

CPC**COOPERATIVE PATENT CLASSIFICATION****F****MECHANICAL ENGINEERING; LIGHTING;
HEATING; WEAPONS; BLASTING ENGINES OR
PUMPS****NOTE**

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;
 - "co-operating 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;

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- "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 and 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 should be 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 should be classified only in the relevant subclass of classes [F01](#) to [F04](#);
 - lubricating, gas-flow silencers or exhaust apparatus, or cooling of machines or engines should be classified in subclasses [F01M](#), [F01N](#), [F01P](#) except for those peculiar to steam engines which should be 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](#), [F04B](#), [F04C](#) and [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 in 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

ii. Characteristics

Machines; engines; pumps.

Positive displacement; non-positive displacement.

Simple reciprocating piston; rotary or oscillating

piston; other kind.

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 following table:

Kind of dis- rality in place- respect ment of kind cating ing piston placement	positive _____ of gene- rotary or os- cillat- other	non- posi- tive elastic fluid	Working fluid liquid and elastic fluid liquid	
<hr/>				
MACHINES				
X	X	X	X	F01B
X		X		F01C
X	X			F01D

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(continued)

X				X	F03B			
X			X				X	F04B
X						X		F04C
ENGINES								
<hr/>								
X			X		X	X		F01B
X				X	X			F01C
X	X		X					F01D
X				X	F03B			
X	X		X				X	F03C
PUMPS								
<hr/>								
X			X		X	X	X	F04B
X				X	X	X		F04C
X	X		X	X	F04D			

It is seen from the table that :

- For the same kind of apparatus in a given genus, the characteristic of "working fluid" associates:

[F01B](#) and [F04B](#))

[F01C](#) and [F04C](#)) Machines

[F01D](#) and [F03B](#))

[F01B](#) and [F03C](#))

[F01C](#) and [F03C](#)) Engines

[F01D](#) and [F03B](#))

- For the same kind of working fluid, the "apparatus" characteristic relates subclasses in the same way as considerations of relative generality.

ENGINES OR PUMPS

F01

MACHINES OR ENGINES IN GENERAL (combustion engines [F02](#); machines for liquids [F03](#), [F04](#)); **ENGINE PLANTS IN GENERAL; STEAM ENGINES**

F01B

MACHINES OR ENGINES, IN GENERAL OR OF POSITIVE-DISPLACEMENT TYPE, e.g. STEAM ENGINES (of rotary-piston or oscillating-piston type [F01C](#); of non-positive-displacement type [F01D](#); internal-combustion aspects of reciprocating-piston engines [F02B 57/00](#), [F02B 59/00](#); crankshafts, crossheads, connecting-rods [F16C](#); flywheels [F16F](#); gearings for interconverting rotary motion and reciprocating motion in general [F16H](#); pistons, piston rods, cylinders, for engines in general [F16J](#))

NOTES

1. This subclass covers, with the exception of the matter provided for in subclasses [F01C](#) 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 note preceding class [F01](#), especially as regards the definitions of "steam" and "special vapour".

F01C

ROTARY-PISTON OR OSCILLATING-PISTON MACHINES OR ENGINES (internal-combustion aspects [F02B 53/00](#), [F02B 55/00](#))

NOTES

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".

F01D

NON-POSITIVE DISPLACEMENT MACHINES OR ENGINES, e.g. STEAM TURBINES (machines or engines for liquids [F03](#); non-positive displacement pumps [F04D](#))

NOTES

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.

F01D

(continued)

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.

WARNING

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

[F01D 5/32](#) covered by [F01D 5/30](#)

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](#); 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".

F01L

CYCLICALLY OPERATING VALVES FOR MACHINES OR ENGINES (valves in general [F16K](#))

NOTES

1. Groups [F01L 1/00](#) to [F01L 13/00](#) cover only valve-gear or valve arrangements without provision for variable fluid distribution.
2. Valve gear or valve arrangements specially adapted for steam engines are covered by groups [F01L 15/00](#) to [F01L 35/00](#).
3. Valve-gear arrangements specially adapted for machines or engines with variable working-fluid distribution are covered by groups [F01L 15/00](#) to [F01L 35/00](#).
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 3/10](#), [F01B 15/06](#), [F01C 21/18](#), [F02B 53/06](#), [F03C 1/08](#), [F04B 1/18](#), [F04B 7/00](#), [F04B 39/08](#), [F04B 39/10](#), and [F04C 15/06](#), [F04C 29/12](#).

F01M

LUBRICATING OF MACHINES OR ENGINES IN GENERAL (lubricating in general [F16N](#)); **LUBRICATING INTERNAL COMBUSTION ENGINES; CRANKCASE VENTILATING**

NOTE

Attention is drawn to the notes preceding class [F01](#), specially as regards Note (3).

F01N**GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR MACHINES OR ENGINES IN GENERAL; GAS-FLOW SILENCERS OR EXHAUST APPARATUS FOR INTERNAL COMBUSTION ENGINES**

({evacuation of fumes from the area where they are produced [B08B 15/00](#); arrangement of exhaust or silencing apparatus on percussive tools [B25D 17/12](#)}; arrangements in connection with gas exhaust of propulsion units in vehicles [B60K 13/00](#), {on ships or other waterborne vessels [B63H 21/32](#), on aircraft [B64D 33/04](#); arrangement of exhaust or silencing apparatus on firearms [F41A 21/30](#); ground installations for reducing aircraft engine or jet noise [B64F 1/26](#); silencers specially adapted for steam engines [F01B 31/16](#); air-intake silencers for gas turbine or jet propulsion plants [F02C 7/045](#); jet pipe or nozzles for jet propulsion plants [F02K](#)}; combustion-air intake silencers specially adapted for, or arranged on, internal-combustion engines [F02M 35/00](#); {combating noise or silencing in positive displacement machines or pumps [F04B 39/0027](#), in rotary-piston machines or pumps [F04C 29/06](#), in non-positive displacement pumps [F04D 29/66](#); means in valves for absorbing noise [F16K 47/02](#); noise absorbers in pipe system [F16L 55/02](#); conducting smoke or fumes from various locations to the outside [F23J 11/00](#); means for preventing or suppressing noise in air-conditioning or ventilation systems [F24F 13/24](#)}; protecting against, or damping, noise in general [G10K 11/16](#))

NOTE

Attention is drawn to the notes preceding Class [F01](#), especially as regards Note 2(b).

