COMBUSTION APPARATUS; COMBUSTION PROCESSES

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 Furnaces for cremation of human or animal carcasses

5/00 Incineration of waste (of specific waste F23G 7/00); Incinerator constructions; Details, accessories or control therefor

5/002 . . . (characterised by their grates (F23G 5/05 takes precedence))

5/004 . . . (with endless travelling grates)

5/006 . . . [General arrangement of incineration plant, e.g. flow sheets]

5/008 . . . (adapted for burning two or more kinds, e.g. liquid and solid, of waste being fed through separate inlets)

5/02 . . . with pretreatment

5/027 . . . pyrolysing or gasifying stage (pyrolysis of sludge C02F 11/00; destructive distillation of carbonaceous materials C10B 53/00)

5/0273 . . . . . . . . . [using indirect heating]

5/0276 . . . . . . . . . [using direct heating]

5/033 . . . comminuting or crushing

5/04 . . . drying

5/05 . . . . using drying grates

5/08 . . . having supplementary heating

5/085 . . . . . . (High-temperature heating means, e.g. plasma, for partly melting the waste)

5/10 . . . electric

5/12 . . . using gaseous or liquid fuel (F23G 5/14 takes precedence)

5/14 . . . including secondary combustion

5/16 . . . . in a separate combustion chamber

5/165 . . . . . . . . . [arranged at a different level]

5/18 . . . . . in a stack

5/20 . . . having rotating or oscillating drums

5/22 . . . . the drums being conically shaped

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

5/32 . . . the waste being subjected to a whirling movement, e.g. cyclonic incinerators

5/34 . . . the waste being burnt in a pit or arranged in a heap for combustion

5/36 . . . having a conical combustion chamber, e.g. "teepee" incinerators (F23G 5/22 takes precedence)

5/38 . . . Multi-hearth arrangements

5/40 . . . Portable or mobile incinerators

5/42 . . . of the basket type

5/44 . . . Details; Accessories

5/442 . . . . . . . . . [Waste feed arrangements]

5/444 . . . . . . . . . (for solid waste (F23G 5/448 takes precedence)

5/446 . . . . . . . . . (for liquid waste (F23G 5/448 takes precedence)

5/448 . . . . . . . . . (in which the waste is fed in containers or the like)

5/46 . . . Recuperation of heat

5/48 . . . Preventing corrosion

5/50 . . . Control or safety arrangements

7/00 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)

7/001 . . . (for sludges or waste products from water treatment installations (F23G 5/008 takes precedence)

7/003 . . . (for used articles)

7/005 . . . . . . . . . [cars, vehicles]

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)]

7/008 . . . . . . . . . (for liquid waste (waste oil F23G 7/05, waste liquors F23G 7/04, sludges F23G 7/001)

