

# CPC COOPERATIVE PATENT CLASSIFICATION

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

### LIGHTING; HEATING

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

#### F23J REMOVAL OR TREATMENT OF COMBUSTION PRODUCTS OR COMBUSTION RESIDUES {(from fluidised-bed combustion apparatus [F23C 10/24](#))}; FLUES (precipitating dust from flue gases [B01D](#); composition of fuel [C10](#); combustion apparatus for consuming smoke or fumes, e.g. exhaust gases, [F23G 7/06](#))

##### NOTE

This subclass covers the cleaning of external surfaces of water tubes of boilers

##### 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>Removing ash, clinker, or slag from combustion chamber</b> {(arrangements for collecting bottom ash and flyash <a href="#">F23J 3/06</a> ; removing flyash from flue gas <a href="#">F23J 15/022</a> )}  | 11/02  | . for conducting smoke or fumes originating from various locations to the outside, e.g. in locomotive sheds, in garages  |
| 1/02  | . Apparatus for removing ash, clinker, or slag from ash-pits, e.g. by employing trucks or conveyors, by employing suction devices   | 11/04  | . in locomotives; in road vehicles; in ships   |
| 1/04  | . Hand tools, e.g. rakes, prickers, tongs   | 11/06  | . . for conducting smoke horizontally  |
| 1/06  | . Mechanically-operated devices, e.g. clinker pushers (forming part of the grate <a href="#">F23H</a> )   | 11/08  | . for portable apparatus   |
| 1/08  | . Liquid slag removal   | 11/10  | . for tents; for log huts; for other inflammable structures  |
| 3/00  | <b>Removing solid {deposited} residues from passages or chambers beyond the fire, e.g. from flues by soot blowers</b> {(soot blowers <i>per se</i> <a href="#">F28G 1/16</a> )}   | 11/12  | . Smoke conduit systems for factories or large buildings   |
| 3/02  | . Cleaning furnace tubes; Cleaning flues or chimneys (by means which do not differ materially from the cleaning of any other tube once the fire is out <a href="#">B08B</a> )   | 13/00  | <b>Fittings for chimneys or flues</b> (staying, stiffening <a href="#">E04H</a> ; means for facilitating climbing <a href="#">E06C</a> ; draught-inducing apparatus associated with chimneys or flues <a href="#">F23L</a> ) |
| 3/023 | . . {cleaning the fireside of watertubes in boilers}  | 13/02  | . Linings; Jackets; Casings  |
| 3/026 | . . {cleaning the chimneys}   | 13/025 | . . {composed of concentric elements, e.g. double walled (in general <a href="#">F16L</a> ; terminals for balanced flue arrangements <a href="#">F23L 17/04</a> )}   |
| 3/04  | . Traps   | 13/04  | . Joints; Connections (pipe joints in general <a href="#">F16L</a> )   |
| 3/06  | . Systems for accumulating residues from different parts of furnace plant   | 13/06  | . Mouths; Inlet holes  |
| 7/00  | <b>Arrangement of devices for supplying chemicals to fire</b> (supplying chemicals to fire <a href="#">C10L</a> {; to fumes <a href="#">F23J 15/003</a> })  | 13/08  | . Doors or covers specially adapted for smoke-boxes, flues, or chimneys (in general <a href="#">E06B</a> )   |
| 9/00  | <b>Preventing premature solidification of molten combustion residues</b>  | 15/00  | <b>Arrangements of devices for treating smoke or fumes</b> (treating smoke or fumes, <i>see</i> the relevant class for the treatment, e.g. <a href="#">B01D 53/00</a> )  |
| 11/00 | <b>Devices for conducting smoke or fumes, e.g. flues</b> ({removing fumes other than combustion fumes from the area where they are produced, in general <a href="#">B08B 15/00</a> }; heat insulation therefor <a href="#">E04B 1/94</a> ; chimneys <a href="#">E04H 12/28</a> ; removing cooking fumes from domestic stoves or ranges <a href="#">F24C 15/20</a> {; fume conduits of furnaces, kilns, ovens, or retorts <a href="#">F27D 17/002</a> }) | 15/003 | . {for supplying chemicals to fumes, e.g. using injection devices (to fire <a href="#">F23J 7/00</a> )}  |
|       |   | 15/006 | . {Layout of treatment plant}  |
|       |   | 15/02  | . of purifiers, e.g. for removing noxious material (traps for solid {deposits} <a href="#">F23J 3/04</a> )   |
|       |   | 15/022 | . . {for removing solid particulate material from the gasflow}   |
|       |   | 15/025 | . . . {using filters}  |
|       |   | 15/027 | . . . {using cyclone separators}   |
|       |   | 15/04  | . . using washing fluids {(scrubbers for removing solids only <a href="#">F23J 15/022</a> )}   |