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](#); {cooling of gas-turbine engines [F02C 7/12](#)}; heat exchange in general, radiators [F28](#))

NOTES

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 herefore;
 - "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.

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** (plants in which engines use combustion products [F02C](#), [F02G](#); internal-combustion turbines [F02C](#))

NOTES

1. In this subclass, the following terms or expressions 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 embraces super-charging;
 - "scavenging" means forcing the combustion residues from the cylinders other than by movement of the working pistons and thus embraces tuned exhaust systems.
2. Attention is drawn to the Notes preceding class [F01](#), specially as regards Note (1).
3. Engines with specified cycles or number of cylinders are classified in group [F02B 75/02](#) or [F02B 75/16](#), unless other classifying features predominate.

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](#); gas-turbine combustion chambers [F23R](#); using gas turbines in compression refrigeration plants [F25B 11/00](#); using gas-turbine plants in vehicles, see the relevant vehicle classes)

NOTES

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](#).
 - { combined cycle plants, which are covered by subclass [F01K 23/00](#)}
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](#).

F02D

CONTROLLING COMBUSTION ENGINES (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)

NOTES

1. Attention is drawn to the notes preceding class [F01](#).
2. In this subclass, the following words are 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.

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](#))

NOTES

1. Attention is drawn to the notes preceding class [F01](#).
2. In considering the relationship between class [F16](#) and subclass [F02F](#), class [F16](#) will take precedence unless the subject-matter is specific to combustion engines.

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](#).

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](#))

NOTES

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 plant is obtained on the reaction principle.
2. Attention is drawn to the notes preceding class [F01](#).

F02M

SUPPLYING COMBUSTION ENGINES IN GENERAL, WITH COMBUSTIBLE MIXTURES OR CONSTITUENTS THEREOF
(charging such engines [F02B](#))

NOTES

1. Attention is drawn to the notes preceding class [F01](#).
2. In this subclass the following terms 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 embraces 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.

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

F02M 7/23	covered by	F02M 7/103
F02M 51/08	" "	F02M 51/06

F02N **STARTING OF COMBUSTION ENGINES** (starting of free-piston combustion engines [F02B 71/02](#); starting of gas-turbine plants [F02C 7/26](#)); **STARTING AIDS FOR SUCH ENGINES, NOT OTHERWISE PROVIDED FOR**

NOTES

1. Attention is drawn to the notes preceding class [F01](#).
2. The starting of engines which are not explicitly stated to be combustion engines will be classified in this subclass insofar as their starting is equivalent to that of combustion engines.

F02P **IGNITION, OTHER THAN COMPRESSION IGNITION, FOR INTERNAL-COMBUSTION ENGINES; TESTING OF IGNITION TIMING IN COMPRESSION-IGNITION ENGINES** ({anti-pollution means for internal-combustion engines [F02B 17/00](#)}; specially adapted for rotary-piston or oscillating-piston engines [F02B 53/12](#); {ignition of gas turbine plants [F02C 7/26](#); ignition of jet propulsion plants [F02K 9/95](#); starting of combustion engines [F02N 9/00](#)}; 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; {ignition coils [H01F 38/12](#); sparking plugs [H01T 13/00](#))

F02W **INDEXING SCHEME RELATING TO TURBINES; GAS TURBINES**

NOTE

This subclass constitutes an internal scheme for indexing only, associated with subclasses [F01D](#), [F01K](#), [F02C](#) and [F02K](#), relating to turbines and gas turbines

F03 **MACHINES OR ENGINES FOR LIQUIDS** (for liquid and gases [F01](#); positive-displacement machines for liquids [F04](#)); **WIND, SPRING WEIGHT AND MISCELLANEOUS MOTORS; PRODUCING MECHANICAL POWER; OR A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR**

F03B **MACHINES OR ENGINES FOR LIQUIDS** (positive-displacement engines for liquid [F03C](#); machines for liquids and gases [F01](#); positive-displacement machines for liquids [F04](#), rotary fluid gearing of the hydrokinetic type [F16H 41/00](#))

NOTES

1. Attention is drawn to the notes preceding Class [F01](#), especially as regards the definition of "reaction type".

F03B

(continued)

2. This subclass comprises:
- engines, other than of positive-displacement type, driven by liquids;
 - machines, other than of positive-displacement type, for liquids.

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 meanings 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".

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

F03C 1/253	covered by	F03C
F03C 1/28	" "	F03C 1/0406 , F03C 1/0605
F03C 1/30	" "	F03C 1/0409 , F03C 1/0631 , F03C 1/0668
F03C 1/32	" "	F03C 1/0415 , F03C 1/0626 , F03C 1/0652
F03C 1/34	" "	F03C 1/0435 , F03C 1/0615 , F03C 1/0655
F03C 1/36	" "	F03C 1/0435 , F03C 1/0615 , F03C 1/0655
F03C 1/38	" "	F03C 1/0435 , F03C 1/0615 , F03C 1/0655
F03C 1/40	" "	F03C 1/0447 , F03C 1/0678

F03D**WIND MOTORS****NOTE**

In this subclass, the following words 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;
- "Rotations axis" means the axis of rotation of the rotor.

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.

WARNING

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

F03G 4/00	covered by	F03G 7/04
F03G 4/02	covered by	F03G 7/04
F03G 4/04	covered by	F03G 7/04
F03G 4/06	covered by	F03G 7/04

F03H

PRODUCING A REACTIVE PROPULSIVE THRUST, NOT OTHERWISE PROVIDED FOR ([from combustion products F02K](#))

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](#); engines fuel-injection pumps [F02M](#); ion pumps [H01J 41/00](#); electro-dynamic pumps [H02K 44/02](#))

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 these 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](#))

NOTES

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 preceding class [F01](#), especially as regards the definitions of "machines", "pumps", and "positive-displacement".

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F04B 35/02](#) covered by [F04B 9/08](#)

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".

F04D**NON-POSITIVE DISPLACEMENT PUMPS****NOTES**

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".

F04F **PUMPING OF FLUID BY DIRECT CONTACT OF ANOTHER FLUID OR BY USING INERTIA OF FLUID TO BE PUMPES** {(evacuating by sorption [F04B](#))}; **SIPHONS** {(Conveying materials in bulk by flows of gas, liquid of foam [B65G 53/00](#))}

NOTES

1. Attention is drawn to the notes preceding class [F01](#).
2. Combinations of pumps belonging to this subclass with other pumps are only classified in this subclass if such other pumps are fore pumps of diffusion pumps.

