

**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 . . . [N. 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 [F02P 17/12](#); analysing gases by investigating the ionisation by using heat [G01N 27/626](#))}
- F23N 5/123      ...      {using electronic means}
- F23N 5/126      ...      [N. 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 5/18      .      using detectors sensitive to rate of flow of air or fuel
- F23N 5/184      ..      {using electronic means}
- 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 ([F23N 5/02](#) to [F23N 5/18](#) take precedence)
- 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}

**F23N 2005/00      Systems for controlling combustion ([F23N 1/00](#), [F23N 3/00](#) take precedence)**

- F23N 2005/16      .      using noise-sensitive detectors
- F23N 2005/165      ..      with ultrasonic means
- F23N 2005/18      .      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 2005/185      ..      using detectors sensitive to rate of flow of fuel

**F23N 2021/00****Pretreatment or prehandling**

- 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

**F23N 2023/00****Signal processing; Details thereof**

- 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
<b>F23N 2025/00</b>	<b>Measuring</b>
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
<b>F23N 2027/00</b>	<b>Ignition or checking</b>

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 ( <a href="#">ignition circuits therefor F23N 2027/32</a> )
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
<b>F23N 2029/00</b>	<b>Flame sensors</b>
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