7/02 . . . . . . . . . of bagasse, megasse or the like

7/04 . . . . . . . . . of waste liquors, e.g. sulfite liquors

7/05 . . . . . . . . . of waste oils
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 pyro solids
2201/303 . Burning pyrogases
2201/304 . Burning pyro solids
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
2203/506 . Mobile furnace
2203/60 . with one or more fluidised beds
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
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<tr>
<td>2205/125</td>
<td>Vibrating conveyor</td>
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<td>2205/14</td>
<td>using hopper or bin</td>
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<td>2205/16</td>
<td>using chute</td>
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<td>2205/20</td>
<td>using airblast or pneumatic feeding</td>
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<td>2206/00</td>
<td>Waste heat recuperation</td>
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<tr>
<td>2206/10</td>
<td>reintroducing the heat in the same process, e.g. for predrying</td>
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<tr>
<td>2206/20</td>
<td>using the heat in association with another installation</td>
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<tr>
<td>2206/201</td>
<td>with an industrial furnace</td>
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<td>2206/202</td>
<td>with an internal combustion engine</td>
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<td>2206/203</td>
<td>with a power/heat generating installation</td>
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<td>2207/00</td>
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<td>2207/10</td>
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<td>2207/1015</td>
<td>Heat pattern monitoring of flames</td>
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<td>2207/102</td>
<td>for pressure</td>
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<td>2207/103</td>
<td>for oxygen</td>
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<td>2207/104</td>
<td>for CO or CO2</td>
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<td>2207/105</td>
<td>for NOx</td>
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<td>2207/106</td>
<td>for SOx</td>
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<td>2207/107</td>
<td>for halogen concentration</td>
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<td>2207/108</td>
<td>for hydrocarbon concentration</td>
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<td>2207/112</td>
<td>for waste supply flowrate</td>
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<td>2207/113</td>
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<td>2207/114</td>
<td>for combustion bed level</td>
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<td>2207/20</td>
<td>Waste supply</td>
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<td>Oxidant supply</td>
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<td>2207/40</td>
<td>Supplementary heat supply</td>
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<td>2207/60</td>
<td>Additives supply</td>
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<td>2208/00</td>
<td>Safety aspects</td>
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<tr>
<td>2208/10</td>
<td>Preventing or abating fire or explosion, e.g. by purging</td>
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<td>2209/00</td>
<td>Specific waste</td>
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<td>2209/10</td>
<td>Liquid waste</td>
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<td>2209/101</td>
<td>Waste liquor</td>
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<td>2209/102</td>
<td>Waste oil</td>
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<td>2209/103</td>
<td>Bagasse, megasse</td>
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<tr>
<td>2209/12</td>
<td>Sludge, slurries or mixtures of liquids</td>
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<tr>
<td>2209/14</td>
<td>Gaseous waste or fumes</td>
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<td>2209/141</td>
<td>Explosive gases</td>
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<td>2209/142</td>
<td>Halogen gases, e.g. silane</td>
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<td>2209/16</td>
<td>Warfare materials, e.g. ammunition</td>
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<td>2209/18</td>
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<td>2209/22</td>
<td>Waste papers</td>
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<td>2209/24</td>
<td>Contaminated soil; foundry sand</td>
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<td>2209/26</td>
<td>Biowaste</td>
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<td>2209/261</td>
<td>Woodwaste</td>
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<td>2209/262</td>
<td>Agricultural waste</td>
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<tr>
<td>2209/28</td>
<td>Plastics or rubber like materials</td>
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<td>2209/281</td>
<td>Tyres</td>
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<td>2209/30</td>
<td>Solid combustion residues, e.g. bottom or flyash</td>
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<tr>
<td>2900/00</td>
<td>Special features of, or arrangements for incinerators</td>
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<td>2900/0001</td>
<td>Exhaust gas recirculation (using the heat thereof)</td>
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<tr>
<td>2900/5001</td>
<td>Combination of two or more furnaces</td>
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<tr>
<td>2900/5002</td>
<td>Burning with downwards directed draft through the waste mass</td>
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<tr>
<td>2900/5003</td>
<td>Waste oxidation, pyrolysis or gasification in water under supercritical</td>
