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 . Tuyéres
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
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}
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**
2100/20 . Increasing the gas reduction potential of recycled exhaust gases
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
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
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

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