

**CPC****COOPERATIVE PATENT CLASSIFICATION****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](#))

**F23N 1/00****Regulating fuel supply**

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

**F23N 3/00****Regulating air supply or draught** ( conjointly with fuel supply [F23N 1/00](#))

- F23N 3/002 . { using electronic means ([F23N 3/02](#) to [F23N 3/08](#) take precedence )}

- F23N 3/005 . { using electrical or electromechanical means ([F23N 3/02](#) to [F23N 3/08](#) take precedence )}
- F23N 3/007 . { using mechanical means ([F23N 3/02](#) to [F23N 3/08](#) take precedence )}
- F23N 3/02 . Regulating draught by direct pressure operation of single valves or dampers
- F23N 3/04 . by operation of single valves or dampers by temperature sensitive elements
- F23N 3/042 .. { using electronic means }
- F23N 3/045 .. { using electrical or electromechanical means }
- F23N 3/047 .. { using mechanical means }
- F23N 3/06 . by conjoint operation of two or more valves or dampers ([F23N 3/08](#) takes precedence )
- F23N 3/065 .. { using mechanical means }
- F23N 3/08 . by power-assisted systems
- F23N 3/082 .. { using electronic means }
- F23N 3/085 .. { using electrical or electromechanical means }
- F23N 3/087 .. { using mechanical means }
- F23N 5/00** **Systems for controlling combustion** ([F23N 1/00](#) , [F23N 3/00](#) take precedence )
- F23N 5/003 . { using detectors sensitive to combustion gas properties ([F23N 5/02](#) , [F23N 5/18](#) to [F23N 5/26](#) take precedence )}
- F23N 5/006 .. { the detector being sensitive to oxygen }
- F23N 5/02 . using devices responsive to thermal changes or to thermal expansion of a medium
- F23N 5/022 .. { using electronic means ([F23N 5/04](#) to [F23N 5/14](#) take precedence )}
- F23N 5/025 .. { using electrical or electromechanical means ([F23N 5/04](#) to [F23N 5/14](#) take precedence )}
- F23N 5/027 .. { using mechanical means ([F23N 5/04](#) to [F23N 5/14](#) take precedence )}
- F23N 5/04 .. using bimetallic elements
- F23N 5/042 ... { using electronic means }
- F23N 5/045 ... { using electrical or electromechanical means }
- F23N 5/047 ... { using mechanical means }
- F23N 5/06 .. using bellows; using diaphragms
- F23N 5/062 ... { using electronic means }
- F23N 5/065 ... { using electrical or electromechanical means }
- F23N 5/067 ... { using mechanical means }
- F23N 5/08 .. using light-sensitive elements
- F23N 5/082 ... { using electronic means }
- F23N 5/085 ... { using electrical or electromechanical means }

F23N 5/087	... { using mechanical means }
F23N 5/10	.. using thermocouples
F23N 5/102	... { using electronic means }
F23N 5/105	... { using electrical or electromechanical means }
F23N 5/107	... { using mechanical means e.g. safety valves }
F23N 5/12	.. using ionisation-sensitive elements, i.e. flame rods { ( testing of other ignition means, e.g. flame <a href="#">F02P 17/12</a> ; analysing gases by investigating the ionisation by using heat <a href="#">G01N 27/626</a> ) }
F23N 5/123	... { using electronic means }
F23N 5/126	... { using electrical or electromechanical means }
F23N 5/14	.. using thermo-sensitive resistors
F23N 5/143	... { using electronic means }
F23N 5/146	... { using electrical or electromechanical means }
F23N 5/16	. using noise-sensitive detectors
F23N 2005/165	.. { with ultrasonic means }
F23N 5/18	. using detectors sensitive to rate of flow of air or fuel
F23N 2005/181	.. { using detectors sensitive to rate of flow of air }
F23N 2005/182	... { Air flow switch }
F23N 5/184	.. { using electronic means }
F23N 2005/185	.. { using detectors sensitive to rate of flow of fuel }
F23N 5/187	.. { using electrical or electromechanical means }
F23N 5/188	.. { using mechanical means }
F23N 5/20	. with a time programme acting through electrical means, e.g. using time-delay relays
F23N 5/203	.. { using electronic means }
F23N 5/206	.. { using electrical or electromechanical means }
F23N 5/22	. with a time programme acting through mechanical means, e.g. using cams
F23N 5/24	. Preventing development of abnormal or undesired conditions, i.e. safety arrangements <a href="#">(F23N 5/02 to F23N 5/18 take precedence )</a>
F23N 5/242	.. { using electronic means }
F23N 5/245	.. { using electrical or electromechanical means }
F23N 5/247	.. { using mechanical means }
F23N 5/26	. Details
F23N 5/265	.. { using electronic means }
<b>F23N 2021/00</b>	<b>Pretreatment or prehandling</b>
F23N 2021/02	. using belt conveyers

