

# CPC COOPERATIVE PATENT CLASSIFICATION

## F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

### ENGINES OR PUMPS

#### F02 COMBUSTION ENGINES; HOT-GAS OR COMBUSTION-PRODUCT ENGINE PLANTS

#### 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](#).

##### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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| <p><b>1/00</b> Gas-turbine plants characterised by the use of hot gases or unheated pressurised gases, as the working fluid (by the use of combustion products <a href="#">F02C 3/00</a>, <a href="#">F02C 5/00</a>)</p> <p>1/002 . {using an auxiliary fluid}</p> <p>1/005 . . {being recirculated}</p> <p>1/007 . {combination of cycles}</p> <p>1/02 . the working fluid being an unheated pressurised gas</p> <p>1/04 . the working fluid being heated indirectly {(in a fluidised-bed combustor <a href="#">F02C 3/205</a>)}</p> <p>1/05 . . characterised by the type or source of heat, e.g. using nuclear or solar energy</p> <p>1/06 . . . using reheated exhaust gas (<a href="#">F02C 1/08</a> takes precedence)</p> <p>1/08 . . Semi-closed cycles</p> <p>1/10 . . Closed cycles</p> <p>1/105 . . . {construction; details}</p> <p><b>3/00</b> Gas-turbine plants characterised by the use of combustion products as the working fluid (generated by intermittent combustion <a href="#">F02C 5/00</a>)</p> <p>3/02 . using exhaust-gas pressure in a pressure exchanger to compress combustion-air (pressure exchangers per se <a href="#">F04F 13/00</a>)</p> | <p>3/04 . having a turbine driving a compressor (power transmission arrangements <a href="#">F02C 7/36</a>; control of working fluid flow <a href="#">F02C 9/16</a>)</p> <p>3/045 . . having compressor and turbine passages in a single rotor-module (<a href="#">F02C 3/073</a> takes precedence)</p> <p>3/05 . . . the compressor and the turbine being of the radial flow type</p> <p>3/055 . . the compressor being of the positive-displacement type</p> <p>3/06 . . the compressor comprising only axial stages (<a href="#">F02C 3/10</a> takes precedence)</p> <p>3/062 . . . {the turbine being of the radial-flow type}</p> <p>3/064 . . . {the compressor having concentric stages}</p> <p>3/067 . . . having counter-rotating rotors (<a href="#">F02C 3/073</a> takes precedence)</p> <p>3/073 . . . the compressor and turbine stages being concentric</p> <p>3/08 . . the compressor comprising at least one radial stage (<a href="#">F02C 3/10</a> takes precedence)</p> <p>3/085 . . . {the turbine being of the radial-flow type (radial-radial) (<a href="#">F02C 3/05</a> takes precedence)}</p> <p>3/09 . . . of the centripetal type</p> <p>3/10 . . with another turbine driving an output shaft but not driving the compressor</p> |
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- 3/103 . . . {the compressor being of the centrifugal type}
- 3/107 . . with two or more rotors connected by power transmission
- 3/113 . . . with variable power transmission between rotors
- 3/13 . . having variable working fluid interconnections between turbines or compressors or stages of different rotors {(controlling flow ratio between different flows of multi-flow jet-propulsion plant, e.g. ducted fan F02K 3/075)}
- 3/14 . characterised by the arrangement of the combustion chamber in the plant (combustion chambers per se F23R; F02C 3/205 takes precedence)
- 3/145 . . {the combustion chamber being in the reverse flow-type}
- 3/16 . . the combustion chambers being formed at least partly in the turbine rotor {or in an other rotating part of the plant}
- 3/165 . . . {the combustion chamber contributes to the driving force by creating reactive thrust}
- 3/20 . using a special fuel, oxidant, or dilution fluid to generate the combustion products
- 3/205 . . {in a fluidised-bed combustor (in combination with a steam cycle see F01K 23/061; fluidised-bed apparatus in general B01J 8/18; fluidised-bed combustors in general F23C 10/00)}
