missiles other than those incorporating springs as projecting means F42B 6/00)

#### Subclass index

BLOW GUNS .....	1/00	LIQUID PRESSURE GUNS, e.g. WATER	
SLING WEAPONS .....	3/00	PISTOLS .....	9/00
FRICTION-WHEEL OPERATED		AIR GUNS, STEAM GUNS .....	11/00
LAUNCHERS .....	4/00	THRUSTING WEAPONS, CUTTING	
BOWS, CROSSBOWS .....	5/00	WEAPONS CARRIED AS SIDE-ARMS .....	13/00
ELECTROMAGNETIC LAUNCHERS .....	6/00	OTHER WEAPONS .....	15/00
SPRING GUNS .....	7/00		

- 1/00 Blow guns, i.e. tubes for impelling projectiles, e.g. peas or darts, by the force of the breath** (pop guns A63H)
- 3/00 Sling weapons** (throwing-apparatus for clay-pigeon or clay-disc targets F41J 9/00)
- 4/00 Friction-wheel operated launchers** [5]
- 5/00 Bows; Crossbows** (sighting devices for bows F41G 1/00)
- 6/00 Electromagnetic launchers** [5]
- 7/00 Spring guns** (catapults F41B 3/00)
- 9/00 Liquid ejecting guns, e.g. water pistols**
- 11/00 Air guns, e.g. air pistols; Steam guns**
- 13/00 Thrusting-weapons** (bayonets F41C 27/00); **Cutting-weapons carried as side-arms** (training appliances for fencing A63B 69/02; sheaths for hand cutting tools B26B 29/00)
- 15/00 Weapons not otherwise provided for**

**F41C SMALLARMS, E.G. PISTOLS, RIFLES** (functional features or details common to both smallarms and ordnance, mountings therefor F41A; projecting missiles without use of explosive or combustible propellant charge F41B); **ACCESSORIES THEREFOR [5]**

**Note**

Attention is drawn to the definitions in Note (2) following the title of class F41. [5]

**Subclass index**

KINDS OF SMALLARMS	BUTTS, BUTT PLATES, STOCKS .....	23/00
Pistols, revolvers .....	ACCESSORIES; OTHER DETAILS .....	27/00
Shoulder-fired smallarms .....	WEARING OR CARRYING-MEANS .....	33/00
Other smallarms, e.g. hidden, muzzle-loaded, underwater .....		

<b>3/00</b>	<b>Pistols, e.g. revolvers</b> (specially adapted for underwater use F41C 9/00; for slaughtering or stunning animals A22B; for shooting bolts into concrete constructions, metal walls or the like B25C) [3,5]
<b>7/00</b>	<b>Shoulder-fired smallarms, e.g. rifles, carbines, shotguns</b> (specially adapted for underwater use F41C 9/00) [3]
<b>9/00</b>	<b>Other smallarms, e.g. hidden smallarms or smallarms specially adapted for underwater use</b> [3]

**Details**

<b>23/00</b>	<b>Butts; Butt plates; Stocks</b>
<b>27/00</b>	<b>Accessories; Details or attachments not otherwise provided for</b>
<b>33/00</b>	<b>Means for wearing or carrying smallarms</b>

**F41F APPARATUS FOR LAUNCHING PROJECTILES OR MISSILES FROM BARRELS, E.G. CANNONS** (smallarms F41C); **LAUNCHERS FOR ROCKETS OR TORPEDOES; HARPOON GUNS** (functional features or details common to both smallarms and ordnance, mountings therefor F41A; projecting missiles without use of explosive or combustible propellant charge F41B) [5]

**Subclass index**

LAUNCHING FROM BARRELS .....	1/00	LAUNCHING GRAVITY-PROPELLED PROJECTILES OR MISSILES .....	5/00
ROCKET OR TORPEDO LAUNCHERS .....	3/00	OTHER LAUNCHING APPARATUS .....	7/00

