

CPC COOPERATIVE PATENT CLASSIFICATION

C CHEMISTRY; METALLURGY

(NOTES omitted)

METALLURGY

C21 METALLURGY OF IRON

C21B MANUFACTURE OF IRON OR STEEL (preliminary treatment of ferrous ores or scrap [C22B 1/00](#); electric heating [H05B](#))

NOTE

This subclass covers:

- the production of iron or steel from source materials, e.g. the production of pig-iron;
- apparatus specially adapted therefor, e.g. blast furnaces or air heaters.

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.

3/00 General features in the manufacture of pig-iron (mixers for pig-iron [C21C 1/06](#))

- 3/02 . by applying additives, e.g. fluxing agents
- 3/04 . Recovery of by-products, e.g. slag
- 3/06 . . Treatment of liquid slag (slag wool [C03B](#); slag stones [C04B](#))
- 3/08 . . . Cooling slag
- 3/10 . . . Slag pots; Slag cars

5/00 Making pig-iron in the blast furnace

- 5/001 . {Injecting additional fuel or reducing agents}
- 5/002 . . {Heated electrically (plasma)}
- 5/003 . . {Injection of pulverulent coal}
- 5/004 . . . {Injection of slurries}
- 2005/005 . . {Selection or treatment of the reducing gases}
- 5/006 . {Automatically controlling the process}
- 5/007 . {Conditions of the cokes or characterised by the cokes used}
- 5/008 . {Composition or distribution of the charge}
- 5/02 . Making special pig-iron, e.g. by applying additives, e.g. oxides of other metals
- 5/023 . . {Injection of the additives into the melting part}
- 5/026 . . . {of plastic material}
- 5/04 . Making slag of special composition
- 5/06 . using top gas in the blast furnace process (in coke ovens [C10B](#))

7/00 Blast furnaces (lifts associated with blast furnaces [B66B 9/06](#))

- 7/002 . {Evacuating and treating of exhaust gases}
- 7/005 . . {Bleeder valves or slides}
- 7/007 . {Controlling or regulating of the top pressure}
- 7/02 . Internal forms
- 7/04 . with special refractories (refractory materials [C04B](#))
- 7/06 . . Linings for furnaces
- 7/08 . Top armourings
- 7/10 . Cooling; Devices therefor
- 7/103 . . {Detection of leakages of the cooling liquid}
- 7/106 . . {Cooling of the furnace bottom}

- 7/12 . Opening or sealing the tap holes
- 7/125 . . {Refractory plugging mass}
- 7/14 . Discharging devices, e.g. for slag
- 7/16 . Tuyères
- 7/163 . . {Blowpipe assembly}
- 7/166 . . {Tuyere replacement apparatus}
- 7/18 . Bell-and-hopper arrangements
- 7/20 . . with appliances for distributing the burden
- 7/205 . . . {Details concerning the gear-box driving the charge distribution system}
- 7/22 . Dust arresters
- 7/24 . Test rods or other checking devices

9/00 Stoves for heating the blast in blast furnaces

- 9/02 . Brick hot-blast stoves
- 9/04 . . with combustion shaft
- 9/06 . . Linings
- 9/08 . Iron hot-blast stoves
- 9/10 . Other details, e.g. blast mains
- 9/12 . . Hot-blast valves or slides for blast furnaces (valves in general [F16K](#))
- 9/14 . Preheating the combustion air
- 9/16 . Cooling or drying the hot-blast

11/00 Making pig-iron other than in blast furnaces

- 11/02 . in low shaft furnaces {or shaft furnaces}
- 11/06 . in rotary kilns
- 11/08 . in hearth-type furnaces
- 11/10 . in electric furnaces

13/00 Making spongy iron or liquid steel, by direct processes

- 13/0006 . {obtaining iron or steel in a molten state}
- 13/0013 . . {introduction of iron oxide into a bath of molten iron containing a carbon reductant}
- 13/002 . . . {Reduction of iron ores by passing through a heated column of carbon}
- 13/0026 . . {introduction of iron oxide in the flame of a burner or a hot gas stream}

- 13/0033 . {In fluidised bed furnaces or apparatus containing a dispersion of the material}
- 13/004 . {in a continuous way by reduction from ores}
- 13/0046 . {making metallised agglomerates or iron oxide}
- 13/0053 . . {On a massing grate}
- 13/006 . {Starting from ores containing non ferrous metallic oxides}
- 13/0066 . {Preliminary conditioning of the solid carbonaceous reductant}
- 13/0073 . {Selection or treatment of the reducing gases}
- 13/008 . {Use of special additives or fluxing agents}
- 13/0086 . {Conditioning, transformation of reduced iron ores}
- 13/0093 . . {Protecting against oxidation}
- 13/02 . in shaft furnaces

WARNING

Group [C21B 13/02](#) is impacted by reclassification into group [C21B 13/029](#).

Groups [C21B 13/02](#) and [C21B 13/029](#) should be considered in order to perform a complete search.

- 13/023 . . {wherein iron or steel is obtained in a molten state}
- 13/026 . . . {heated electrically}
- 13/029 . . {Introducing coolant gas in the shaft furnaces}

WARNING

Group [C21B 13/029](#) is incomplete pending reclassification of documents from group [C21B 13/02](#).

Groups [C21B 13/02](#) and [C21B 13/029](#) should be considered in order to perform a complete search.