F05 **INDEXING SCHEMES RELATING TO ENGINES OR PUMPS IN VARIOUS SUBCLASSES OF CLASSES [F01-F04](#)**

F05B **INDEXING SCHEME RELATING TO MACHINES OR ENGINES OTHER THAN NON-POSITIVE-DISPLACEMENT MACHINES OR ENGINES, TO WIND MOTORS, TO NON-POSITIVE DISPLACEMENT PUMPS, AND TO GENERATING COMBUSTION PRODUCTS OF HIGH PRESSURE OR HIGH VELOCITY**

NOTE

This subclass constitutes an internal scheme for indexing only.

F05C **INDEXING SCHEME RELATING TO MATERIALS, MATERIAL PROPERTIES OR MATERIAL CHARACTERISTICS FOR MACHINES, ENGINES OR PUMPS OTHER THAN NON-POSITIVE-DISPLACEMENT MACHINES OR ENGINES**

NOTE

This subclass constitutes an internal scheme for indexing only.

F05D **INDEXING SCHEME FOR ASPECTS RELATING TO NON-POSITIVE-DISPLACEMENT MACHINES OR ENGINES, GAS-TURBINES OR JET-PROPULSION PLANTS**

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. SERVO-MOTORS; DETAILS OF FLUID-PRESSURE SYSTEMS, NOT OTHERWISE PROVIDED**

FOR ({hydraulically or pneumatically operated lifting devices for soil-working machines [A01B 63/10](#); hydraulic drawing presses [B21D](#); hydraulic or pneumatic manipulators [B25J](#); hydraulic or pneumatic tipping devices for vehicles [B60P 1/00](#); hydraulic or pneumatic remote control for railway signals [B61L 7/04](#); hydraulic or pneumatic mine supports [E21D 15/44](#)}; motors, turbines, compressors, blowers, pumps [F01](#) to [F04](#); {fluid signal amplifiers, relays [F15C](#)}; 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 17/10](#); 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 meaning stated:

- "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.

F15C**FLUID-CIRCUIT ELEMENTS PREDOMINANTLY USED FOR COMPUTING OR CONTROL PURPOSES**

(transducers [F15B 5/00](#), {[F15B 21/00](#)}; fluid dynamics in general [F15D](#); computer comprising fluid elements [G06D](#), [G06G](#); {electric control by means of electro-hydraulic or electro-pneumatic amplifiers [G05B 7/02](#)})

F15D**FLUID DYNAMICS, i.e. METHODS OR MEANS FOR INFLUENCING THE FLOW OF GASES OR LIQUIDS**

({nozzles, spray heads [B05B](#); devices to decrease friction or resistance or to increase speed of ships [B63B](#); ship rudders [B63H 25/38](#); influencing the flow or the viscosity of fluids with chemical additives [C09K 3/00](#), [C10M](#); hydraulic engineering [E02B](#)}; fluid circuit elements [F15C](#); {one-way check valves [F16K 15/00](#)})

NOTE

This subclass comprises 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.

F16 **ENGINEERING ELEMENTS AND 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, WEDGES, JOINTS OR JOINTING**

NOTES

1. Attention is drawn to:
 - a. the Note following group [E04B 1/38](#);
 - 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
 - {[C14B 17/08](#) Fastening devices, e.g. clips for leather-stretching used in apparatus or machines
for manufacturing or treating skins, hides, leathers or furs}
 - [E01B 9/10](#) Screws or bolts for railway sleepers
 - [E01B 11/00](#) Rail joints
 - [E04](#) Connections for building
 - [E04D 13/08](#) Clamping means for down pipes for roof drainage
 - [E04G 5/04](#) Fastening scaffolds against buildings
 - [E04G 7/00](#) Scaffolding couplings
 - [E05C](#) Bolts for fasteners for wings, specially for doors or windows
 - [F16C 29/10](#) 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

F16B

(continued)

[H01F 7/00](#) Magnetic holding devices[H02N 13/00](#) Electrostatic holding devices.

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

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F16B 7/08](#) covered by [F16B 5/12](#), [F16B 7/04](#), [F16L 3/00](#)

[F16B 7/12](#) " " [F16B 7/105](#)

[F16B 7/16](#) " " [F16B 7/14](#)

[F16B 13/10](#) " " [F16B 13/08](#)

[F16B 13/13](#) " " [F16B 13/002](#), [F16B 13/12](#)

[F16B 21/14](#) " " [F16B 21/12](#), [F16B 21/125](#)

[F16B 25/02](#) " " [F16B 25/00](#)

[F16B 25/04](#) " " [F16B 25/00](#)

[F16B 25/06](#) " " [F16B 25/00](#)

[F16B 25/08](#) " " [F16B 25/00](#)

[F16B 33/04](#) " " [F16B 33/02](#)

[F16B 37/10](#) " " [F16B 37/0842](#), [F16B 37/0871](#)

F16C

SHAFTS; FLEXIBLE SHAFTS; ELEMENTS OR CRANKSHAFT MECHANISMS; ROTARY BODIES OTHER THAN GEARING ELEMENTS; BEARINGS

NOTES

- 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.
- Attention is drawn to the following places:

[A01B 71/04](#) Bearings for agricultural machines

[B21B 31/07](#) Adaptation of roll bearings for metal-rolling mills

[B61C 17/10](#) Connecting-rods, bearings for driving wheels of railway locomotives

[B61F 15/00](#) Axle-boxes for railway vehicles

[B62K 21/06](#) Bearings for steering heads

[E06B 9/174](#),

[E06B 9/50](#) Bearings specially adapted for roller shutters or for roller blinds

[E21B 10/22](#) Bearings for drill bits

[F01C 21/02](#) Arrangement of bearings in rotary-piston machines or engines

F16C

(continued)

- [F01D 25/16](#) Arrangement of bearings in non-positive displacement machines or engines
- [F02C 7/06](#) Arrangement of bearings in gas-turbine plants
- [G01C 19/16](#) Bearings for gyroscopes
- [G01D 11/02](#) Bearings or suspensions for moving parts of measuring instruments
- [G01G 21/02](#) Arrangements of bearings in weighing apparatus
- [G01R 1/10](#) Arrangements of bearings in instruments for measuring electric variables
- [G01R 11/12](#) 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.