<b>1/00</b>	<b>Launching apparatus for projecting projectiles or missiles from barrels, e.g. cannons</b> (F41F 3/00 takes precedence); <b>Harpoon guns</b>
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<b>3/00</b>	<b>Rocket or torpedo launchers</b>
<b>5/00</b>	<b>Launching-apparatus for gravity-propelled missiles or projectiles</b> (from aircraft B64D 1/00)
<b>7/00</b>	<b>Launching-apparatus for projecting missiles or projectiles otherwise than from barrels</b> (F41F 3/00 takes precedence) [3]

**F41G WEAPON SIGHTS; AIMING** (optical aspects thereof G02B)

<b>1/00</b>	<b>Sighting devices</b> (for indirect laying of fire F41G 3/00; bombsights F41G 3/00)
<b>3/00</b>	<b>Aiming means; Laying means</b> (sighting devices F41G 1/00; determining direction, distance or velocity by use of radio or other waves G01S; computers G06; aerials H01Q)
<b>5/00</b>	<b>Elevating or traversing control systems for guns</b> (gun mountings permitting traversing or elevating movement, e.g. gun carriages, F41A 27/00; computers G06)



**7/00 Direction control systems for self-propelled missiles** (flight control B64C, G05D 1/00; self-propelled or guided missiles having direction control systems only installed aboard F42B 15/00; rocket torpedoes F42B 17/00; marine torpedoes or sea-mines having self-propulsion means F42B 19/00; locating by use of radio or other waves G01S; computing aspects G06)

7/20 . based on continuous observation of target position [3]

**9/00 Systems for controlling missiles or projectiles, not provided for elsewhere**

**11/00 Details of sighting or aiming apparatus; Accessories**

## **F41H ARMOUR; ARMoured TURRETS; ARMoured OR ARMED VEHICLES; MEANS OF ATTACK OR DEFENCE, E.G. CAMOUFLAGE, IN GENERAL**

### **Subclass index**

ARMOUR	ARMoured OR ARMED VEHICLES.....	7/00
Personal protection gear .....	FLAME, GAS OR CHEMICAL WARFARE .....	9/00
Armour plates, shields .....	OTHER ATTACK OR DEFENCE MEANS.....	11/00, 13/00
CAMOUFLAGE.....		3/00

**1/00 Personal protection-gear** (shields for personal use F41H 5/00; for protection against chemical warfare A62B)

**3/00 Camouflage, i.e. means or methods for concealment or disguise** (for vessels B63G 8/00, B63G 13/00)

**5/00 Armour; Armour plates** (processes for manufacturing or treating B21, C21)

5/007 . Reactive armour; Dynamic armour [5]

**7/00 Armoured or armed vehicles** (general vehicle aspects B60; armoured or armed ships B63G; armoured or armed aircraft B64D; mounting guns, e.g. machine-guns, on vehicles F41A 23/00)

**9/00 Equipment for attack or defence by spreading flame, gas, or smoke; Chemical warfare equipment** (protection against chemicals A62B; smoke-pot projectors, e.g. arranged on vehicles, F42B 5/00)

**11/00 Defence installations; Defence devices** (sweeping mines B63G; constructional aspects, see section E, e.g. E04H 9/04)

**13/00 Means of attack or defence not otherwise provided for**

## **F41J TARGETS; TARGET RANGES; BULLET CATCHERS**

### **Subclass index**

TARGETS	TARGET-HIT INDICATORS OR RECORDERS .....	5/00
Stationary or movable.....	TARGET STANDS; TARGET RANGES.....	1/00; 11/00
	BULLET CATCHERS.....	13/00
Reflecting or active.....		2/00
Specially adapted for arrows or darts.....		3/00

**1/00 Targets; Target stands; Target holders** (F41J 2/00 - F41J 11/00 take precedence; targets combined with bullet catchers F41J 13/00) [5,2009.01]

