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 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)

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.

1/00  Regulating fuel supply

  1/02 . . . [using electronic means (F23N 1/04 - F23N 1/10 take precedence)]
  1/05 . . . [using electrical or electromechanical means (F23N 1/04 - F23N 1/10 take precedence)]
  1/07 . . . [using mechanical means (F23N 1/04 - F23N 1/10 take precedence)]
  1/02 . . . conjointly with air supply
  1/02 . . . [using electronic means]
  1/05 . . . [using electrical or electromechanical means]
  1/07 . . . [using mechanical means]
  1/04 . . . conjointly with air supply and with draught
  1/02 . . . [using electronic means]
  1/04 . . . [using electrical or electromechanical means]
  1/07 . . . [using mechanical means]
  1/06 . . . conjointly with draught
  1/02 . . . [using electronic means]
  1/05 . . . [using electrical or electromechanical means]
  1/07 . . . [using mechanical means]
  1/08 . . . conjointly with another medium, e.g. boiler water
  1/02 . . . [using electronic means]
  1/05 . . . [using electrical or electromechanical means]
  1/07 . . . [using mechanical means]
  1/10 . . . and with air supply or draught
  1/02 . . . [using electronic means]
  1/05 . . . [using electrical or electromechanical means]
  1/07 . . . [using mechanical means]

3/00  Regulating air supply or draught (conjointly with fuel supply F23N 1/00)

  3/02 . . . [using electronic means (F23N 3/02 - F23N 3/08 take precedence)]
  3/05 . . . [using electrical or electromechanical means (F23N 3/02 - F23N 3/08 take precedence)]
  3/07 . . . [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]
5/12 . . . using ionisation-sensitive elements, i.e. flame rods (testing of other ignition means, e.g. flame F02P 17/12; analysing gases by investigating the ionisation by using heat G01N 27/626)
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 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]

2021/00 Pretreatment or prehandling
2021/02 . . . using belt conveyors
2021/04 . . . Preheating liquid fuel
2021/06 . . . Preheating gaseous fuel
2021/08 . . . Preheating the air
2021/10 . . . Analysing fuel properties, e.g. density, calorific
2021/12 . . . Recycling exhaust gases

2023/00 Signal processing; Details thereof
2023/02 . . . Multiplex transmission
2023/04 . . . Memory
2023/06 . . . Sampling
2023/08 . . . Microprocessor; Microcomputer
2023/10 . . . Correlation
2023/12 . . . Integration
2023/14 . . . Differentiation
2023/16 . . . Measuring bridge
2023/18 . . . Chopper
2023/20 . . . Opto-coupler
2023/22 . . . Timing network
2023/24 . . . with bimetallic elements
2023/26 . . . with capacitors
2023/28 . . . with more than one timing element
2023/30 . . . Switches
2023/32 . . . Reed switches
2023/34 . . . with feedforward processing
2023/36 . . . PID signal processing
2023/38 . . . Remote control
2023/40 . . . Simulation
2023/42 . . . Function generator

2025/00 Measuring
2025/02 . . . filling height in burners
2025/04 . . . pressure
2025/06 . . . for determining flow
2025/08 . . . temperature
2025/10 . . . stack temperature
2025/12 . . . room temperature
2025/13 . . . outdoor temperature
2025/14 . . . Ambient temperature around burners
2025/16 . . . burner temperature
2025/18 . . . feedwater temperature
2025/19 . . . outlet temperature water heat-exchanger
2025/20 . . . entrant temperature
2025/21 . . . outlet temperature
2025/22 . . . heat losses
2025/24 . . . indicated in an amount of money
2025/26 . . . humidity
2025/30 . . . measuring lambda

2027/00 Ignition or checking
2027/02 . . . Starting or ignition cycles
2027/04 . . . Prepurge
2027/06 . . . Postpurge
2027/08 . . . Hold fire apparatus
2027/10 . . . Sequential burner running
2027/12 . . . Burner simulation or checking
2027/14 . . . Flame simulation
2027/16 . . . Checking components, e.g. electronic
2027/18 . . . Applying test signals, e.g. periodic
2027/20 . . . Calibrating devices
2027/22 . . . Pilot burners (ignition circuits therefor F23N 2027/32)
2027/24 . . . the pilot burner not burning continuously
2027/26 . . . comprising two or more distinct pilot burners
2027/28 . . . Ignition circuits
2027/30 . . . for pilot burners
2027/32 . . . Igniting for a predetermined number of cycles
2027/34 . . . Continuously applied ignition cycles
2027/36 . . . Spark ignition, e.g. by means of a high voltage
2027/38 . . . Electrical resistance ignition
2027/40 . . . Catalytic ignition
2027/42 . . . Ceramic glow ignition

2029/00 Flame sensors
2029/02 . . . Pilot flame sensors
2029/04 . . . sensitive to the colour of flames
2029/06 . . . with periodical shutters; Modulation signals
2029/08 . . . detecting flame flicker
2029/10 . . . comprising application of periodical fuel flow fluctuations
2029/12 . . . with flame rectification current detecting means
2029/14 . . . using two or more different types of flame sensor
2029/16 . . . using two or more of the same types of flame sensor
2029/18 . . . Flame sensor cooling means
2029/20 . . . Camera viewing
the sensor’s sensitivity being variable

**Fail safe**

- using electric energy accumulators
- for electrical power failures
- for flame failures
- for pilot flame failures
- for component failures
- for ignition failures
- for earthquakes
- for melting materials or shape memory alloys
- for fluid leaks
- Warning devices
- for clogging air inlet
- preventing flash-back or blow-back

**Ventilators**

- in stacks
- with variable speed
- at the air intake
- with variable speed
- forcing air through heat exchangers

**Valves, nozzles or pumps**

- Air or combustion gas valves or dampers
- in stacks
- at the air intake
- used with heat exchanges
- power assisted, e.g. using electric motors
- Fuel valves
- electromagnetically operated
- variable flow or proportional valves
- Groups of two or more valves
- Membrane valves
- cooperating with magnets
- Valve details
- Fuel nozzles
- Spray fuel nozzles
- Pumps

**Controlling** *(F23N 5/00 takes precedence)*

- two or more burners
- at two or more different localities
- predetermining temperatures, e.g. day-night
- two or more different types of fuel simultaneously
- High or low fire
- catalytic burners
- burners with gasification or vaporizer elements
- secondary air
- fluidized bed burners
- one or more bypass conduits
- water injection
- height of burner
- oxygen-air ratio
- oxygen as pure oxidant
- matrix burners
- Nox

**Fuels**

- Solid fuels
- Gaseous fuels
- Liquid fuels

**Applications**

- Space-heating
- Heating water
- Space-heating and heating water
- Household apparatus
- Generating vapour
- Torches
- Stack-torches
- Vehicle heating, the heat being derived otherwise than from the propulsion plant
- Spectrometer burners
- Incinerating apparatus
- Gas turbines
- Absorption refrigerator

**Special features of, or arrangements for controlling combustion**

- Micro Electro Mechanical Systems [MEMS] for controlling fuel supply to burners
- Electromagnetically operated fuel valves with a single solenoid controlling two or more cores
- Measuring CO content in flue gas
- Measuring CO₂ content in flue gas
- Measuring NOx content in flue gas
- Details of components, e.g. connecting adaptors
- Mounting arrangements for sensing, detecting or measuring devices
- Controlling systems using neuronal networks
- Connections between thermocouple and magnetic valves, e.g. by plug and socket connectors
- Controlling air to fuel ratio by using a single differential pressure detector