

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](#))

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|-------------|--|-------------|---|
| 1/00 | Regulating fuel supply | 3/06 | • by conjoint operation of two or more valves or dampers (by power-assisted systems F23N 3/08) |
| 1/002 | • {using electronic means (F23N 1/04 - F23N 1/10 take precedence)} | 3/065 | • • {using mechanical means} |
| 1/005 | • {using electrical or electromechanical means (F23N 1/04 - F23N 1/10 take precedence)} | 3/08 | • by power-assisted systems |
| 1/007 | • {using mechanical means (F23N 1/04 - F23N 1/10 take precedence)} | 3/082 | • • {using electronic means} |
| 1/02 | • conjointly with air supply | 3/085 | • • {using electrical or electromechanical means} |
| 1/022 | • • {using electronic means} | 3/087 | • • {using mechanical means} |
| 1/025 | • • {using electrical or electromechanical means} | 5/00 | Systems for controlling combustion (regulating fuel supply F23N 1/00, regulating air supply or draught F23N 3/00) |
| 1/027 | • • {using mechanical means} | 5/003 | • {using detectors sensitive to combustion gas properties (F23N 5/02 , F23N 5/18 - F23N 5/26 take precedence)} |
| 1/04 | • conjointly with air supply and with draught | 5/006 | • • {the detector being sensitive to oxygen} |
| 1/042 | • • {using electronic means} | 5/02 | • using devices responsive to thermal changes or to thermal expansion of a medium |
| 1/045 | • • {using electrical or electromechanical means} | 5/022 | • • {using electronic means (F23N 5/04 - F23N 5/14 take precedence)} |
| 1/047 | • • {using mechanical means} | 5/025 | • • {using electrical or electromechanical means (F23N 5/04 - F23N 5/14 take precedence)} |
| 1/06 | • conjointly with draught | 5/027 | • • {using mechanical means (F23N 5/04 - F23N 5/14 take precedence)} |
| 1/062 | • • {using electronic means} | 5/04 | • • using bimetallic elements |
| 1/065 | • • {using electrical or electromechanical means} | 5/042 | • • • {using electronic means} |
| 1/067 | • • {using mechanical means} | 5/045 | • • • {using electrical or electromechanical means} |
| 1/08 | • conjointly with another medium, e.g. boiler water | 5/047 | • • • {using mechanical means} |
| 1/082 | • • {using electronic means} | 5/06 | • • using bellows; using diaphragms |
| 1/085 | • • {using electrical or electromechanical means} | 5/062 | • • • {using electronic means} |
| 1/087 | • • {using mechanical means} | 5/065 | • • • {using electrical or electromechanical means} |
| 1/10 | • • and with air supply or draught | 5/067 | • • • {using mechanical means} |
| 1/102 | • • • {using electronic means} | 5/08 | • • using light-sensitive elements |
| 1/105 | • • • {using electrical or electromechanical means} | 5/082 | • • • {using electronic means} |
| 1/107 | • • • {using mechanical means} | 5/085 | • • • {using electrical or electromechanical means} |
| 3/00 | Regulating air supply or draught (conjointly with fuel supply F23N 1/00) | 5/087 | • • • {using mechanical means} |
| 3/002 | • {using electronic means (F23N 3/02 - F23N 3/08 take precedence)} | 5/10 | • • using thermocouples |
| 3/005 | • {using electrical or electromechanical means (F23N 3/02 - F23N 3/08 take precedence)} | 5/102 | • • • {using electronic means} |
| 3/007 | • {using mechanical means (F23N 3/02 - F23N 3/08 take precedence)} | 5/105 | • • • {using electrical or electromechanical means} |
| 3/02 | • Regulating draught by direct pressure operation of single valves or dampers | 5/107 | • • • {using mechanical means, e.g. safety valves} |
| 3/04 | • by operation of single valves or dampers by temperature sensitive elements | 5/12 | • • using ionisation-sensitive elements, i.e. flame rods |
| 3/042 | • • {using electronic means} | 5/123 | • • • {using electronic means} |
| 3/045 | • • {using electrical or electromechanical means} | 5/126 | • • • {using electrical or electromechanical means} |
| 3/047 | • • {using mechanical 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 predetermining 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 CO₂ content in flue gas
- 2900/05003 . Measuring NO_x 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