**2/00 Reflecting targets, e.g. radar-reflector targets; Active targets transmitting electromagnetic waves** [5]

**3/00 Targets for arrows or darts, e.g. for sporting or amusement purposes**

**5/00 Target indicating systems; Target-hit or score detecting systems** (targets disappearing when hit F41J 7/00) [5]

**7/00 Movable targets which are stationary when fired at**

**9/00 Moving targets, i.e. moving when fired at** (F41J 2/00 takes precedence) [5]

**11/00 Target ranges** [2009.01]

**13/00 Bullet catchers** [2009.01]

## F42 AMMUNITION; BLASTING

- (1) This class covers also means for practice or training which may have aspects of simulation, although simulators are generally covered by class G09.
- (2) In this class, the following terms or expressions are used with the meanings indicated:
- “primer” effects the first explosive step in the sequence of explosion; [2]
  - “percussion cap” means a primer which is struck to explode; [2]
  - “igniter” effects the first spark-producing or heat-producing step but may not be explosive; [2]
  - “firing-means” or “initiator” (used respectively in the arts of weaponry and blasting) means a device acting directly on the primer, which device may or may not form part of the fuze; [2]
  - “detonator” or “detonator charge” means a charge used to amplify the explosion of the primer; [2]
  - “fuze” means an assembly or mechanism which incorporates safety and arming means in order that the explosion can only take place under certain conditions; this assembly or mechanism determines also the moment (instantaneous or delayed) or the manner, e.g. impact, proximity, hydrostatic pressure, of the firing; [2]
  - “ammunition” covers propulsive charge and projectile whether or not forming a single body, unless otherwise made clear; [2]
  - “projectile”, “missile” or “projectile or missile” means any body which is projected or propelled; [4]
  - “guided missile” means projectile or missile which is guided during at least part of its trajectory; [4]
  - “rocket” means projectile or missile which is self-propelled, during at least part of its trajectory, by a rocket engine, i.e. by a jet-propulsion engine carrying both fuel and oxidant therefor; [4]
  - “fuse” or “fuse cord” means a continuous train of explosive enclosed in a usually flexible cord or cable for setting-off an explosive charge in the art of blasting. [5]

**F42B EXPLOSIVE CHARGES, E.G. FOR BLASTING; FIREWORKS; AMMUNITION** (explosive compositions C06B; fuzes F42C; blasting F42D) [2,5]

### Subclass index

CHARGES CHARACTERISED BY THE FORM .....	1/00	Self-propelled projectiles or missiles, rocket torpedoes, marine torpedoes .....	15/00 to 19/00
BLASTING CARTRIDGES.....	3/00	Depth charges.....	21/00
Initiators.....	3/00	Marine mines .....	22/00
FIREWORKS.....	4/00	Land mines.....	23/00
CARTRIDGE AMMUNITION .....	5/00	Fall bombs.....	25/00
PROJECTILES FOR BLOWGUNS, BOWS, SPRING OR AIR GUNS .....	6/00	Hand grenades.....	27/00
SHOTGUN AMMUNITION.....	7/00	Noiseless, smokeless or flashless projectiles .....	29/00
TRAINING AMMUNITION.....	8/00	Bullets, rifle grenades, ordnance projectiles, harpoons .....	30/00
STEERING, STABILISING OR RETARDING OF AMMUNITION .....	10/00	MANUFACTURING OR DISMANTLING OF AMMUNITION .....	33/00
AMMUNITION CHARACTERISED BY WARHEAD, INTENDED EFFECT OR MATERIAL .....	12/00	TESTING OR CHECKING OF AMMUNITION .....	35/00
GUIDING OR SEALING AMMUNITION IN BARRELS, LUBRICATING OR CLEANING BARRELS BY AMMUNITION .....	14/00	PACKAGING OR STORAGE OF AMMUNITION OR EXPLOSIVE CHARGES, SAFETY FEATURES THEREOF .....	39/00
TYPES OF AMMUNITION		SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS .....	99/00
Warhead types.....	12/00		