F16D

COUPLINGS FOR TRANSMITTING ROTATION; CLUTCHES; BRAKES**NOTE**

Attention is drawn to the following places:

- [A01D 69/08](#), [A01D 69/10](#) Clutches or brakes of harvesting machines for grass or cereals;
- [A61C 1/18](#) Clutches in dental machines for boring or cutting;
- [B21B 35/14](#) Drive couplings for metal-rolling mills;
- [B30B 15/10](#) Brakes specially adapted for presses;
- [B30B 15/12](#) 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 5/04](#) Braking mechanisms for hand carts;
- [B62B 9/08](#) 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;

F16D

(continued)

[H02P 3/04](#) Brakes for electric motors, generators, dynamo-electric converters;

[H04L 13/04](#) Clutches for apparatus for transmission of coded digital information.

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F16D 3/19](#) covered by [F16D 3/50](#);

[F16D 3/27](#) covered by [F16D 3/265](#);

[F16D 27/07](#) covered by [F16D 27/06](#), [F16D 27/14](#);

[F16D 48/12](#) covered by [B60K 23/0808](#);

[F16D 65/35](#) covered by [F16D 63/00](#).

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

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.
2. This subclass does not cover inventions concerning 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 [A47C 27/00](#) Spring mattresses

{ [A61F 2/00](#) Prostheses }

[A63C 5/075](#) 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 1/02](#) Resiliently mounted saddles on cycles

[B62K 21/08](#) Steering dampers

[B63H 21/30](#) Anti-vibration mounting of marine propulsion plant in ships

[B64C 25/58](#) 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 49/06](#) Resilient mountings in domestic spin-dryers

F16F

(continued)

- {[E04B 1/98](#) Protection of buildings against vibrations or shocks }
 - [E05D 7/086](#) Braking devices structurally combined with hinges
 - [F03G 1/00](#) Spring motors
 - {[F16L 3/20](#) Pipe or cable supports }
 - [F21V 15/04](#) Resilient mounting of lighting devices
 - [F41A 25/00](#) Gun cradles to permit recoil
 - [F41B 5/1426](#) Vibration dampers for archery bows
 - [G01D 11/00](#) Indicating or recording in connection with measuring
 - [G01G 21/10](#) Weighing apparatus, e.g. arrangement of shock-absorbers in weighing apparatus
 - [G04B](#) Clocks, watches
 - [G12B 3/08](#) Damping of movements in instruments
 - [G21C 7/20](#) Disposition of shock-absorbing devices for displaceable control elements in nuclear reactors.
 - {[H02G 7/14](#) Arrangements or devices for damping mechanical oscillations of power lines }
3. Mention of "steel" or "metal" in groups [F16F](#), unless specific mention is made otherwise, should be seen in the light of the title of group [F16F 1/00](#), i.e. material having low internal friction. This normally includes composite materials such as fibre-reinforced plastics.
 4. Mention of "rubber" or "plastics" in group [F16F](#), unless specific mention is made otherwise, should be seen in the light of the title of group [F16F 1/36](#), i.e. material having high internal friction. This normally does NOT include composite materials such as fibre-reinforced plastics except in the case of groups [F16F 1/366](#) to [F16F 1/3686](#) and [F16F 15/305](#).

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

- [F16F 3/07](#) covered by [F16F 13/00](#)
- [F16F 9/24](#) covered by [F16F 9/22](#)
- [F16F 9/40](#) covered by [F16F 9/00](#) to
- [F16F 9/50](#)
- [F16F 9/508](#) covered by [F16F 9/512](#)
- [F16F 11/00](#) covered by [F16F 7/00](#), [F16F 9/00](#),
- [F16F 15/00](#)
- [F16F 13/12](#) covered by [F16F 13/08](#)

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

Attention is drawn to the following places:

[B63B 21/04](#) Fastening equipment for chains, ropes or the like for ships

[B63B 21/20](#) Adaptations of chains, ropes or the like for ships

[B65G 15/30](#) Endless conveyer belts

[B65G 17/38](#),

[B65G 19/20](#) Traction chains for conveyers

[F16H](#) Gearings using flexible members

[F16H 9/24](#) Chains specially adapted for gearings with variable ratio

[H05F](#) Preventing or carrying-off electrostatic charges.

F16H**GEARING** {(steering of motor vehicles by differentially driving ground-engaging elements on opposite vehicle sides [B62D 11/02](#))}**NOTES**

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](#).
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 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;

F16H

(continued)

– "central gears" includes any gears whose axis is the main axis of the gearing.

4. Attention is drawn to the following places:

A01D 69/06	Gearings in harvesting machines
A63H 31/00	Gearing for toys
B21B 35/12	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 propulsions
B63H 25/00	Marine steering gears
{ B64C 27/12 , helicopters	B64C 27/58 Transmissions for
B64D 35/00	Transmissions for aircraft }
F01 to F04	Machines, engines, pumps
F15B 15/00	Gearings associated with fluid-actuated devices
G01D 5/04	Gearing used in indicating or recording apparatus in connection with measuring devices
H03J 1/00	Driving arrangements for tuning resonant circuits
H04L 13/04	Driving mechanisms for apparatus for transmission of coded digital information.

F16J**PISTONS {(specially adapted for dampers [F16F 9/32](#))}; CYLINDERS; 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 31/28	
F02F 1/00	Cylinders for combustion engines
F02F 3/00	Pistons for combustion engines
F04D 29/08	Sealings of non-positive displacement pumps
F17B 1/04	Sealing devices for sliding parts of gas holders

F16J

(continued)

of variable capacity

[F28F 9/04](#) Arrangements for sealing elements into header boxes or end plates of heat-exchangers.