F23N 2021/04	. Preheating liquid fuel
F23N 2021/06	. Preheating gaseous fuel
F23N 2021/08	. Preheating the air
F23N 2021/10	. Analysing fuel properties, e.g. density, calorific
F23N 2021/12	. Recycling exhaust gases
<b>F23N 2023/00</b>	<b>Signal processing; Details thereof</b>
F23N 2023/02	. Multiplex transmission
F23N 2023/04	. Memory
F23N 2023/06	. Sampling
F23N 2023/08	. Microprocessor; Microcomputer
F23N 2023/10	. Correlation
F23N 2023/12	. Integration
F23N 2023/14	. Differentiation
F23N 2023/16	. Measuring bridge
F23N 2023/18	. Chopper
F23N 2023/20	. Opto-coupler
F23N 2023/22	. Timing network
F23N 2023/24	. . with bimetallic elements
F23N 2023/26	. . with capacitors
F23N 2023/28	. . with more than one timing element
F23N 2023/30	. Switches
F23N 2023/32	. . Reed switches
F23N 2023/34	. with feedforward processing
F23N 2023/36	. PID signal processing
F23N 2023/38	. Remote control
F23N 2023/40	. Simulation

- F23N 2023/42 . Function generator
- F23N 2023/44 . Optimum control
- F23N 2023/46 . Identification
- F23N 2023/48 . Learning / Adaptive control
- F23N 2023/50 . Human control
- F23N 2023/52 . Fuzzy logic
- F23N 2023/54 . Recording

### **F23N 2025/00 Measuring**

- F23N 2025/02 . filling height in burners
- F23N 2025/04 . pressure
- F23N 2025/06 . . for determining flow
- F23N 2025/08 . temperature
- F23N 2025/10 . . stack temperature
- F23N 2025/12 . . room temperature
- F23N 2025/13 . . outdoor temperature
- F23N 2025/14 . . Ambient temperature around burners
- F23N 2025/16 . . burner temperature
- F23N 2025/18 . . feedwater temperature
- F23N 2025/19 . . outlet temperature water heat-exchanger
- F23N 2025/20 . . entrant temperature
- F23N 2025/21 . . outlet temperature
- F23N 2025/22 . heat losses
- F23N 2025/24 . . indicated in an amount of money
- F23N 2025/26 . humidity
- F23N 2025/30 . . measuring lambda

### **F23N 2027/00 Ignition or checking**

- F23N 2027/02 . Starting or ignition cycles
- F23N 2027/04 . Prepurge
- F23N 2027/06 . Postpurge

- F23N 2027/08 . Hold fire apparatus
- F23N 2027/10 . Sequential burner running
- F23N 2027/12 . Burner simulation or checking
- F23N 2027/14 . . Flame simulation
- F23N 2027/16 . . Checking components, e.g. electronic
- F23N 2027/18 . Applying test signals, e.g. periodic
- F23N 2027/20 . Calibrating devices
- F23N 2027/22 . Pilot burners ( [ignition circuits therefor F23N 2027/32](#))
- F23N 2027/24 . . the pilot burner not burning continuously
- F23N 2027/26 . . comprising two or more distinct pilot burners
- F23N 2027/28 . Ignition circuits
- F23N 2027/30 . . for pilot burners
- F23N 2027/32 . Igniting for a predetermined number of cycles
- F23N 2027/34 . Continuously applied ignition cycles
- F23N 2027/36 . Spark ignition, e.g. by means of a high voltage
- F23N 2027/38 . Electrical resistance ignition
- F23N 2027/40 . Catalytic ignition
- F23N 2027/42 . Ceramic glow ignition
- F23N 2029/00 Flame sensors**
- F23N 2029/02 . Pilot flame sensors
- F23N 2029/04 . sensitive to the colour of flames
- F23N 2029/06 . with periodical shutters; Modulation signals
- F23N 2029/08 . detecting flame flicker
- F23N 2029/10 . comprising application of periodical fuel flow fluctuations
- F23N 2029/12 . with flame rectification current detecting means
- F23N 2029/14 . using two or more different types of flame sensor

- F23N 2029/16 . using two or more of the same types of flame sensor
- F23N 2029/18 . Flame sensor cooling means
- F23N 2029/20 . Camera viewing
- F23N 2029/22 . the sensor`s sensivity being variable