- 1/00 Explosive charges characterised by form or shape but not dependent on shape of container**
- 3/00 Blasting cartridges, i.e. case and explosive** (fuse cords, e.g. detonating fuse cords, C06C 5/00; chemical aspects of detonators, blasting caps or primers C06C 7/00)
- 4/00 Fireworks, i.e. pyrotechnic devices for amusement, display, illumination, or signal purposes** (signalling by explosives G08B; advertising by firework G09F 13/00) [2]

- 5/00 Cartridge ammunition, e.g. separately-loaded propellant charges** (shotgun ammunition F42B 7/00; practice or training ammunition F42B 8/00; missiles therefor F42B 12/00, F42B 14/00, F42B 15/00)
- 6/00 Projectiles or missiles specially adapted for projection without use of explosive or combustible propellant charge, e.g. for blow guns, bows or crossbows, hand-held spring or air guns** (for delivering hypodermic charges F42B 12/02; throwing-darts A63B 65/00; projectiles or missiles incorporating springs as the projecting means F41B 7/00) [5]
- 7/00 Shotgun ammunition**

- 8/00 Practice or training ammunition** (F42B 19/00 takes precedence; range-reducing, destabilising or braking arrangements F42B 10/00; with signalling effect F42B 12/02) [4]
- 10/00 Means for influencing, e.g. improving, the aerodynamic properties of projectiles or missiles; Arrangements on projectiles or missiles for stabilising, steering, range-reducing, range-increasing or fall-retarding** (F42B 6/00 takes precedence; sub-calibre projectiles having sabots F42B 14/00) [5]
- 12/00 Projectiles, missiles or mines characterised by the warhead, the intended effect, or the material** (F42B 6/00, F42B 10/00, F42B 14/00 take precedence; for practice or training F42B 8/00; self-propulsion or guidance aspects F42B 15/00) [5]
- 12/02 . characterised by the warhead or the intended effect [5]
- 14/00 Projectiles or missiles characterised by arrangements for guiding or sealing them inside barrels, or for lubricating or cleaning barrels** (coatings for reducing friction F42B 12/00) [5]
- 15/00 Self-propelled projectiles or missiles, e.g. rockets; Guided missiles** (F42B 10/00, F42B 12/00, F42B 14/00 take precedence; for practice or training F42B 8/00; rocket torpedoes F42B 17/00; marine torpedoes F42B 19/00; cosmonautic vehicles B64G; jet-propulsion plants F02K) [4]
- 17/00 Rocket torpedoes, i.e. missiles provided with separate propulsion means for movement through air and through water** (F42B 12/00 takes precedence)
- 19/00 Marine torpedoes, e.g. launched by surface vessels or submarines** (having additional propulsion means for movement through air F42B 17/00); **Sea mines having self-propulsion means** (F42B 12/00 takes precedence; launching means F41F; locating by use of radio or other waves G01S; automatic control of course G05D 1/00; firing directors or calculators G06G)
- 21/00 Depth charges** (F42B 12/00 takes precedence; for practice or training F42B 8/00; laying aspects B63G)
- 22/00 Marine mines, e.g. launched by surface vessels or submarines** (F42B 12/00 takes precedence; for practice or training F42B 8/00; with propulsion means F42B 19/00; mine laying or sweeping B63G)
- 23/00 Land mines** (F42B 12/00 takes precedence; for practice or training F42B 8/00)
- 25/00 Fall bombs** (F42B 10/00, F42B 12/00 take precedence; for practice or training F42B 8/00) [5]
- 27/00 Hand grenades** (F42B 12/00 takes precedence; for practice or training F42B 8/00)
- 29/00 Noiseless, smokeless, or flashless missiles launched by their own explosive propellant**
- 30/00 Projectiles or missiles, not otherwise provided for, characterised by the ammunition class or type, e.g. by the launching apparatus or weapon used** (F42B 10/00, F42B 12/00, F42B 14/00 take precedence) [5]
- 33/00 Manufacture of ammunition; Dismantling of ammunition; Apparatus therefor** (F42B 5/00 takes precedence; manufacturing processes for hollow charges F42B 1/00; manufacturing of blasting cartridge initiators F42B 3/00)
- 35/00 Testing or checking of ammunition**
- 39/00 Packaging or storage of ammunition or explosive charges; Safety features thereof; Cartridge belts or bags**
- 99/00 Subject matter not provided for in other groups of this subclass** [8]

