# CPC COOPERATIVE PATENT CLASSIFICATION

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

## LIGHTING; HEATING

## F23 COMBUSTION APPARATUS; COMBUSTION PROCESSES
*(NOTE omitted)*

## F23N REGULATING OR CONTROLLING COMBUSTION (control devices specially adapted for combustion apparatus in which combustion takes place in a fluidised bed of fuel or other particles F23C 10/28; condition responsive controls for regulating combustion in domestic stoves with open fires for solid fuel F24B 1/187)

**1/00** **Regulating fuel supply**
1/002 . {using electronic means (F23N 1/04 - F23N 1/10 take precedence)}
1/005 . {using electrical or electromechanical means (F23N 1/04 - F23N 1/10 take precedence)}
1/007 . {using mechanical means (F23N 1/04 - F23N 1/10 take precedence)}
1/02 . conjointly with air supply
1/022 . . {using electronic means}
1/025 . . {using electrical or electromechanical means}
1/027 . . {using mechanical means}
1/04 . conjointly with air supply and with draught
1/042 . . {using electronic means}
1/045 . . {using electrical or electromechanical means}
1/047 . . {using mechanical means}
1/06 . conjointly with draught
1/062 . . {using electronic means}
1/065 . . {using electrical or electromechanical means}
1/067 . . {using mechanical means}
1/08 . conjointly with another medium, e.g. boiler water
1/082 . . {using electronic means}
1/085 . . {using electrical or electromechanical means}
1/087 . . {using mechanical means}
1/10 . . and with air supply or draught
1/102 . . . {using electronic means}
1/105 . . . {using electrical or electromechanical means}
1/107 . . . {using mechanical means}

**3/00** **Regulating air supply or draught** (conjointly with fuel supply F23N 1/00)
3/002 . {using electronic means (F23N 3/02 - F23N 3/08 take precedence)}
3/005 . {using electrical or electromechanical means (F23N 3/02 - F23N 3/08 take precedence)}
3/007 . {using mechanical means (F23N 3/02 - F23N 3/08 take precedence)}
3/02 . Regulating draught by direct pressure operation of single valves or dampers
3/04 . by operation of single valves or dampers by temperature sensitive elements
3/042 . . {using electronic means}
3/045 . . {using electrical or electromechanical means}
3/047 . . {using mechanical means}
3/06 . by conjoint operation of two or more valves or dampers (by power-assisted systems F23N 3/08)
3/065 . . {using mechanical means}
3/08 . by power-assisted systems
3/082 . . {using electronic means}
3/085 . . {using electrical or electromechanical means}
3/087 . . {using mechanical means}

**5/00** **Systems for controlling combustion** (regulating fuel supply F23N 1/00, regulating air supply or draught F23N 3/00)
5/003 . {using detectors sensitive to combustion gas properties (F23N 5/02, F23N 5/18 - F23N 5/26 take precedence)}
5/006 . . {the detector being sensitive to oxygen}
5/02 . using devices responsive to thermal changes or to thermal expansion of a medium
5/022 . . {using electronic means (F23N 5/04 - F23N 5/14 take precedence)}
5/025 . . {using electrical or electromechanical means (F23N 5/04 - F23N 5/14 take precedence)}
5/027 . . {using mechanical means (F23N 5/04 - F23N 5/14 take precedence)}
5/04 . . using bimetallic elements
5/042 . . . {using electronic means}
5/045 . . . {using electrical or electromechanical means}
5/047 . . . {using mechanical means}
5/06 . . using bellows; using diaphragms
5/062 . . . {using electronic means}
5/065 . . . {using electrical or electromechanical means}
5/067 . . . {using mechanical means}
5/08 . . using light-sensitive elements
5/082 . . . {using electronic means}
5/085 . . . {using electrical or electromechanical means}
5/087 . . . {using mechanical means}
5/10 . . using thermocouples
5/102 . . . {using electronic means}
5/105 . . . {using electrical or electromechanical means}
5/107 . . . {using mechanical means, e.g. safety valves}
5/12 . . using ionisation-sensitive elements, i.e. flame rods
5/123 . . . {using electronic means}
5/126 . . . {using electrical or electromechanical means}
5/14 . . using thermo-sensitive resistors