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<tr>
<td>2900/5004</td>
<td>Furnace with inclined hearth</td>
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<tr>
<td>2900/5005</td>
<td>Waste in combustion chamber supported on bed made of special materials</td>
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<tr>
<td>2900/5006</td>
<td>Combustion chamber walls reflecting radiant energy within the chamber</td>
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<tr>
<td>2900/5007</td>
<td>Co-combustion of two or more kinds of waste, separately fed into the</td>
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<tr>
<td>2900/5008</td>
<td>Combustion of waste suspended or lifted by upward gas flows</td>
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<tr>
<td>2900/5009</td>
<td>Furnace with progressive waste movements in vertical or steeply inclined</td>
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<tr>
<td>2900/50201</td>
<td>Waste pyrolysis, gasification or cracking by indirect heat transfer</td>
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<tr>
<td>2900/50202</td>
<td>Waste pyrolysis, gasification or cracking in presence of catalysts</td>
</tr>
<tr>
<td>2900/50203</td>
<td>Waste pyrolysis, gasification or cracking in a mechanically fluidised bed,</td>
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<td></td>
<td>e.g. obtained by a centrifugal force</td>
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<tr>
<td>2900/50204</td>
<td>Waste pre-treatment by pyrolysis, gasification or cracking</td>
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<tr>
<td>2900/50205</td>
<td>Waste pre-treatment by pyrolysis, gasification or cracking followed by</td>
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<tr>
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<td>condensation of gas into combustible oil or fat</td>
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<tr>
<td>2900/50206</td>
<td>Pelletising waste before combustion</td>
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<td>2900/50207</td>
<td>Thermoforming of plastic waste materials before combustion</td>
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<tr>
<td>2900/50208</td>
<td>Biologic treatment before burning, e.g. biogas generation</td>
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<tr>
<td>2900/50209</td>
<td>Compacting waste before burning</td>
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<tr>
<td>2900/50211</td>
<td>Evaporating, e.g. liquid waste before burning</td>
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<td>2900/50212</td>
<td>Extruding waste before combustion</td>
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<td>2900/50213</td>
<td>Preheating processes other than drying or pyrolysis</td>
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<td>2900/50214</td>
<td>Separating non combustible matters</td>
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<td>2900/50401</td>
<td>Drying waste by mixing with drying chemicals, e.g. with CaO</td>
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<tr>
<td>2900/508</td>
<td>Providing additional energy for combustion, e.g. by using supplementary</td>
</tr>
<tr>
<td></td>
<td>heating</td>
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<tr>
<td>2900/50801</td>
<td>using the heat from externally heated bodies, e.g. steel balls</td>
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<tr>
<td>2900/50802</td>
<td>using solid propellant</td>
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<tr>
<td>2900/50803</td>
<td>using solar energy</td>
</tr>
<tr>
<td>2900/50804</td>
<td>using thermit or other compositions of metal oxides as auxiliary fuel</td>
</tr>
<tr>
<td>2900/51001</td>
<td>using arc discharge electrodes to provide heat</td>
</tr>
<tr>
<td>2900/52001</td>
<td>Rotary drums with co-current flows of waste and gas</td>
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<tr>
<td>2900/52002</td>
<td>Rotary drum furnaces with counter-current flows of waste and gas</td>
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<tr>
<td>2900/52003</td>
<td>Rotary drum furnaces with foramenous drum walls, e.g. grate drums</td>
</tr>
<tr>
<td>2900/53801</td>
<td>Multi-hearth furnaces with vertical axis</td>
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<tr>
<td>2900/54001</td>
<td>Hearths or supports movable into and from the furnace, e.g. by a conveyor</td>
</tr>
<tr>
<td>2900/54401</td>
<td>Feeding waste in containers, bags or barrels</td>
</tr>
<tr>
<td>2900/54402</td>
<td>Injecting fluid waste into incinerator</td>
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<tr>
<td>2900/54601</td>
<td>using waste heat for desalinating sea water</td>
</tr>
</tbody>
</table>
Controlling; Monitoring or measuring

Controlling combustion air preheating
Sensing exhaust gas opacity
Sensing for exhaust gas properties, e.g. O\textsubscript{2} content
Sensing exhaust gas radioactivity
Sensing ash or slag properties
Measuring material flow rates
Sensors arranged in waste loading zone, e.g. feed hopper level
Measuring produced steam flow rate
Controlling stoker grate speed or vibrations for waste movement
Detecting the properties of waste to be incinerated, e.g. heating value, density

Incinerating particular products or waste
Air bags or seat belt pre-tensioners
Animal fat, e.g. lard, tallow, stearin
Incinerating litter from animals, e.g. poultry litter
Incinerating contaminated animal meals
Incinerating used asbestos
Incinerating used automobiles
Incinerating or pyrolysing used batteries
Incinerating remains of building materials after demolishing, e.g. fibreglass asphalt shingles
Incinerating human or animal corpses or remains
Incinerating PCB-materials
Incinerating rice or grain husks, hulls or bran
Incinerating oil shales
Incinerating drainage water from waste pits of incinerators
Temporary storage means, e.g. buffers for accumulating fumes or gases, between treatment stages