

# CPC COOPERATIVE PATENT CLASSIFICATION

## F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING (NOTE omitted)

### LIGHTING; HEATING

#### F23 COMBUSTION APPARATUS; COMBUSTION PROCESSES (NOTE omitted)

#### F23G CREMATION FURNACES; CONSUMING WASTE PRODUCTS BY COMBUSTION

##### NOTE

This subclass covers also the burning of low-grade fuel of solid, liquid, or gaseous nature.

##### 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   | <b>Furnaces for cremation of human or animal carcasses</b>  | 5/32        | . the waste being subjected to a whirling movement, e.g. cyclonic incinerators  |
| 5/00   | <b>Incineration of waste (of specific waste F23G 7/00); Incinerator constructions; Details, accessories or control therefor</b>   | 5/34        | . the waste being burnt in a pit or arranged in a heap for combustion   |
| 5/002  | . {characterised by their grates (F23G 5/05 takes precedence)}  | 5/36        | . having a conical combustion chamber, e.g. "teepee" incinerators (F23G 5/22 takes precedence)  |
| 5/004  | . . {with endless travelling grates}  | 5/38        | . Multi-hearth arrangements   |
| 5/006  | . {General arrangement of incineration plant, e.g. flow sheets}   | 5/40        | . Portable or mobile incinerators   |
| 5/008  | . {adapted for burning two or more kinds, e.g. liquid and solid, of waste being fed through separate inlets}                      | 5/42        | . . of the basket type  |
| 5/02   | . with pretreatment   | 5/44        | . Details; Accessories  |
| 5/027  | . . pyrolysing or gasifying stage (pyrolysis of sludge C02F 11/00; destructive distillation of carbonaceous materials C10B 53/00) | 5/442       | . . . {Waste feed arrangements}   |
| 5/0273 | . . . {using indirect heating}  | 5/444       | . . . {for solid waste (F23G 5/448 takes precedence)}   |
| 5/0276 | . . . {using direct heating}  | 5/446       | . . . {for liquid waste (F23G 5/448 takes precedence)}  |
| 5/033  | . . comminuting or crushing   | 5/448       | . . . {in which the waste is fed in containers or the like}   |
| 5/04   | . . drying  | 5/46        | . . Recuperation of heat  |
| 5/05   | . . . using drying grates   | 5/48        | . . Preventing corrosion  |
| 5/08   | . having supplementary heating  | 5/50        | . Control or safety arrangements  |
| 5/085  | . . {High-temperature heating means, e.g. plasma, for partly melting the waste}   | <b>7/00</b> | <b>Incinerators or other apparatus for consuming industrial waste, e.g. chemicals (incinerator closets A47K 11/02; oxidation of sludge C02F 11/06; burners in general, burner details F23D; incinerating radioactive waste G21F 9/00)</b> |
| 5/10   | . . electric  | 7/001       | . {for sludges or waste products from water treatment installations (F23G 5/008 takes precedence)}  |
| 5/12   | . . using gaseous or liquid fuel (F23G 5/14 takes precedence)   | 7/003       | . {for used articles}   |
| 5/14   | . . including secondary combustion  | 7/005       | . . {cars, vehicles}  |
| 5/16   | . . . in a separate combustion chamber  | 7/006       | . . {wires, cables (production and refining of metals C22B, e.g. from scrap to produce non-ferrous metals C22B 7/00; salvaging material from cables H01B 15/003)}   |
| 5/165  | . . . . {arranged at a different level}   | 7/008       | . {for liquid waste (waste oil F23G 7/05, waste liquors F23G 7/04, sludges F23G 7/001)}   |
| 5/18   | . . . in a stack  | 7/02        | . of bagasse, megasse or the like   |
| 5/20   | . having rotating or oscillating drums  | 7/04        | . of waste liquors, e.g. sulfite liquors  |
| 5/22   | . . the drums being conically shaped  | 7/05        | . of waste oils   |
| 5/24   | . having a vertical, substantially cylindrical, combustion chamber  |             |   |
| 5/245  | . . {with perforated bottom or grate}   |             |   |
| 5/26   | . . having rotating bottom  |             |   |
| 5/28   | . . having raking arms  |             |   |
| 5/30   | . having a fluidised bed  |             |   |