**F42C AMMUNITION FUZES** (blasting cartridge initiators F42B 3/00; chemical aspects C06C); **ARMING OR SAFETY MEANS THEREFOR** (filling fuzes F42B 33/00; fitting or extracting primers in or from fuzes F42B 33/00; containers for fuzes F42B 39/00) [5]

#### Subclass index

##### FUZE-OPERATING PRINCIPLES

Impact .....	1/00
Liquid contact .....	3/00
Fluid pressure.....	5/00
Mechanical force .....	7/00
Non-electric time fuzes.....	9/00
Electric fuzes.....	11/00
Proximity fuzes.....	13/00
Combination fuzes .....	9/00

##### FUZES CHARACTERISED BY THE TYPE

OF AMMUNITION.....	14/00
ARMING OR SAFETY MEANS .....	15/00
FUZE-SETTING .....	17/00
OTHER DETAILS.....	19/00
CHECKING, TESTING .....	21/00
SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS .....	99/00

- 1/00 Impact fuzes, i.e. fuzes actuated only by ammunition impact**
- 3/00 Fuzes actuated by exposure to a liquid, e.g. sea-water** (F42C 5/00 takes precedence; time fuzes F42C 9/00)

- 5/00 Fuzes actuated by exposure to a predetermined ambient fluid pressure**

**F42C – F42D**

<b>7/00</b>	<b>Fuzes actuated by application of a predetermined mechanical force, e.g. tension, torsion, pressure</b> (by ammunition impact F42C 1/00; by exposure to a predetermined ambient fluid pressure F42C 5/00)	<b>14/00</b>	<b>Fuzes characterised by the ammunition class or type</b> (F42C 1/00, F42C 13/00, F42C 15/00 take precedence) [5]
<b>9/00</b>	<b>Time fuzes; Combined time- and percussion- or pressure-actuated fuzes; Fuzes for timed self-destruction of ammunition</b>	<b>15/00</b>	<b>Arming-means in fuzes; Safety means for preventing premature detonation of fuzes or charges</b> (F42C 3/00, F42C 5/00 take precedence)
<b>11/00</b>	<b>Electric fuzes</b> (proximity fuzes F42C 13/00; electric igniters F42C 19/00)	<b>17/00</b>	<b>Fuze-setting apparatus</b>
<b>13/00</b>	<b>Proximity fuzes; Fuzes for remote detonation</b>	<b>19/00</b>	<b>Details of fuzes</b> (other parts F42C 15/00)
		<b>21/00</b>	<b>Checking fuzes; Testing fuzes</b>
		<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b> [8]

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**F42D     BLASTING** (fuses, e.g. fuse cords, C06C 5/00; blasting cartridges F42B 3/00)

<b>1/00</b>	<b>Blasting methods or apparatus, e.g. for loading or tamping</b>	<b>5/00</b>	<b>Safety arrangements</b>
<b>3/00</b>	<b>Particular applications of blasting techniques</b>	<b>99/00</b>	<b>Subject matter not provided for in other groups of this subclass</b> [2009.01]

**F99**      **SUBJECT MATTER NOT OTHERWISE PROVIDED FOR IN THIS SECTION [8]**

**F99Z**      **SUBJECT MATTER NOT OTHERWISE PROVIDED FOR IN THIS SECTION [8]**

**Note**

This subclass covers subject matter that: [8]

(a) is not provided for, but is most closely related to, the subject matter covered by the subclasses of this section, and [8]

(b) is not explicitly covered by any subclass of another section. [8]

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**99/00**      **Subject matter not otherwise provided for in this  
section [8]**