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F16J 15/53](#) covered by [F16J 15/43](#)

F16K**VALVES; TAPS; COCKS; ACTUATING-FLOATS; DEVICES FOR VENTING OR AERATING {(devices for emptying and evacuating the excess liquid in valves or conduits [F16L 55/07](#))}****NOTE**

Attention is drawn to the following places:

[A47J 27/09](#) Safety devices for pressure cookers

[A47J 31/46](#) Dispensing spouts, drain valves or like beverage-making apparatus

[A61B 5/0235](#) 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 9/02](#) Valves for respiratory apparatus

[A62B 18/10](#) Valves for breathing masks or helmets

[A62C](#) Fire extinguishers

{[B01D 35/04](#) Plug, tap, or cock filters }

[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 17/048](#) 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](#),

[B63C 9/00](#) Arrangement of inflating valves for floatable life-saving equipment

F16K

(continued)

B65D 47/04	Container closures with discharging valves
B65D 90/32	Safety valves for large containers
B65D 90/54	Gates or closures on large containers
B67C 3/28	Flow control devices for bottling liquids
B67D	Dispensing, delivering or transferring liquids
{C21B 9/12	Hot-blast valves for blast
furnaces	}
E02B 8/00	Details, e.g. valves, of barrages or weirs
E02B 13/02	Closures for irrigation conduits
{E03C 1/04	Water-basin installations specially adapted for wash-basins or baths
{E03C 1/05	Arrangements on wash-basins for the remote control of taps
E03D	Flushing valves for water-closets or urinals
{E03F 7/04	Valves for preventing return flow in sewer systems
E05F 3/12	Valve arrangements in door closers
E21B 21/10	Valve arrangements in drilling-fluid circulation systems
E21B 34/00	Valve arrangements for boreholes or wells
{E21D 15/51	Arrangement of relief valves in hydraulic mine props
F01B 25/10	Working-fluid valves for controlling machines or engines in general or of positive-displacement type
F01D 17/10	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 9/58	Propellant feed valves for rocket-engines
F02M	Carburettors, fuel injection
F02M 59/46	Valves for fuel injection pumps
F04	Pumps
F16F 9/34	Valves for shock absorbers
F16L 29/00	
F16L 37/28	Pipe joints or quick-acting couplings with fluid cut-off means
F16L 55/00	Arrangement of valves in pipes
F16L 55/055	Valves specially adapted to prevent or minimise the effect of water hammer
F16L 55/46	Launching devices for pigs or moles

F16K

(continued)

F16N 23/00	Check valves for lubrication systems
{ F16T	Draining-off liquids from steam traps}
F17C 13/04	Arrangement of valves in pressure vessels
F22B 37/44	Arrangement of safety valves on steam boilers
F22D 5/34	Application of valves to automatic water-feed in boiler
F23L 13/00	Valves for air supply control to burners
{ F23Q 2/16	Valves for lighters with gaseous fuel and adjustable flame }
F24C 3/12 ,	
F24C 5/16	Arrangement of valves on stoves or ranges
F24F	Air conditioning; Ventilation
F25B 41/04	Disposition of fluid circulation valves in refrigeration machines
G05D	Controlling non-electric variables
G10B 3/06	Valves for organs
G10D 9/04	Valves for other wind-actuated musical instruments
{ G21C 9/06	Safety valves structurally associated with nuclear reactors }
{ H01M 2/12	Vent plugs in batteries or cells }

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

F16K 31/11	covered by	F16K 31/06 ,
F16K 31/08 ,	F16K 31/10	
F16K 31/64	" "	G05D
F16K 31/66	" "	F16K 31/06 ; H01F
F16K 31/68	" "	G05D
F16K 31/70	" "	F16K 31/002
F16K 31/72	" "	F16K 31/00

F16L

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

NOTES

- 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.
- Attention is drawn to the following places:

F16L

(continued)

- [A61M 39/00](#) Tube connectors, tube couplings or branch units, specially adapted for medical use
- [B05B 1/20](#) Perforated pipes
- [B60T 17/04](#) Arrangement of piping or air hoses in brake systems}
- [B63B 35/03](#) Pipe-laying vessels
- [B64D 39/04](#) Adaptation of hose constructions for refuelling aircraft during flight
- [B65G 51/00](#) Conveying articles through pipes or tubes by fluid flow or pressure}
- [B65G 53/00](#) Conveying materials in bulk through pipes or tubes}
- [B67D 7/38](#) Arrangements of hoses in apparatus for transferring liquids, e.g. fuel, from bulk to vehicles or portable containers
- [E01D 19/10](#) Fastening of pipes or cables to bridges
- [E03B](#) Water supply installations
- [E03D 11/17](#) Means for connecting water-closet bowls to the flushing pipe
- [E03D 11/18](#) Siphons for water-closets
- [E03F 3/04](#) Pipes or fittings specially adapted to sewers
- [E04D 13/08](#) Down pipes for roof drainage; Clamping means therefor
- [E04F 17/00](#) Vertical ducts, channels in buildings, e.g. chimneys
- [E21F 1/04](#) Air ducts for ventilation of mines or tunnels; Connections therefor
- [E21F 17/02](#) Suspension devices for tubes or the like in mines or tunnels
- [F01N](#) Gas flow silencers or exhaust apparatus for machines or engines
- [F16B 7/00](#) Connections of rods or tubes}
- [F16N 21/00](#) Conduits, junctions for lubrication systems
- [F17C 3/02](#) Thermal insulation of vessels not under pressure for storing liquefied or solidified gases, e.g. Dewar flask
- [F17D](#) Pipe-line systems, pipe-lines}
- [F22B 37/10](#) Water tubes of steam boilers
- [F23J 13/04](#) 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 15/22](#) Structural association of coolant tubes with headers or other pipes in nuclear

F16L

(continued)

reactors

[H02G 3/04](#) Protective tubing or conduits for electric cables[H02G 3/26](#) Installations of electric cables or lines, or protective tubing on or in walls, ceilings or floors.**WARNING**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F16L 3/21](#) covered by [F16L 3/2053](#), [F16L 3/2056](#);[F16L 13/013](#) covered by [F16L 13/007](#);[F16L 19/03](#) covered by [F16L 19/0212](#);[F16L 59/05](#) covered by [F16L 59/021](#).**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 31/02](#) Metal-rolling stand frames[G01D 11/30](#) Supports specially adapted for indicating or recording instruments.**F16N****LUBRICATING****NOTE**

Attention is drawn to the following places:

[A01D 69/12](#) Lubrication of harvesters;[B21J 3/00](#) Lubricating during forging or pressing;[B25D 17/26](#) Lubricating of portable power-driven percussive tools;[B60R 17/00](#) Arrangements or adaptations of lubricating; systems or devices in vehicles;[B61C 17/08](#) Lubrication systems for railway locomotives;[B62D 55/092](#) Vehicle endless-track units with lubrication means;[D04B 35/28](#) Devices for lubricating knitting machine parts;[E05B 17/08](#) Lubricating devices for locks;

F16N

(continued)

[E05D 11/02](#) Lubricating arrangements for hinges;
[E21B 10/22](#) Lubricating details of roller drill bits for
earth;
drilling.