- 15/06 . of coolers
- 15/08 . of heaters
- 99/00 Subject matter not provided for in other groups of this subclass**
- 2211/00 Flue gas duct systems**
- 2211/10 . Balanced flues (combining air supply and flue gas exhaust)
  - 2211/101 . . with coaxial duct arrangement
  - 2211/20 . Common flues for several combustion devices
  - 2211/30 . Chimney or flue associated with building ventilation system
  - 2211/40 . Chimney with internal flue pipe system
- 2213/00 Chimneys or flues**
- 2213/10 . Linings
  - 2213/101 . . Fastening means therefor
  - 2213/20 . Joints; Connections
    - 2213/201 . . between stack and branch pipes
    - 2213/202 . . between duct or stack sections
    - 2213/203 . . between stack/duct and combustion apparatus
    - 2213/204 . . Sealing arrangements
  - 2213/30 . Specific materials
    - 2213/301 . . flexible
    - 2213/302 . . plastic
    - 2213/303 . . metallic
    - 2213/304 . . ceramic
    - 2213/305 . . glass
  - 2213/40 . Heat insulation fittings
  - 2213/50 . Top cover
  - 2213/60 . Service arrangements
  - 2213/70 . Safety arrangements
- 2215/00 Preventing emissions (solids only [F23J 2217/00](#))**
- 2215/10 . Nitrogen; Compounds thereof
  - 2215/101 . . Nitrous oxide (N<sub>2</sub>O)
- 2215/20 . Sulfur; Compounds thereof
- 2215/30 . Halogen; Compounds thereof
  - 2215/301 . . Dioxins; Furans
- 2215/40 . Carbon monoxide
- 2215/50 . Carbon dioxide
- 2215/60 . Heavy metals; Compounds thereof
- 2217/00 Intercepting solids**
- 2217/10 . by filters
  - 2217/101 . . Baghouse type
  - 2217/102 . . electrostatic
  - 2217/103 . . ultrafine [HEPA]
  - 2217/104 . . High temperature resistant (ceramic) type
  - 2217/105 . . Granular bed
- 2217/20 . by baffles
- 2217/30 . by screens
- 2217/40 . by cyclones
- 2217/50 . by cleaning fluids (washers or scrubbers)
- 2217/60 . using settling/precipitation chambers
- 2219/00 Treatment devices**
- 2219/10 . Catalytic reduction devices
- 2219/20 . Non-catalytic reduction devices
  - 2219/201 . . Reducing species generators, e.g. plasma, corona
- 2219/30 . Sorption devices using carbon, e.g. coke
- 2219/40 . Sorption with wet devices, e.g. scrubbers
- 2219/50 . Sorption with semi-dry devices, e.g. with slurries
- 2219/60 . Sorption with dry devices, e.g. beds
- 2219/70 . Condensing contaminants with coolers
- 2219/80 . Quenching
- 2700/00 Ash removal, handling and treatment means; Ash and slag handling in pulverulent fuel furnaces; Ash removal means for incinerators**
- 2700/001 . Ash removal, handling and treatment means
- 2700/002 . Ash and slag handling in pulverulent fuel furnaces
- 2700/003 . Ash removal means for incinerators
- 2900/00 Special arrangements for conducting or purifying combustion fumes; Treatment of fumes or ashes**
- 2900/01001 . Sorting and classifying ashes or fly-ashes from the combustion chamber before further treatment
- 2900/01002 . Cooling of ashes from the combustion chamber by indirect heat exchangers ([for preheating air F23L 2900/15041](#))
- 2900/01003 . Ash crushing means associated with ash removal means
  - 2900/01004 . Separating water from ash
  - 2900/01005 . Mixing water to ash
  - 2900/01006 . Airlock sealing associated with ash removal means
  - 2900/01007 . Thermal treatments of ash, e.g. temper or shock-cooling for granulation
- 2900/01009 . Controls related to ash or slag extraction
- 2900/01021 . Removing ashes from the ash pit using reciprocating means, e.g. pushers
- 2900/11001 . Conducting systems with a gas flow bypass from main flue to an auxiliary flue
- 2900/11002 . Modelling systems adapted for designing arrangements for conducting or purifying combustion fumes, e.g. flues
  - 2900/13001 . Preventing or reducing corrosion in chimneys
  - 2900/13002 . Initial heating of the flue before starting combustion
  - 2900/13003 . Means for reducing the noise in smoke conducting ducts or systems
    - 2900/13004 . Water draining devices associated with flues
    - 2900/13005 . Protections for chimneys or flue tops against external factors, e.g. birds
  - 2900/13006 . Devices for heating the chimney top to avoid ice formation
    - 2900/13021 . Means for supporting the lining of conducting means, e.g. ducts or chimneys
    - 2900/13022 . Manufacturing processes for the lining of conducting means, e.g. by extrusion
  - 2900/13023 . Ducts with non-circular cross-section
- 2900/15001 . Irradiating fumes with electron or light beams, e.g. UV, for oxidizing or dissociating SO<sub>x</sub> and NO<sub>x</sub>
- 2900/15002 . Cleaning fumes by letting them to pass a molten metal bath
  - 2900/15003 . Supplying fumes with ozone
  - 2900/15004 . Preventing plume emission at chimney outlet
- 2900/15021 . Preventing emission of hexavalent chromium at the chimney outlet
  - 2900/15022 . Electrochemical cell filters
  - 2900/15023 . Magnetic filters
  - 2900/15024 . Photocatalytic filters
- 2900/15025 . Cyclone walls forming heat exchangers
- 2900/15026 . Cyclone separators with horizontal axis
- 2900/15027 . Preventing emission of CO<sub>2</sub> at the chimney outlet by using sea weeds filters or absorbers
- 2900/15041 . Means for absorbing SO<sub>x</sub> using seawater

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- 2900/15061 . Deep cooling or freezing of flue gas rich of CO<sub>2</sub> to deliver CO<sub>2</sub>-free emissions, or to deliver liquid CO<sub>2</sub>
- 2900/15081 . Reheating of flue gases