- 7/06 . . of waste gases or noxious gases, e.g. exhaust gases (exhaust apparatus for engines with means for rendering the exhaust innocuous, e.g. by thermal or catalytic conversion, F01N 3/08; combustion of uncombusted material from primary combustion within apparatus for combustion of solid or fluent fuel F23B, {of non combusted material from primary combustion of solid fuels F23B 5/00; of gases produced by primary combustion of solid fuels F23B 90/04}, F23C)
  - 7/061 . . . {with supplementary heating}
  - 7/063 . . . {electric heating}
  - 7/065 . . . {using gaseous or liquid fuel}
  - 7/066 . . . . {preheating the waste gas by the heat of the combustion, e.g. recuperation type incinerator}
  - 7/068 . . . . . {using regenerative heat recovery means}
  - 7/07 . . in which combustion takes place in the presence of catalytic material
  - 7/08 . . using flares, e.g. in stacks
  - 7/085 . . . {in stacks}
  - 7/10 . . of field or garden waste {or biomasses}
  - 7/105 . . {of wood waste}
  - 7/12 . . of plastics, e.g. rubber
  - 7/14 . . of contaminated soil, e.g. by oil
- 2200/00 Waste incineration**
- 2201/00 Pretreatment**
- 2201/10 . . Drying by heat
  - 2201/101 . . . using indirect heat transfer
  - 2201/20 . . Dewatering by mechanical means
  - 2201/30 . . Pyrolysing
  - 2201/301 . . . Treating pyrogases
  - 2201/302 . . . Treating pyrosolids
  - 2201/303 . . . Burning pyrogases
  - 2201/304 . . . Burning pyrosolids
  - 2201/40 . . Gasification
  - 2201/50 . . Devolatilising; from soil, objects
  - 2201/60 . . Separating
  - 2201/601 . . . different calorific values
  - 2201/602 . . . different sizes
  - 2201/603 . . . recyclable material
  - 2201/70 . . Blending
  - 2201/701 . . . with additives
  - 2201/702 . . . with other waste
  - 2201/80 . . Shredding
  - 2201/90 . . Cooling
- 2202/00 Combustion**
- 2202/10 . . in two or more stages
  - 2202/101 . . . with controlled oxidant supply
  - 2202/102 . . . with supplementary heating
  - 2202/103 . . . in separate chambers
  - 2202/104 . . . with ash melting stage
  - 2202/105 . . . with waste supply in stages
  - 2202/106 . . . with recirculation of unburned solid or gaseous matter into combustion chamber
  - 2202/20 . . to temperatures melting waste
  - 2202/30 . . in a pressurised chamber
  - 2202/40 . . in a pulsed combustion chamber
  - 2202/50 . . in a matrix bed combustion chamber
  - 2202/60 . . in a catalytic combustion chamber
  - 2202/70 . . with application of specific energy
- 2202/701 . . . Electrical fields
  - 2202/703 . . . Acoustic energy
- 2203/00 Furnace arrangements**
- 2203/10 . . Stoker grate furnace
  - 2203/101 . . . with stepped or inclined grate
  - 2203/103 . . . with roller grate
  - 2203/105 . . . with endless chain or travelling grate
  - 2203/107 . . . with vibrating grate
  - 2203/20 . . Rotary drum furnace
  - 2203/201 . . . using oscillating movement
  - 2203/202 . . . rotating around substantially vertical axis
  - 2203/203 . . . with conically shaped drum
  - 2203/204 . . . having non-circular inner cross-section
  - 2203/205 . . . with water-cooled wall
  - 2203/206 . . . with charging ports in the sidewall
  - 2203/207 . . . with air supply ports in the sidewall
  - 2203/208 . . . with interior agitating members
  - 2203/209 . . . with variable inclination of rotation axis
  - 2203/21 . . . with variable speed of rotation
  - 2203/211 . . . Arrangement of a plurality of drums
  - 2203/212 . . . Sealing arrangements between rotary and stationary parts
  - 2203/30 . . Cyclonic combustion furnace
  - 2203/40 . . Stationary bed furnace
  - 2203/401 . . . with support for a grate or perforated plate
  - 2203/403 . . . with substantial cylindrical combustion chamber
  - 2203/50 . . Fluidised bed furnace
  - 2203/501 . . . with external recirculation of entrained bed material
  - 2203/502 . . . with recirculation of bed material inside combustion chamber
  - 2203/503 . . . with two or more fluidised beds
  - 2203/504 . . . with essentially horizontal flow of bed material
  - 2203/505 . . . with fluidised bed rotated as a whole
  - 2203/60 . . Mobile furnace
  - 2203/601 . . . carried by a vehicle
  - 2203/70 . . Modular furnace
  - 2203/80 . . Furnaces with other means for moving the waste through the combustion zone
  - 2203/801 . . . using conveyors
  - 2203/8013 . . . . Screw conveyors
  - 2203/8016 . . . . Belt conveyors
  - 2203/803 . . . Rams or pushers
  - 2203/805 . . . using a rotating hearth
- 2204/00 Supplementary heating arrangements**
- 2204/10 . . using auxiliary fuel
  - 2204/101 . . . solid fuel
  - 2204/103 . . . gaseous or liquid fuel
  - 2204/20 . . using electric energy
  - 2204/201 . . . Plasma
  - 2204/202 . . . Laser
  - 2204/203 . . . Microwave
  - 2204/204 . . . Induction
- 2205/00 Waste feed arrangements**
- 2205/10 . . using ram or pusher
  - 2205/101 . . . sequentially operated
  - 2205/12 . . using conveyors
  - 2205/121 . . . Screw conveyor
  - 2205/122 . . . Belt conveyor
  - 2205/123 . . . Roller conveyor