5/143 . . . {using electronic means}
5/146 . . . {using electrical or electromechanical means}
5/16 . using noise-sensitive detectors
2005/165 . . {with ultrasonic means}
5/18 . using detectors sensitive to rate of flow of air or fuel
2005/181 . . {using detectors sensitive to rate of flow of air}
2005/182 . . . {Air flow switch}
5/184 . . {using electronic means}
2005/185 . . {using detectors sensitive to rate of flow of fuel}
5/187 . . {using electrical or electromechanical means}
5/188 . . {using mechanical means}
5/20 . with a time programme acting through electrical means, e.g. using time-delay relays
5/203 . . {using electronic means}
5/206 . . {using electrical or electromechanical means}
5/22 . with a time programme acting through mechanical means, e.g. using cams
5/24 . Preventing development of abnormal or undesired conditions, i.e. safety arrangements (F23N 5/02 - F23N 5/18 take precedence)
5/242 . . {using electronic means}
5/245 . . {using electrical or electromechanical means}
5/247 . . {using mechanical means}
5/26 . Details
5/265 . . {using electronic means}

**2221/00 Pretreatment or prehandling**
2221/02 . using belt conveyors
2221/04 . Preheating liquid fuel
2221/06 . Preheating gaseous fuel
2221/08 . Preheating the air
2221/10 . Analysing fuel properties, e.g. density, calorific
2221/12 . Recycling exhaust gases

**2223/00 Signal processing; Details thereof**
2223/02 . Multiplex transmission
2223/04 . Memory
2223/06 . Sampling
2223/08 . Microprocessor; Microcomputer
2223/10 . Correlation
2223/12 . Integration
2223/14 . Differentiation
2223/16 . Measuring bridge
2223/18 . Chopper
2223/20 . Opto-coupler
2223/22 . Timing network
2223/24 . . with bimetallic elements
2223/26 . . with capacitors
2223/28 . . with more than one timing element
2223/30 . Switches
2223/32 . . Reed switches
2223/34 . with feedforward processing
2223/36 . PID signal processing
2223/38 . Remote control
2223/40 . Simulation
2223/42 . Function generator
2223/44 . Optimum control
2223/46 . Identification
2223/48 . Learning / Adaptive control
2223/50 . Human control
2223/52 . Fuzzy logic
2223/54 . Recording

**2225/00 Measuring**
2225/02 . filling height in burners
2225/04 . pressure
2225/06 . . for determining flow
2225/08 . temperature
2225/10 . . stack temperature
2225/12 . . room temperature
2225/13 . . outdoor temperature
2225/14 . . Ambient temperature around burners
2225/16 . . burner temperature
2225/18 . . feedwater temperature
2225/19 . . outlet temperature water heat-exchanger
2225/20 . . entrant temperature
2225/21 . . outlet temperature
2225/22 . heat losses
2225/24 . . indicated in an amount of money
2225/26 . humidity
2225/30 . . measuring lambda

**2227/00 Ignition or checking**
2227/02 . Starting or ignition cycles
2227/04 . Prepurge
2227/06 . Postpurge
2227/08 . Hold fire apparatus
2227/10 . Sequential burner running
2227/12 . Burner simulation or checking
2227/14 . . Flame simulation
2227/16 . . Checking components, e.g. electronic
2227/18 . Applying test signals, e.g. periodic
2227/20 . Calibrating devices
2227/22 . Pilot burners
2227/24 . . the pilot burner not burning continuously
2227/26 . . comprising two or more distinct pilot burners
2227/28 . Ignition circuits
2227/30 . . for pilot burners
2227/32 . Igniting for a predetermined number of cycles
2227/34 . Continuously applied ignition cycles
2227/36 . Spark ignition, e.g. by means of a high voltage
2227/38 . Electrical resistance ignition
2227/40 . Catalytic ignition
2227/42 . Ceramic glow ignition