- 13/04 . in retorts
- 13/06 . in multi-storied furnaces
- 13/08 . in rotary furnaces
- 13/085 . . {wherein iron or steel is obtained in a molten state}
- 13/10 . in hearth-type furnaces
- 13/105 . . {Rotary hearth-type furnaces}
- 13/12 . in electric furnaces
- 13/125 . . {By using plasma}
- 13/14 . Multi-stage processes {processes carried out in different vessels or furnaces}
- 13/143 . . {Injection of partially reduced ore into a molten bath}
- 13/146 . . {Multi-step reduction without melting}

15/00 Other processes for the manufacture of iron from iron compounds (general methods of reducing to metal [C22B 5/00](#); by electrolysis [C25C 1/06](#))

- 15/003 . {By using nuclear energy}
- 15/006 . {By a chloride process}
- 15/02 . Metallothermic processes, e.g. thermit reduction
- 15/04 . from iron carbonyl

2100/00 Handling of exhaust gases produced during the manufacture of iron or steel

WARNING

Groups [C21B 2100/02](#) - [C21B 2100/06](#) are no longer used for the classification of documents as of May 1, 2017. The content of these groups is being reclassified into groups [C21B 2100/20](#) - [C21B 2100/80](#).

Groups [C21B 2100/02](#) - [C21B 2100/06](#) and [C21B 2100/20](#) - [C21B 2100/80](#) should be considered in order to perform a complete search.

- 2100/02 . Treatment of the exhaust gases
(Frozen)
- 2100/04 . Recirculation of the exhaust gases
(Frozen)
- 2100/06 . Energy from waste gases used in other processes
(Frozen)
- 2100/20 . Increasing the gas reduction potential of recycled exhaust gases

WARNING

Groups [C21B 2100/20](#) - [C21B 2100/284](#) are incomplete pending reclassification of documents from groups [C21B 2100/02](#) - [C21B 2100/06](#).

Groups [C21B 2100/02](#) - [C21B 2100/06](#) and [C21B 2100/20](#) - [C21B 2100/284](#) should be considered in order to perform a complete search.

- 2100/22 . . by reforming
- 2100/24 . . by shift reactions
- 2100/26 . . by adding additional fuel in recirculation pipes
- 2100/28 . . by separation
- 2100/282 . . . of carbon dioxide
- 2100/284 . . . of nitrogen
- 2100/40 . Gas purification of exhaust gases to be recirculated or used in other metallurgical processes

WARNING

Groups [C21B 2100/40](#) - [C21B 2100/44](#) are incomplete pending reclassification of documents from groups [C21B 2100/02](#) - [C21B 2100/06](#).

Groups [C21B 2100/02](#) - [C21B 2100/06](#) and [C21B 2100/40](#) - [C21B 2100/44](#) should be considered in order to perform a complete search.

- 2100/42 . . Sulphur removal
- 2100/44 . . Removing particles, e.g. by scrubbing, dedusting
- 2100/60 . Process control or energy utilisation in the manufacture of iron or steel

WARNING

Groups [C21B 2100/60](#) - [C21B 2100/66](#) are incomplete pending reclassification of documents from groups [C21B 2100/02](#) - [C21B 2100/06](#).

Groups [C21B 2100/02](#) - [C21B 2100/06](#) and [C21B 2100/60](#) - [C21B 2100/66](#) should be considered in order to perform a complete search.

C21B

- 2100/62 . . Energy conversion other than by heat exchange, e.g. by use of exhaust gas in energy production
- 2100/64 . . Controlling the physical properties of the gas, e.g. pressure or temperature
- 2100/66 . . Heat exchange
- 2100/80 . Interaction of exhaust gases produced during the manufacture of iron or steel with other processes

WARNING

Group [C21B 2100/80](#) is incomplete pending reclassification of documents from groups [C21B 2100/02](#) - [C21B 2100/06](#).

Groups [C21B 2100/02](#) - [C21B 2100/06](#) and [C21B 2100/80](#) should be considered in order to perform a complete search.

2200/00 Recycling of non-gaseous waste material

2300/00 Process aspects

- 2300/02 . Particular sequence of the process steps
- 2300/04 . Modeling of the process, e.g. for control purposes; CII

2400/00 Treatment of slags originating from iron or steel processes

- 2400/02 . Physical or chemical treatment of slags
- 2400/022 . . Methods of cooling or quenching molten slag
- 2400/024 . . . with the direct use of steam or liquid coolants, e.g. water
- 2400/026 . . . using air, inert gases or removable conductive bodies
- 2400/028 . . . with the permanent addition of cooled slag or other solids
- 2400/03 . . Removing sulfur
- 2400/032 . . Separating slag from liquid, e.g. from water, after quenching
- 2400/034 . . Stirring or agitating by pressurised fluids or by moving apparatus
- 2400/04 . Specific shape of slag after cooling
- 2400/042 . . Sheets
- 2400/044 . . Briquettes or moulded bodies other than sheets
- 2400/05 . Apparatus features
- 2400/052 . . including rotating parts
- 2400/054 . . . Disc-shaped or conical parts for cooling, dispersing or atomising of molten slag rotating along vertical axis
- 2400/056 . . . Drums whereby slag is poured on or in between
- 2400/058 . . . Rotating beds on which slag is cooled
- 2400/06 . . Conveyors on which slag is cooled
- 2400/062 . . Jet nozzles or pressurised fluids for cooling, fragmenting or atomising slag
- 2400/064 . . Thermally-conductive removable bodies, e.g. balls
- 2400/066 . . Receptacle features where the slag is treated
- 2400/068 . . . with a sealed or controlled environment
- 2400/07 . . . open to atmosphere
- 2400/072 . . . Tanks to collect the slag, e.g. water tank
- 2400/074 . . . Tower structures for cooling, being confined but not sealed
- 2400/076 . . . Fluidised bed for cooling
- 2400/08 . with energy recovery