#### **F23N 2031/00 Fail safe**

- F23N 2031/02 . using electric energy accumulators
- F23N 2031/04 . for electrical power failures
- F23N 2031/06 . for flame failures
- F23N 2031/08 . . for pilot flame failures
- F23N 2031/10 . for component failures
- F23N 2031/12 . for ignition failures
- F23N 2031/14 . for earthquakes
- F23N 2031/16 . using melting materials or shape memory alloys
- F23N 2031/18 . Detecting fluid leaks
- F23N 2031/20 . Warning devices
- F23N 2031/22 . . using warning lamps
- F23N 2031/24 . Freezing
- F23N 2031/26 . for clogging air inlet
- F23N 2031/28 . preventing flash-back or blow-back
- F23N 2031/30 . Representation of working time

#### **F23N 2033/00 Ventilators**

- F23N 2033/02 . in stacks
- F23N 2033/04 . . with variable speed
- F23N 2033/06 . at the air intake
- F23N 2033/08 . . with variable speed
- F23N 2033/10 . forcing air through heat exchangers

**F23N 2035/00****Valves, nozzles or pumps**

- F23N 2035/02 . Air or combustion gas valves or dampers
- F23N 2035/04 . . in stacks
- F23N 2035/06 . . at the air intake
- F23N 2035/08 . . used with heat exchanges
- F23N 2035/10 . . power assisted, e.g. using electric motors
- F23N 2035/12 . Fuel valves
- F23N 2035/14 . . electromagnetically operated
- F23N 2035/16 . . variable flow or proportional valves
- F23N 2035/18 . . Groups of two or more valves
- F23N 2035/20 . . Membrane valves
- F23N 2035/22 . . cooperating with magnets
- F23N 2035/24 . . Valve details
- F23N 2035/26 . Fuel nozzles
- F23N 2035/28 . . Spray fuel nozzles
- F23N 2035/30 . Pumps

**F23N 2037/00****Controlling ([F23N 5/00](#) takes precedence )**

- F23N 2037/02 . two or more burners
- F23N 2037/04 . at two or more different localities
- F23N 2037/06 . two predetermining temperatures, e.g. day-night
- F23N 2037/08 . two or more different types of fuel simultaneously
- F23N 2037/10 . High or low fire
- F23N 2037/12 . catalytic burners
- F23N 2037/14 . burners with gasification or vaporizer elements
- F23N 2037/16 . secondary air
- F23N 2037/18 . fluidized bed burners
- F23N 2037/20 . one or more bypass conduits
- F23N 2037/22 . water injection



- F23N 2037/24 . height of burner
- F23N 2037/26 . . oxygen-air ratio
- F23N 2037/28 . . oxygen as pure oxydant
- F23N 2037/30 . . matrix burners
- F23N 2037/32 . . Nox

## **F23N 2039/00 Fuels**

- F23N 2039/02 . Solid fuels
- F23N 2039/04 . Gaseous fuels
- F23N 2039/06 . Liquid fuels

## **F23N 2041/00 Applications**

- F23N 2041/02 . Space-heating
- F23N 2041/04 . Heating water
- F23N 2041/06 . Space-heating and heating water
- F23N 2041/08 . Household apparatus
- F23N 2041/10 . Generating vapour
- F23N 2041/11 . Torches
- F23N 2041/12 . Stack-torches
- F23N 2041/14 . Vehicle heating, the heat being derived otherwise than from the propulsion plant
- F23N 2041/16 . Spectrometer burners
- F23N 2041/18 . Incinerating apparatus
- F23N 2041/20 . Gas turbines
- F23N 2041/22 . Absorption refrigerator

## **F23N 2900/00 Special features of, or arrangements for controlling combustion**

- F23N 2900/01001 . Micro Electro Mechanical Systems (MEMS) for controlling fuel supply to burners
- F23N 2900/01002 . Electromagnetically operated fuel valves with a single solenoid controlling two or more cores

- F23N 2900/05001 . Measuring CO content in flue gas
- F23N 2900/05002 . Measuring CO<sub>2</sub> content in flue gas
- F23N 2900/05003 . Measuring NO<sub>x</sub> content in flue gas
- F23N 2900/05004 . Details of components, e.g. connecting adaptors
- F23N 2900/05005 . Mounting arrangements for sensing, detecting or measuring devices
- F23N 2900/05006 . Controlling systems using neuronal networks
- F23N 2900/05101 . Connections between thermocouple and magnetic valves, e.g. by plug and socket connectors
- F23N 2900/05181 . Controlling air to fuel ratio by using a single differential pressure detector