- 2205/124 . . Chain conveyor
- 2205/125 . . Vibrating conveyor
- 2205/14 . using hopper or bin
- 2205/16 . using chute
- 2205/18 . using airlock systems
- 2205/20 . using airblast or pneumatic feeding
- 2206/00 Waste heat recuperation**
- 2206/10 . reintroducing the heat in the same process, e.g. for predrying
- 2206/20 . using the heat in association with another installation
- 2206/201 . . with an industrial furnace
- 2206/202 . . with an internal combustion engine
- 2206/203 . . with a power/heat generating installation
- 2207/00 Control**
- 2207/10 . Arrangement of sensing devices
- 2207/101 . . for temperature
- 2207/1015 . . . Heat pattern monitoring of flames
- 2207/102 . . for pressure
- 2207/103 . . for oxygen
- 2207/104 . . for CO or CO<sub>2</sub>
- 2207/105 . . for NO<sub>x</sub>
- 2207/106 . . for SO<sub>x</sub>
- 2207/107 . . for halogen concentration
- 2207/108 . . for hydrocarbon concentration
- 2207/112 . . for waste supply flowrate
- 2207/113 . . for oxidant supply flowrate
- 2207/114 . . for combustion bed level
- 2207/20 . Waste supply
- 2207/30 . Oxidant supply
- 2207/40 . Supplementary heat supply
- 2207/50 . Cooling fluid supply
- 2207/60 . Additives supply
- 2208/00 Safety aspects**
- 2208/10 . Preventing or abating fire or explosion, e.g. by purging
- 2209/00 Specific waste**
- 2209/10 . Liquid waste
- 2209/101 . . Waste liquor
- 2209/102 . . Waste oil
- 2209/103 . . Bagasse, megasse
- 2209/12 . Sludge, slurries or mixtures of liquids
- 2209/14 . Gaseous waste or fumes
- 2209/141 . . Explosive gases
- 2209/142 . . Halogen gases, e.g. silane
- 2209/16 . Warfare materials, e.g. ammunition
- 2209/18 . Radioactive materials
- 2209/20 . Medical materials
- 2209/22 . Waste papers
- 2209/24 . Contaminated soil; foundry sand
- 2209/26 . Biowaste
- 2209/261 . . Woodwaste
- 2209/262 . . Agricultural waste
- 2209/28 . Plastics or rubber like materials
- 2209/281 . . Tyres
- 2209/30 . Solid combustion residues, e.g. bottom or flyash
- 2900/00 Special features of, or arrangements for incinerators**
- 2900/00001 . Exhaust gas recirculation
- 2900/50001 . Combination of two or more furnaces
- 2900/50002 . Burning with downwards directed draft through the waste mass
- 2900/50003 . Waste oxidation, pyrolysis or gasification in water under supercritical conditions
- 2900/50004 . Furnace with inclined hearth
- 2900/50005 . Waste in combustion chamber supported on bed made of special materials
- 2900/50006 . Combustion chamber walls reflecting radiant energy within the chamber
- 2900/50007 . Co-combustion of two or more kinds of waste, separately fed into the furnace
- 2900/50008 . Combustion of waste suspended or lifted by upward gas flows
- 2900/50009 . Furnace with progressive waste movements in vertical or steeply inclined direction
- 2900/50201 . Waste pyrolysis, gasification or cracking by indirect heat transfer
- 2900/50202 . Waste pyrolysis, gasification or cracking in presence of catalysts
- 2900/50203 . Waste pyrolysis, gasification or cracking in a mechanically fluidised bed, e.g. obtained by a centrifugal force
- 2900/50204 . Waste pre-treatment by pyrolysis, gasification or cracking
- 2900/50205 . Waste pre-treatment by pyrolysis, gasification or cracking followed by condensation of gas into combustible oil or fat
- 2900/50206 . Pelletising waste before combustion
- 2900/50207 . Thermoforming of plastic waste materials before combustion
- 2900/50208 . Biologic treatment before burning, e.g. biogas generation
- 2900/50209 . Compacting waste before burning
- 2900/50211 . Evaporating, e.g. liquid waste before burning
- 2900/50212 . Extruding waste before combustion
- 2900/50213 . Preheating processes other than drying or pyrolysis
- 2900/50214 . Separating non combustible matters
- 2900/50401 . Drying waste by mixing with drying chemicals, e.g. with CaO
- 2900/508 . Providing additional energy for combustion, e.g. by using supplementary heating
- 2900/50801 . . using the heat from externally heated bodies, e.g. steel balls
- 2900/50802 . . using solid propellant
- 2900/50803 . . using solar energy
- 2900/50804 . . using thermit or other compositions of metal oxides as auxiliary fuel
- 2900/51001 . . using arc discharge electrodes to provide heat
- 2900/52001 . Rotary drums with co-current flows of waste and gas
- 2900/52002 . Rotary drum furnaces with counter-current flows of waste and gas
- 2900/52003 . Rotary drum furnaces with foramenous drum walls, e.g. grate drums
- 2900/53801 . Multi-hearth furnaces with vertical axis
- 2900/54001 . Hearths or supports movable into and from the furnace, e.g. by a conveyor
- 2900/54401 . Feeding waste in containers, bags or barrels
- 2900/54402 . Injecting fluid waste into incinerator
- 2900/54601 . using waste heat for desalinating sea water
- 2900/55 . Controlling; Monitoring or measuring
- 2900/55001 . . Controlling combustion air preheating

