

# 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](#))

- |             |                                                                                                                          |             |                                                                                                                                                                                                                                                |
|-------------|--------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1/00</b> | <b>Regulating fuel supply</b>                                                                                            | 3/065       | . . {using mechanical means}                                                                                                                                                                                                                   |
| 1/002       | . {using electronic means ( <a href="#">F23N 1/04</a> - <a href="#">F23N 1/10</a> take precedence)}                      | 3/08        | . by power-assisted systems                                                                                                                                                                                                                    |
| 1/005       | . {using electrical or electromechanical means ( <a href="#">F23N 1/04</a> - <a href="#">F23N 1/10</a> take precedence)} | 3/082       | . . {using electronic means}                                                                                                                                                                                                                   |
| 1/007       | . {using mechanical means ( <a href="#">F23N 1/04</a> - <a href="#">F23N 1/10</a> take precedence)}                      | 3/085       | . . {using electrical or electromechanical means}                                                                                                                                                                                              |
| 1/02        | . conjointly with air supply                                                                                             | 3/087       | . . {using mechanical means}                                                                                                                                                                                                                   |
| 1/022       | . . {using electronic means}                                                                                             | <b>5/00</b> | <b>Systems for controlling combustion (<a href="#">F23N 1/00</a>, <a href="#">F23N 3/00</a> take precedence)</b>                                                                                                                               |
| 1/025       | . . {using electrical or electromechanical 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)}                                                                                |
| 1/027       | . . {using mechanical means}                                                                                             | 5/006       | . . {the detector being sensitive to oxygen}                                                                                                                                                                                                   |
| 1/04        | . conjointly with air supply and with draught                                                                            | 5/02        | . using devices responsive to thermal changes or to thermal expansion of a medium                                                                                                                                                              |
| 1/042       | . . {using electronic means}                                                                                             | 5/022       | . . {using electronic means ( <a href="#">F23N 5/04</a> - <a href="#">F23N 5/14</a> take precedence)}                                                                                                                                          |
| 1/045       | . . {using electrical or electromechanical means}                                                                        | 5/025       | . . {using electrical or electromechanical means ( <a href="#">F23N 5/04</a> - <a href="#">F23N 5/14</a> take precedence)}                                                                                                                     |
| 1/047       | . . {using mechanical means}                                                                                             | 5/027       | . . {using mechanical means ( <a href="#">F23N 5/04</a> - <a href="#">F23N 5/14</a> take precedence)}                                                                                                                                          |
| 1/06        | . conjointly with draught                                                                                                | 5/04        | . . using bimetallic elements                                                                                                                                                                                                                  |
| 1/062       | . . {using electronic means}                                                                                             | 5/042       | . . . {using electronic means}                                                                                                                                                                                                                 |
| 1/065       | . . {using electrical or electromechanical means}                                                                        | 5/045       | . . . {using electrical or electromechanical means}                                                                                                                                                                                            |
| 1/067       | . . {using mechanical means}                                                                                             | 5/047       | . . . {using mechanical means}                                                                                                                                                                                                                 |
| 1/08        | . conjointly with another medium, e.g. boiler water                                                                      | 5/06        | . . using bellows; using diaphragms                                                                                                                                                                                                            |
| 1/082       | . . {using electronic means}                                                                                             | 5/062       | . . . {using electronic means}                                                                                                                                                                                                                 |
| 1/085       | . . {using electrical or electromechanical means}                                                                        | 5/065       | . . . {using electrical or electromechanical means}                                                                                                                                                                                            |
| 1/087       | . . {using mechanical means}                                                                                             | 5/067       | . . . {using mechanical means}                                                                                                                                                                                                                 |
| 1/10        | . . and with air supply or draught                                                                                       | 5/08        | . . using light-sensitive elements                                                                                                                                                                                                             |
| 1/102       | . . . {using electronic means}                                                                                           | 5/082       | . . . {using electronic means}                                                                                                                                                                                                                 |
| 1/105       | . . . {using electrical or electromechanical means}                                                                      | 5/085       | . . . {using electrical or electromechanical means}                                                                                                                                                                                            |
| 1/107       | . . . {using mechanical means}                                                                                           | 5/087       | . . . {using mechanical means}                                                                                                                                                                                                                 |
| <b>3/00</b> | <b>Regulating air supply or draught (conjointly with fuel supply <a href="#">F23N 1/00</a>)</b>                          | 5/10        | . . using thermocouples                                                                                                                                                                                                                        |
| 3/002       | . {using electronic means ( <a href="#">F23N 3/02</a> - <a href="#">F23N 3/08</a> take precedence)}                      | 5/102       | . . . {using electronic means}                                                                                                                                                                                                                 |
| 3/005       | . {using electrical or electromechanical means ( <a href="#">F23N 3/02</a> - <a href="#">F23N 3/08</a> take precedence)} | 5/105       | . . . {using electrical or electromechanical means}                                                                                                                                                                                            |
| 3/007       | . {using mechanical means ( <a href="#">F23N 3/02</a> - <a href="#">F23N 3/08</a> take precedence)}                      | 5/107       | . . . {using mechanical means, e.g. safety valves}                                                                                                                                                                                             |
| 3/02        | . Regulating draught by direct pressure operation of single valves or dampers                                            | 5/12        | . . using ionisation-sensitive elements, i.e. flame rods ( <a href="#">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></a> ) |
| 3/04        | . by operation of single valves or dampers by temperature sensitive elements                                             | 5/123       | . . . {using electronic means}                                                                                                                                                                                                                 |
| 3/042       | . . {using electronic means}                                                                                             | 5/126       | . . . {using electrical or electromechanical means}                                                                                                                                                                                            |
| 3/045       | . . {using electrical or electromechanical means}                                                                        | 5/14        | . . using thermo-sensitive resistors                                                                                                                                                                                                           |
| 3/047       | . . {using mechanical means}                                                                                             | 5/143       | . . . {using electronic means}                                                                                                                                                                                                                 |
| 3/06        | . by conjoint operation of two or more valves or dampers ( <a href="#">F23N 3/08</a> takes precedence)                   | 5/146       | . . . {using electrical or electromechanical means}                                                                                                                                                                                            |

