

# 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.

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

5/12	. . using ionisation-sensitive elements, i.e. flame rods { <a href="#">(testing of other ignition means, e.g. flame F02P 17/12; analysing gases by investigating the ionisation by using heat G01N 27/626)</a> }	2023/44	. Optimum control
5/123	. . . { <a href="#">using electronic means</a> }	2023/46	. Identification
5/126	. . . { <a href="#">using electrical or electromechanical means</a> }	2023/48	. Learning / Adaptive control
5/14	. . using thermo-sensitive resistors	2023/50	. Human control
5/143	. . . { <a href="#">using electronic means</a> }	2023/52	. Fuzzy logic
5/146	. . . { <a href="#">using electrical or electromechanical means</a> }	2023/54	. Recording
5/16	. using noise-sensitive detectors	<b>2025/00</b>	<b>Measuring</b>
2005/165	. . { <a href="#">with ultrasonic means</a> }	2025/02	. filling height in burners
5/18	. using detectors sensitive to rate of flow of air or fuel	2025/04	. pressure
2005/181	. . { <a href="#">using detectors sensitive to rate of flow of air</a> }	2025/06	. . for determining flow
2005/182	. . . { <a href="#">Air flow switch</a> }	2025/08	. temperature
5/184	. . { <a href="#">using electronic means</a> }	2025/10	. . stack temperature
2005/185	. . { <a href="#">using detectors sensitive to rate of flow of fuel</a> }	2025/12	. . room temperature
5/187	. . { <a href="#">using electrical or electromechanical means</a> }	2025/13	. . outdoor temperature
5/188	. . { <a href="#">using mechanical means</a> }	2025/14	. . Ambient temperature around burners
5/20	. with a time programme acting through electrical means, e.g. using time-delay relays	2025/16	. . burner temperature
5/203	. . { <a href="#">using electronic means</a> }	2025/18	. . feedwater temperature
5/206	. . { <a href="#">using electrical or electromechanical means</a> }	2025/19	. . outlet temperature water heat-exchanger
5/22	. with a time programme acting through mechanical means, e.g. using cams	2025/20	. . entrant temperature
5/24	. Preventing development of abnormal or undesired conditions, i.e. safety arrangements ( <a href="#">F23N 5/02 - F23N 5/18 take precedence</a> )	2025/21	. . outlet temperature
5/242	. . { <a href="#">using electronic means</a> }	2025/22	. heat losses
5/245	. . { <a href="#">using electrical or electromechanical means</a> }	2025/24	. . indicated in an amount of money
5/247	. . { <a href="#">using mechanical means</a> }	2025/26	. humidity
5/26	. Details	2025/30	. . measuring lambda
5/265	. . { <a href="#">using electronic means</a> }	<b>2027/00</b>	<b>Ignition or checking</b>
<b>2021/00</b>	<b>Pretreatment or prehandling</b>	2027/02	. Starting or ignition cycles
2021/02	. using belt conveyors	2027/04	. Prepurge
2021/04	. Preheating liquid fuel	2027/06	. Postpurge
2021/06	. Preheating gaseous fuel	2027/08	. Hold fire apparatus
2021/08	. Preheating the air	2027/10	. Sequential burner running
2021/10	. Analysing fuel properties, e.g. density, calorific	2027/12	. Burner simulation or checking
2021/12	. Recycling exhaust gases	2027/14	. . Flame simulation
<b>2023/00</b>	<b>Signal processing; Details thereof</b>	2027/16	. . Checking components, e.g. electronic
2023/02	. Multiplex transmission	2027/18	. Applying test signals, e.g. periodic
2023/04	. Memory	2027/20	. Calibrating devices
2023/06	. Sampling	2027/22	. Pilot burners ( <a href="#">ignition circuits therefor F23N 2027/32</a> )
2023/08	. Microprocessor; Microcomputer	2027/24	. . the pilot burner not burning continuously
2023/10	. Correlation	2027/26	. . comprising two or more distinct pilot burners
2023/12	. Integration	2027/28	. Ignition circuits
2023/14	. Differentiation	2027/30	. . for pilot burners
2023/16	. Measuring bridge	2027/32	. Igniting for a predetermined number of cycles
2023/18	. Chopper	2027/34	. Continuously applied ignition cycles
2023/20	. Opto-coupler	2027/36	. Spark ignition, e.g. by means of a high voltage
2023/22	. Timing network	2027/38	. Electrical resistance ignition
2023/24	. . with bimetallic elements	2027/40	. Catalytic ignition
2023/26	. . with capacitors	2027/42	. Ceramic glow ignition
2023/28	. . with more than one timing element	<b>2029/00</b>	<b>Flame sensors</b>
2023/30	. Switches	2029/02	. Pilot flame sensors
2023/32	. . Reed switches	2029/04	. sensitive to the colour of flames
2023/34	. with feedforward processing	2029/06	. with periodical shutters; Modulation signals
2023/36	. PID signal processing	2029/08	. detecting flame flicker
2023/38	. Remote control	2029/10	. comprising application of periodical fuel flow fluctuations
2023/40	. Simulation	2029/12	. with flame rectification current detecting means
2023/42	. Function generator	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

2029/22 . the sensor's sensitivity being variable

### 2031/00 Fail safe

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

### 2033/00 Ventilators

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

### 2035/00 Valves, nozzles or pumps

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

### 2037/00 Controlling (F23N 5/00 takes precedence)

2037/02 . two or more burners  
 2037/04 . at two or more different localities  
 2037/06 . two predetermining temperatures, e.g. day-night  
 2037/08 . two or more different types of fuel simultaneously  
 2037/10 . High or low fire  
 2037/12 . catalytic burners  
 2037/14 . burners with gasification or vaporizer elements  
 2037/16 . secondary air  
 2037/18 . fluidized bed burners  
 2037/20 . one or more bypass conduits  
 2037/22 . water injection  
 2037/24 . height of burner  
 2037/26 . . oxygen-air ratio  
 2037/28 . . oxygen as pure oxydant  
 2037/30 . . matrix burners  
 2037/32 . . Nox

### 2039/00 Fuels

2039/02 . Solid fuels  
 2039/04 . Gaseous fuels

2039/06 . Liquid fuels

### 2041/00 Applications

2041/02 . Space-heating  
 2041/04 . Heating water  
 2041/06 . Space-heating and heating water  
 2041/08 . Household apparatus  
 2041/10 . Generating vapour  
 2041/11 . Torches  
 2041/12 . Stack-torches  
 2041/14 . Vehicle heating, the heat being derived otherwise than from the propulsion plant  
 2041/16 . Spectrometer burners  
 2041/18 . Incinerating apparatus  
 2041/20 . Gas turbines  
 2041/22 . 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<sub>2</sub> content in flue gas  
 2900/05003 . Measuring NO<sub>x</sub> 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