## F23G

- 2900/55002 . . Sensing exhaust gas opacity
- 2900/55003 . . Sensing for exhaust gas properties, e.g. O<sub>2</sub> content
- 2900/55004 . . Sensing exhaust gas radioactivity
- 2900/55005 . . Sensing ash or slag properties
- 2900/55006 . . Measuring material flow rates
- 2900/55007 . . Sensors arranged in waste loading zone, e.g. feed hopper level
- 2900/55008 . . Measuring produced steam flow rate
- 2900/55009 . . Controlling stoker grate speed or vibrations for waste movement
- 2900/55011 . . Detecting the properties of waste to be incinerated, e.g. heating value, density
- 2900/70 . . Incinerating particular products or waste
- 2900/7001 . . Air bags or seat belt pre-tensioners
- 2900/7002 . . Animal fat, e.g. lard, tallow, stearin
- 2900/7003 . . Incinerating litter from animals, e.g. poultry litter
- 2900/7004 . . Incinerating contaminated animal meals
- 2900/7005 . . Incinerating used asbestos
- 2900/7006 . . Incinerating used automobiles
- 2900/7007 . . Incinerating or pyrolysing used batteries
- 2900/7008 . . Incinerating remains of building materials after demolishing, e.g. fibreglass asphalt shingles
- 2900/7009 . . Incinerating human or animal corpses or remains
- 2900/7011 . . Incinerating PCB-materials
- 2900/7012 . . Incinerating rice or grain husks, hulls or bran
- 2900/7013 . . Incinerating oil shales
- 2900/70401 . . Incinerating drainage water from waste pits of incinerators
- 2900/70601 . . Temporary storage means, e.g. buffers for accumulating fumes or gases, between treatment stages