- 3/22 . . the fuel or oxidant being gaseous at standard temperature and pressure (F02C 3/28 takes precedence)
- 3/24 . . the fuel or oxidant being liquid at standard temperature and pressure
- 3/26 . . the fuel or oxidant being solid or pulverulent, e.g. in slurry or suspension
- 3/28 . . . using a separate gas producer for gasifying the fuel before combustion
- 3/30 . . Adding water, steam or other fluids {for influencing combustion, e.g. to obtain cleaner exhaust gases (F02C 7/141, F02C 7/30, F01D 21/00, F01K 21/04, F23D 11/10 take precedence)}
- 3/305 . . . {Increasing the power, speed, torque or efficiency of a gas turbine or the thrust of a turbojet engine by injecting or adding water, steam or other fluids (F01K 21/04 takes precedence)}
- 3/32 . Inducing air flow by fluid jet, e.g. ejector action
- 3/34 . with recycling of part of the working fluid, i.e. semi-closed cycles with combustion products in the closed part of the cycle
- 3/36 . Open cycles
- 3/365 . . {a part of the compressed air being burned, the other part being heated indirectly (in a fluidised-bed combustor F02C 3/205)}
- 5/00 Gas-turbine plants characterised by the working fluid being generated by intermittent combustion**
- 5/02 . characterised by the arrangement of the combustion chamber in the chamber in the plant (combustion chambers per se F23R)
- 5/04 . . the combustion chambers being formed at least partly in the turbine rotor
- 5/06 . the working fluid being generated in an internal-combustion gas generated of the positive-displacement type having essentially no mechanical power output (internal-combustion engines with prolonged expansion using exhaust gas turbines F02B)
- 5/08 . . the gas generator being of the free-piston type
- 5/10 . the working fluid forming a resonating or oscillating gas column, i.e. the combustion chambers having no positively actuated valves, e.g. using Helmholtz effect
- 5/11 . . using valveless combustion chambers
- 5/12 . the combustion chambers having inlet or outlet valves, e.g. Holzwarth gas-turbine plants
- 6/00 Plural gas-turbine plants; Combinations of gas-turbine plants with other apparatus (aspects predominantly concerning such apparatus, see the relevant classes for the apparatus); Adaptations of gas-turbine plants for special use**
- 6/003 . {Gas-turbine plants with heaters between turbine stages}
- 6/006 . {Open cycle gas-turbine in which the working fluid is expanded to a pressure below the atmospheric pressure and then compressed to atmospheric pressure}
- 6/02 . Plural gas-turbine plants having a common power output
- 6/04 . Gas-turbine plants providing heated or pressurised working fluid for other apparatus, e.g. without mechanical power output (F02C 6/18 takes precedence ; for a fluidised-bed combustor F02C 3/205)}
- 6/06 . . providing compressed gas (F02C 6/10 takes precedence)
- 6/08 . . . the gas being bled from the gas-turbine compressor
- 6/10 . . supplying working fluid to a user, e.g. a chemical process, which returns working fluid to a turbine of the plant
- 6/12 . . . Turbochargers, i.e. plants for augmenting mechanical power output of internal-combustion piston engines by increase of charge pressure
- 6/14 . Gas-turbine plants having means for storing energy, e.g. for meeting peak loads
- 6/16 . . for storing compressed air
- 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; using the waste heat of a gasturbine for steam generation or in a steam cycle see F01K 23/10)
- 6/20 . Adaptations of gas-turbine plants for driving vehicles
- 6/203 . . {the vehicles being waterborne vessels}
- 6/206 . . {the vehicles being airscrew driven}
- 7/00 Features, components parts, details or accessories, not provided for in, or of interest apart from groups F02C 1/00 - F02C 6/00; Air intakes for jet-propulsion plants (controlling F02C 9/00)**
- 7/04 . Air intakes for gas-turbine plants or jet-propulsion plants
- 7/042 . . having variable geometry
- 7/045 . . having provisions for noise suppression