F16P**SAFETY DEVICES IN GENERAL; {SAFETY DEVICES FOR PRESSES}****NOTE**

Attention is drawn to the following places:

[A01D 75/18](#) Harvesting machines
[A01F 21/00](#) Threshing machines or baling presses
[B02C 23/04](#) 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 25/04](#) Turning-machines
[B23Q 11/00](#) Machine tools
[B24B 55/00](#) Grinding or polishing machines
[B25J 19/06](#) Manipulators
[B26D 7/22](#) 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.

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](#).

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

F17 **STORING OF DISTRIBUTING GASES OR LIQUIDS** (water supply [E03B](#))

F17B **GAS-HOLDERS OF VARIABLE CAPACITY** (self-acting gas cut-off devices [A47J 27/62](#), [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 1/04](#); detecting leakage [F17D 5/02](#), [G01M](#); supervising or alarm devices [F17D 5/02](#), [G08B](#); control of combustion in burners [F23N](#); gas flow or pressure regulators [G05D](#))

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](#))

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 9/06](#))

NOTE

In this subclass, pipe-line systems are interpreted as systems described in flow sheets as well as arrangements of co-operating elements, the elements per se being covered in the relevant subclasses.

LIGHTING; HEATING

F21 **LIGHTING** (electric aspects or elements, see section H, e.g. electric light sources [H01J](#), [H01K](#), [H05B](#))

NOTE

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

- "Portable" means "intended to be carried personally"
- "Non-portable" means "not intended to be carried personally, even if capable of being moved from place to place"

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

F21K **LIGHT SOURCES NOT OTHERWISE PROVIDED FOR**

F21L **LIGHTING DEVICES OR SYSTEMS THEREOF, BEING PORTABLE OR SPECIALLY ADAPTED FOR TRANSPORTATION**

NOTES

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.
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](#).
3. Non-electric lighting devices are classified in groups [F21L 17/00-F21L 26/00](#) only if a special adaptation related to the use of a non-electric light source is of interest.

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

NOTES

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.
2. This subclass does not cover devices or systems specially adapted for transportation, which are covered by subclass [F21L](#).
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.

F21V**DETAILS OF LIGHTING DEVICES, OF GENERAL APPLICATION****NOTES**

1. Groups [F21V 1/00-F21V 14/00](#) cover aspects related to light emission or distribution. Groups [F21V 15/00-F21V 31/00](#) cover aspects not related to light emission or distribution.
2. Details of non-electric lighting devices or systems are classified in groups [F21V 35/00-F21V 37/00](#) only if a special adaptation related to the use of a non-electric light source is of interest.
3. In this subclass, it is desirable to add the indexing codes of subclasses [F21W](#) and [F21Y](#)

WARNING

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

[F21V 8/00](#) covered by [G02B 6/00](#)

F21W**INDEXING SCHEME RELATING TO USES OR APPLICATIONS OF LIGHTING DEVICES OR SYSTEMS****NOTE**

This subclass constitutes an internal scheme for indexing only, associated with subclasses [F21L](#), [F21S](#) and [F21V](#), relating to uses or applications of lighting devices or systems.

F21Y**INDEXING SCHEME RELATING TO THE FORM OF THE LIGHT SOURCES****NOTE**

This subclass constitutes an internal scheme for indexing only, associated with subclasses [F21L](#), [F21S](#) and [F21V](#), relating to the form of the light sources.

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:

F22

(continued)

- "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

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, [C02E](#); enclosed heat-exchange apparatus in general [F28D](#); controlling in general [G05](#))

F22G

SUPERHEATING OF STEAM (steam separating arrangements in boilers [F22B 37/26](#))

F23

COMBUSTION APPARATUS; COMBUSTION PROCESSES

NOTE

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

- "combustion" means a heat-producing sequence of chemical reactions between a burnable substance and molecular oxygen, e.g. in air, in most cases generating light in the form of flames or a glow;
- "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](#); burning of low grade fuel [F23G](#); grates [F23H](#); feeding solid fuel to combustion apparatus [F23K](#); combustion chambers, not otherwise provided for [F23M](#); domestic apparatus [F24](#); central heating boilers [F24D](#); package boilers [F24H](#))
- NOTE**
- This subclass is only concerned with the combustion of lump fuel, or of pulverulent or granulated fuel if no use is made of its fluent nature.
- F23C** **COMBUSTION APPARATUS USING FLUENT FUEL** (combustion apparatus for solid fuel only [F23B](#); burners [F23D](#); constructional details of combustion chambers not otherwise provided for [F23M](#); combustion chambers for generating combustion products of high pressure or high velocity [F23R](#))
- F23D** **BURNERS** (generating combustion products of high pressure or high velocity [F23R](#))
- F23G** **CREMATION FURNACES; CONSUMING WASTE PRODUCTS BY COMBUSTION**
- NOTE**
- This subclass covers also the burning of low-grade fuel of solid, liquid, or gaseous nature.
- F23H** **GRATES** (inlets for fluidisation air for fluidised bed combustion apparatus [F23C 10/20](#)); **CLEANING OR RAKING GRATES**
- F23J** **REMOVAL OR TREATMENT OF COMBUSTION PRODUCTS OR COMBUSTION RESIDUES** {(from fluidised-bed combustion apparatus [F23C 10/24](#))}; **FLUES** (precipitating dust from flue gases [B01D](#); composition of fuel [C10](#); combustion apparatus for consuming smoke or fumes, e.g. exhaust gases, [F23G 7/06](#))
- NOTE**
- This subclass covers the cleaning of external surfaces of water tubes of boilers