**2229/00 Flame sensors**
2229/02 . Pilot flame sensors
2229/04 . sensitive to the colour of flames
2229/06 . with periodical shutters; Modulation signals
2229/08 . detecting flame flicker
2229/10 . comprising application of periodical fuel flow fluctuations
2229/12 . with flame rectification current detecting means
2229/14 . using two or more different types of flame sensor
2229/16 . using two or more of the same types of flame sensor
2229/18 . Flame sensor cooling means
2229/20 . Camera viewing
2229/22 . the sensor's sensitivity being variable

**2231/00 Fail safe**
2231/02 . using electric energy accumulators
2231/04 . for electrical power failures
2231/06 . for flame failures
2231/08 . . for pilot flame failures
2231/10 . for component failures
2231/12 . for ignition failures

2231/14 . for earthquakes
2231/16 . using melting materials or shape memory alloys
2231/18 . Detecting fluid leaks
2231/20 . Warning devices
2231/22 . . using warning lamps
2231/24 . Freezing
2231/26 . for clogging air inlet
2231/28 . preventing flash-back or blow-back
2231/30 . Representation of working time

**2233/00 Ventilators**
2233/02 . in stacks
2233/04 . . with variable speed
2233/06 . at the air intake
2233/08 . . with variable speed
2233/10 . forcing air through heat exchangers

**2235/00 Valves, nozzles or pumps**
2235/02 . Air or combustion gas valves or dampers
2235/04 . . in stacks
2235/06 . . at the air intake
2235/08 . . used with heat exchanges
2235/10 . . power assisted, e.g. using electric motors
2235/12 . Fuel valves
2235/14 . . electromagnetically operated
2235/16 . . variable flow or proportional valves
2235/18 . . Groups of two or more valves
2235/20 . . Membrane valves
2235/22 . . cooperating with magnets
2235/24 . . Valve details
2235/26 . Fuel nozzles
2235/28 . . Spray fuel nozzles
2235/30 . Pumps

**2237/00 Controlling**
2237/02 . two or more burners
2237/04 . at two or more different localities
2237/06 . two predeterming temperatures, e.g. day-night
2237/08 . two or more different types of fuel simultaneously
2237/10 . High or low fire
2237/12 . catalytic burners
2237/14 . burners with gasification or vaporizer elements
2237/16 . secondary air
2237/18 . fluidized bed burners
2237/20 . one or more bypass conduits
2237/22 . water injection
2237/24 . height of burner
2237/26 . . oxygen-air ratio
2237/28 . . oxygen as pure oxydant
2237/30 . . matrix burners
2237/32 . . Nox

**2239/00 Fuels**
2239/02 . Solid fuels
2239/04 . Gaseous fuels
2239/06 . Liquid fuels

**2241/00 Applications**
2241/02 . Space-heating
2241/04 . Heating water
2241/06 . Space-heating and heating water
2241/08 . Household apparatus
2241/10 . Generating vapour
2241/11 . Torches
2241/12 . Stack-torches
2241/14 . Vehicle heating, the heat being derived otherwise than from the propulsion plant
2241/16 . Spectrometer burners
2241/18 . Incinerating apparatus
2241/20 . Gas turbines
2241/22 . Absorption refrigerator

**2900/00 Special features of, or arrangements for controlling combustion**
2900/01001 . Micro Electro Mechanical Systems [MEMS] for controlling fuel supply to burners
2900/01002 . Electromagnetically operated fuel valves with a single solenoid controlling two or more cores
2900/05001 . Measuring CO content in flue gas
2900/05002 . Measuring $CO_2$ content in flue gas
2900/05003 . Measuring NOx content in flue gas
2900/05004 . Details of components, e.g. connecting adaptors
2900/05005 . Mounting arrangements for sensing, detecting or measuring devices
2900/05006 . Controlling systems using neuronal networks
2900/05101 . Connections between thermocouple and magnetic valves, e.g. by plug and socket connectors
2900/05181 . Controlling air to fuel ratio by using a single differential pressure detector