- 7/047 . . Heating to prevent icing
- 7/05 . . having provisions for obviating the penetration of damaging objects or particles
- 7/052 . . . with dust-separation devices
- 7/055 . . . with intake grids, screens or guards
- 7/057 . . Control or regulation ([conjointly with fuel supply control F02C 9/50](#), with nozzle area control [F02K 1/16](#))
- 7/06 . Arrangements of bearings ([bearings F16C](#)); Lubricating ([of turbo machines F01D 25/18](#); [of machines or engines in general F01M](#))
- 7/08 . Heating air supply before combustion, e.g. by exhaust gases
- 7/10 . . by means of regenerative heat-exchangers
- 7/105 . . . of the rotary type ([rotary heat exchangers per se F28D](#))
- 7/12 . Cooling of plants ([of component parts, see the relevant subclasses, e.g. F01D](#); [cooling of engines in general F01P](#))
- 7/125 . . {[by partial arc admission of the working fluid or by intermittent admission of working and cooling fluid](#)}
- 7/14 . . of fluids in the plant {, e.g. [lubricant or fuel \(F02C 7/185 takes precedence\)](#)}
- 7/141 . . . of working fluid
- 7/143 . . . . before or between the compressor stages
- 7/1435 . . . . {[by water injection](#)}
- 7/16 . . characterised by cooling medium
- 7/18 . . . the medium being gaseous, e.g. air {[\(F02C 7/125 takes precedence\)](#)}
- 7/185 . . . . {[Cooling means for reducing the temperature of the cooling air or gas](#)}
- 7/20 . Mounting or supporting of plant; Accommodating heat expansion or creep
- 7/22 . Fuel supply systems
- 7/222 . . {[Fuel flow conduits, e.g. manifolds](#)}
- 7/224 . . Heating fuel before feeding to the burner
- 7/228 . . Dividing fuel between various burners
- 7/232 . . Fuel valves {[\(control of fuel supply by means of fuel metering valves F02C 9/263\)](#)}; [Draining valves or systems \(valves in general F16K\)](#)
- 7/236 . . Fuel delivery systems comprising two or more pumps
- 7/2365 . . . {[comprising an air supply system for the atomisation of fuel](#)}
- 7/24 . Heat or noise insulation ([air intakes having provisions for noise suppression F02C 7/045](#); [turbine exhaust heads, chambers, or the like F01D 25/30](#); [silencing nozzles of jet-propulsion plants F02K 1/00](#))
- 7/25 . . Fire protection or prevention ([in general A62](#))
- 7/26 . Starting; Ignition
- 7/262 . . Restarting after flame-out
- 7/264 . . Ignition
- 7/266 . . . Electric ([sparking plugs H01T](#))
- 7/268 . . Starting drives for the rotor {, [acting directly on the rotor of the gas turbine to be started](#)}
- 7/27 . . . Fluid drives ([turbine starters F02C 7/277](#))
- 7/272 . . . . generated by cartridges
- 7/275 . . . Mechanical drives
- 7/277 . . . . the starter being a {[separate](#)} turbine
- 7/28 . Arrangement of seals
- 7/30 . Preventing corrosion {[or unwanted deposits](#)} in gas-swept spaces
- 7/32 . Arrangement, mounting, or driving, of auxiliaries
- 7/36 . Power transmission arrangements between the different shafts of the gas turbine plant, or between the gas-turbine plant and the power user ([{F02C 3/107 - F02C 3/13 and} F02C 7/32 take precedence](#); [couplings for transmitting rotation F16D](#); [gearing in general F16H](#))
- 9/00 **Controlling gas-turbine plants; Controlling fuel supply in air- breathing jet-propulsion plants** ([controlling air intakes F02C 7/057](#); [controlling turbines F01D](#); [controlling compressors F04D 27/00](#); [controlling in general G05](#))
- 9/16 . Control of working fluid flow ([F02C 9/48 takes precedence](#); [control of air-intake flow F02C 7/057](#))
- 9/18 . . by bleeding, bypassing or acting on variable working fluid interconnections between turbines or compressors or their stages {[\(F02C 3/113 takes precedence\)](#)}
- 9/20 . . by throttling; by adjusting vanes
- 9/22 . . . by adjusting turbine vanes
- 9/24 . . Control of the pressure level in closed cycles
- 9/26 . Control of fuel supply ([F02C 9/48 takes precedence](#); [fuel valves F02C 7/232](#))
- 9/263 . . {[by means of fuel metering valves](#)}
- 9/266 . . {[specially adapted for gas turbines with intermittent fuel injection](#)}
- 9/28 . . Regulating systems responsive to plant or ambient parameters, e.g. temperature, pressure, rotor speed ([F02C 9/30 - F02C 9/38, F02C 9/44 take precedence](#))
- 9/285 . . . {[Mechanical command devices linked to the throttle lever](#)}
- 9/30 . . characterised by variable fuel pump output
- 9/32 . . characterised by throttling of fuel ([F02C 9/38 takes precedence](#))
- 9/34 . . . Joint control of separate flows to main and auxiliary burners
- 9/36 . . characterised by returning of fuel to sump ([F02C 9/38 takes precedence](#))
- 9/38 . . characterised by throttling and returning of fuel to sump
- 9/40 . . specially adapted to the use of a special fuel or a plurality of fuels
- 9/42 . . specially adapted for the control of two or more plants simultaneously
- 9/44 . . responsive to the speed of aircraft, e.g. Mach number control, optimisation of fuel consumption
- 9/46 . . Emergency fuel control
- 9/48 . Control of fuel supply conjointly with another control of the plant ([with nozzle section control F02K 1/17](#))
- 9/50 . . with control of working fluid flow
- 9/52 . . . by bleeding or by-passing the working fluid
- 9/54 . . . by throttling the working fluid, by adjusting vanes
- 9/56 . . with power transmission control
- 9/58 . . . with control of a variable-pitch propeller