5/16	. using noise-sensitive detectors	2025/04	. pressure
2005/165	. . {with ultrasonic means}	2025/06	. . for determining flow
5/18	. using detectors sensitive to rate of flow of air or fuel	2025/08	. temperature
2005/181	. . {using detectors sensitive to rate of flow of air}	2025/10	. . stack temperature
2005/182	. . . {Air flow switch}	2025/12	. . room temperature
5/184	. . {using electronic means}	2025/13	. . outdoor temperature
2005/185	. . {using detectors sensitive to rate of flow of fuel}	2025/14	. . Ambient temperature around burners
5/187	. . {using electrical or electromechanical means}	2025/16	. . burner temperature
5/188	. . {using mechanical means}	2025/18	. . feedwater temperature
5/20	. with a time programme acting through electrical means, e.g. using time-delay relays	2025/19	. . outlet temperature water heat-exchanger
5/203	. . {using electronic means}	2025/20	. . entrant temperature
5/206	. . {using electrical or electromechanical means}	2025/21	. . outlet temperature
5/22	. with a time programme acting through mechanical means, e.g. using cams	2025/22	. heat losses
5/24	. Preventing development of abnormal or undesired conditions, i.e. safety arrangements (F23N 5/02 - F23N 5/18 take precedence)	2025/24	. . indicated in an amount of money
5/242	. . {using electronic means}	2025/26	. humidity
5/245	. . {using electrical or electromechanical means}	2025/30	. . measuring lambda
5/247	. . {using mechanical means}		
5/26	. Details	<b>2027/00</b>	<b>Ignition or checking</b>
5/265	. . {using electronic means}	2027/02	. Starting or ignition cycles
<b>2021/00</b>	<b>Pretreatment or prehandling</b>	2027/04	. Prepurge
2021/02	. using belt conveyors	2027/06	. Postpurge
2021/04	. Preheating liquid fuel	2027/08	. Hold fire apparatus
2021/06	. Preheating gaseous fuel	2027/10	. Sequential burner running
2021/08	. Preheating the air	2027/12	. Burner simulation or checking
2021/10	. Analysing fuel properties, e.g. density, calorific	2027/14	. . Flame simulation
2021/12	. Recycling exhaust gases	2027/16	. . Checking components, e.g. electronic
<b>2023/00</b>	<b>Signal processing; Details thereof</b>	2027/18	. Applying test signals, e.g. periodic
2023/02	. Multiplex transmission	2027/20	. Calibrating devices
2023/04	. Memory	2027/22	. Pilot burners (ignition circuits therefor F23N 2027/32)
2023/06	. Sampling	2027/24	. . the pilot burner not burning continuously
2023/08	. Microprocessor; Microcomputer	2027/26	. . comprising two or more distinct pilot burners
2023/10	. Correlation	2027/28	. Ignition circuits
2023/12	. Integration	2027/30	. . for pilot burners
2023/14	. Differentiation	2027/32	. Igniting for a predetermined number of cycles
2023/16	. Measuring bridge	2027/34	. Continuously applied ignition cycles
2023/18	. Chopper	2027/36	. Spark ignition, e.g. by means of a high voltage
2023/20	. Opto-coupler	2027/38	. Electrical resistance ignition
2023/22	. Timing network	2027/40	. Catalytic ignition
2023/24	. . with bimetallic elements	2027/42	. Ceramic glow ignition
2023/26	. . with capacitors	<b>2029/00</b>	<b>Flame sensors</b>
2023/28	. . with more than one timing element	2029/02	. Pilot flame sensors
2023/30	. Switches	2029/04	. sensitive to the colour of flames
2023/32	. . Reed switches	2029/06	. with periodical shutters; Modulation signals
2023/34	. with feedforward processing	2029/08	. detecting flame flicker
2023/36	. PID signal processing	2029/10	. comprising application of periodical fuel flow fluctuations
2023/38	. Remote control	2029/12	. with flame rectification current detecting means
2023/40	. Simulation	2029/14	. using two or more different types of flame sensor
2023/42	. Function generator	2029/16	. using two or more of the same types of flame sensor
2023/44	. Optimum control	2029/18	. Flame sensor cooling means
2023/46	. Identification	2029/20	. Camera viewing
2023/48	. Learning / Adaptive control	2029/22	. the sensor's sensitivity being variable
2023/50	. Human control	<b>2031/00</b>	<b>Fail safe</b>
2023/52	. Fuzzy logic	2031/02	. using electric energy accumulators
2023/54	. Recording	2031/04	. for electrical power failures
<b>2025/00</b>	<b>Measuring</b>	2031/06	. for flame failures
2025/02	. filling height in burners	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