- F23K** **FEEDING FUEL TO COMBUSTION APPARATUS** (fuel feeders specially adapted for fluidised-bed combustion apparatus [F23C 10/22](#); regulating or controlling combustion [F23N](#))
- F23L** **AIR SUPPLY; DRAUGHT-INDUCING; SUPPLYING NON-COMBUSTIBLE LIQUID OR GAS** (air-supply arrangements for fluent fuels [F23C](#); dampers and throat restrictors for open fire-places [F24](#); air inlet valves for open fire fronts [F24](#))
- F23M** **CASINGS, LININGS, WALLS OR DOORS SPECIALLY ADAPTED FOR COMBUSTION CHAMBERS, e.g. FIREBRIDGES; DEVICES FOR DEFLECTING AIR, FLAMES OR COMBUSTION PRODUCTS IN COMBUSTION CHAMBERS; SAFETY ARRANGEMENTS SPECIALLY ADAPTED FOR COMBUSTION APPARATUS; DETAILS OF COMBUSTION CHAMBERS, NOT OTHERWISE PROVIDED FOR**
- F23N** **REGULATING OR CONTROLLING COMBUSTION** (control devices specially adapted for fluidised-bed combustion apparatus [F23C 10/28](#); condition responsive controls for regulating combustion in domestic stoves with open fires for solid fuel [F24B 1/187](#))
- F23Q** **IGNITION** (devices or installations peculiar to internal-combustion engines [F02P](#); of cigarettes or tobacco [A24F](#); compositions therefor, chemical igniters [C06C](#)); **EXTINGUISHING-DEVICES**
- F23R** **GENERATING COMBUSTION PRODUCTS OF HIGH PRESSURE OR HIGH VELOCITY, e.g. GAS-TURBINE COMBUSTION CHAMBERS** (using such products for specific purposes, see the relevant classes for the purposes; chemical aspects of gas production [C06D 5/00](#); gas-turbine plants characterised by the arrangement of the combustion chamber in the plant [F02C 3/14](#); arrangement of afterburners in jet-propulsion plants [F02K 3/10](#); combustion chambers of rocket-engine plants [F02K 9/00](#))

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 [B60](#) to [B64](#); combustion apparatus in general [F23](#); drying [F26B](#); ovens in general [F27](#); electric heating elements and 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**

F24C **OTHER DOMESTIC STOVES OR RANGES; DETAILS OF DOMESTIC STOVES OR RANGES, OF GENERAL APPLICATION**
(radiator stoves of the fluid-circulating type [F24H](#))

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 17/02](#); 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.

F24F**AIR-CONDITIONING, AIR-HUMIDIFICATION, VENTILATION, USE OF AIR CURRENTS FOR SCREENING**

(devices for ventilating greenhouses [A01G](#) {air-conditioning systems for greenhouses [A01G 9/246](#)}; animal husbandry [A01K](#), e.g. controlling humidity in incubators [A01K 41/04](#); disinfecting or sterilising of air [A61L](#); devices for reconditioning breathing air in sealed rooms or for ventilating gas-proof 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](#), {[B64D 13/00](#)}; production of ozone [C01B 13/10](#); chimneys or flues [E04F 17/02](#), [E04H 12/28](#), [F23J 11/00](#), [F23L 17/02](#); air ducts or conduits [E04F 17/04](#), [F16L](#); ventilation in doors or windows [E06B 7/02](#); fans, blowers [F04](#); noise-absorbing in pipes or pipe systems [F16L](#); tops for chimneys and 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](#))

NOTES

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 3/14](#)
 - air-humidification per se, e.g. "room humidifiers", is covered by group [F24F 6/00](#)
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.

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 9/20](#); 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](#))

NOTES

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 subclasses [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.
2. In this subclass the following terms are used with the meanings indicated:

F24H

(continued)

- "Water" includes other liquids;
- "air" includes other gases or gas mixtures;
- "water" and "air" always mean, respectively, the liquid and gas to be heated;
- "Furnace tubes" means tubes inside the heater wherein combustion is performed;
- "Fire tubes" means tubes inside the heater through which flue-gases flow from a combustion chamber located outside the tubes;
- "Heater" means apparatus including both heat generating means and means for transferring the generated heat to water or air.

3. All storage heaters are classified in group [F24H 7/00](#).

F24J**PRODUCING 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)

F25**REFRIGERATION OR COOLING; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT PUMP SYSTEMS; MANUFACTURE OR STORAGE OF ICE; LIQUEFACTION SOLIDIFICATION OF GASES****F25B****REFRIGERATION MACHINES, PLANTS OR SYSTEMS; COMBINED HEATING AND REFRIGERATION SYSTEMS; HEAT-PUMP SYSTEMS**

({evaporation or evaporation apparatus for physical or chemical purposes, e.g. evaporation of liquids for gas phase reactions [B01B 1/005](#)}; 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](#))

NOTES

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

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 9/04](#); purification of water by freezing [C02F 1/22](#); refrigeration machines, plants or systems [F25B](#); solidification of gases or gaseous mixtures [F25J](#); freeze drying [F26B](#))

NOTE

F25C

(continued)

Within the subclass, the term "ice" means any frozen liquid and is to be understood as also covering frozen semi-liquids or pasty substances.

F25D

REFRIGERATORS; COLD ROOMS; ICE-BOXES; COOLING OR FREEZING APPARATUS NOT COVERED BY ANY OTHER SUBCLASS (refrigerated show cases [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 and comparable apparatus without refrigeration [G12B](#); cooling of engines or pumps, see the relevant classes)

NOTES

1. 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.
2. Attention is drawn to Note (2) following the title of subclass [F24F](#).

F25J

LIQUEFACTION, SOLIDIFICATION OR SEPARATION OF GASES OR GASEOUS {OR LIQUEFIED GASEOUS} MIXTURES BY PRESSURE AND COLD TREATMENT {OR BY BRINGING THEM INTO THE SUPERCRITICAL STATE} (cryogenic pumps [F04B 37/08](#); 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](#))}

F26**DRYING**

F26B**DRYING SOLID MATERIALS OR OBJECTS BY REMOVING LIQUID THEREFROM**

(racks for drying fruit and vegetables [A01F 25/12](#); drying foodstuffs [A23](#); drying hair [A45D 20/00](#); body-drying implements [A47K 10/00](#); drying household articles [A47L](#), {e.g. drying footwear [A47L 23/20](#); } drying gases and vapours [B01D](#); chemical and physical processes for dewatering or like separating liquids from solids [B01D 43/00](#); centrifugal apparatus [B04](#); drying ceramics [C04B 33/30](#); drying yarns and fabrics in association with some other form of treatment [D06C](#); drying frames for laundry without heating or positive air circulation, domestic and like spin-dryers, wringing and hot pressing laundry [D06F](#); furnaces, kilns, ovens [F27](#); {treatment including a drying step of semiconductor substrates, e.g. wafers, [H01L 21/67028](#)})

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

F26B 11/06	covered by	F26B 11/0486
F26B 13/02	covered by	F26B 13/10
F26B 13/04	covered by	F26B 13/10
F26B 13/20	covered by	F26B 13/104
F26B 23/08	covered by	F26B 3/343 ,
F26B 3/347		

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 electroslog or arc remelting of metals [C22B 9/00](#); enamelling ovens [C23D](#); combustion apparatus [F23](#); electric heating [H05B](#))

NOTES

1. This class deals with furnaces, kilns, ovens, retorts, open sintering apparatus, and details or accessories therefor, in general. It includes the arrangement of electrical heating elements in or on furnaces, but not the elements themselves. It is not concerned with the processes carried on within the furnaces.
2. In this class, where appropriate, the term "furnaces" is to be understood as covering kilns, ovens, or retorts.

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

F27B

(continued)

Attention is drawn to the references and notes following the title of class [F27](#) and the note (par. III) following the Contents of Section H.

WARNING

The following IPC groups are not used in the CPC system. Subject matter covered by these groups is classified in the following CPC groups:

F27B 1/09	covered by	F27B 1/08
F27B 5/05	" "	F27B 5/04
F27B 14/16 , F27B 14/18	" "	F27B 14/0806
F27B 21/08 to F27B 21/14	" "	F27D

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 the Note III following the Contents of Section H.

F27M

INDEXING SCHEME RELATING TO ASPECTS OF THE CHARGES OR FURNACES, KILNS, OVENS OR RETORTS

NOTE

This subclass constitutes an internal scheme for indexing only.

F28

HEAT EXCHANGE IN GENERAL

NOTES

- Apparatus using heat exchange or heat transfer (as defined below) for specific purposes is classified either in subclass [F28B](#) or in the appropriate subclasses of, for example, classes [F22](#), [F24](#), [F25](#), [F26](#); if no such other subclass is appropriate, such apparatus is to be classified in [F28C](#) or [F28D](#).
- In this class the following terms 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.

F28B

STEAM OR VAPOUR CONDENSERS (condensation of vapours [B01D 5/00](#); steam engine plants having condensers [F01K](#); liquefaction of gases [F25J](#); details of heat-exchange and heat-transfer arrangements of general application [F28F](#))

- 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](#))
- 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)
- F28F** **DETAILS OF HEAT-EXCHANGE AND HEAT-TRANSFER APPARATUS, OF GENERAL APPLICATION** (water and air traps, air venting [F16](#))
- F28G** **CLEANING OF INTERNAL OR EXTERNAL SURFACES OF HEAT-EXCHANGE OR HEAT-TRANSFER CONDUITS, e.g. WATER TUBES OR 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 37/48](#); removal or treatment of combustion products or combustion residues [F23J](#); removing ice from heat-exchange apparatus [F28F 17/00](#))

WEAPONS; BLASTING

F41 WEAPONS

NOTES

1. This class covers also means for practice and training which may cover 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](#).
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;
 - "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

F41

(continued)

- smallarm. It may use combustible or explosive propellant charges, air pressure, electromagnetism or other propulsive forces;
- "revolver-type gun" means a gun having a revolving drum magazine, the chambers of which are used successively as firing chamber;
 - "revolver" means a revolver-type pistol;
 - "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 gun" means a gun which will continue firing so long as the initial firing pressure is maintained on the trigger;
 - "sighting" means bringing into visual coincidence a 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 mark.
3. Attention is drawn to the definitions of "projectile", "missile" and "rocket" given in Note 2 following the title of class [F42](#).

F41A**FUNCTIONAL FEATURES OR DETAILS COMMON TO BOTH SMALLARMS AND ORDNANCE, e.g. CANNONS; MOUNTINGS FOR SMALLARMS OR ORDNANCE****NOTES**

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.
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.
3. Attention is drawn to the definitions given in Note (2) following the title of class [F41](#).

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 [A63B 65/08](#); stationary apparatus for projecting sports balls, e.g. tennis balls, [A63B 69/40](#); throwing or slinging toys [A63H 33/18](#); knives, axes [B26B](#); projectiles or missiles other than those incorporating springs as projecting means [F42B 6/00](#))

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**

NOTE

Attention is drawn to the definitions in Note (2) following the title of class F 41.

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](#))

NOTE

This subclass does not cover the arrangement of armaments, adaptation of mountings therefor, or arrangements of ammunition handlers on ships or aircraft, if they present a shipbuilding or aircraft-building aspect, which are covered by subclass [B63G](#) or [B64D](#).

F41G **WEAPON SIGHTS; AIMING** ([optical aspects thereof G02B](#))

F41H **ARMOUR; ARMoured TURRETS; ARMoured OR ARMED VEHICLES; MEANS OF ATTACK OR DEFENCE, e.g. CAMOUFLAGE, IN GENERAL**

F41J **TARGETS; TARGET RANGES; BULLET CATCHERS** ([targets for shooting or hurling games A63F 9/0204](#))

F42 **AMMUNITION; BLASTING**

NOTES

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;
 - "percussion cap" means a primer which is struck to explode;
 - "igniter" effects the first spark-producing or heat-producing step but may not be explosive;
 - "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;
 - "detonator" or "detonator charge" means a charge used to amplify the explosion of the primer;
 - "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;
 - "ammunition" covers propulsive charge and projectile whether or not forming a single body, unless otherwise made clear;
 - "projectile", "missile" or "projectile or missile" means any body which is projected or propelled;

F42

(continued)

- "guided missile" means projectile or missile which is guided during at least part of its trajectory;
- "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;
- "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.

F42B**EXPLOSIVE CHARGES, e.g. FOR BLASTING, FIREWORKS, AMMUNITION** (explosive compositions [C06B](#); fuzes [F42C](#); blasting [F42D](#))**WARNING**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

[F42B 5/14](#) covered by [F42B 12/40](#), [A01K 11/00](#)

[F42B 19/10](#) " " [F41G 7/24](#)

F42C**AMMUNITION FUZES** (blasting cartridge initiators [F42B 3/10](#); chemical aspects [C06C](#)); **ARMING OR SAFETY MEANS THEREFOR** (filling fuzes [F42B 33/02](#); fitting or extracting primers in or from fuzes [F42B 33/04](#); containers for fuzes [F42B 39/30](#))**F42D****BLASTING** (fuses, e.g. fuse cords, [C06C 5/00](#); {for obtaining fluid from wells [E21B 43/00](#); for mining or quarrying [E21C 37/00](#); for making tunnels or galleries [E21D 9/006](#)} ; cartridges [F42B 3/00](#))