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  .  [Injections 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

WARNING
Group C21B 7/20 is impacted by reclassification into group C21B 7/205.
Groups C21B 7/20 and C21B 7/205 should be considered in order to perform a complete search.

7/005  .  .  .  [Details concerning the gear-box driving the charge distribution system]

WARNING
Group C21B 7/205 is incomplete pending reclassification of documents from group C21B 7/20.
Groups C21B 7/205 and C21B 7/20 should be considered in order to perform a complete search.

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
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 oxides 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}
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.

Energy conversion other than by heat exchange, e.g. by use of exhaust gas in energy production

Controlling the physical properties of the gas, e.g. pressure or temperature

Heat exchange

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.

Recycling of non-gaseous waste material

Process aspects

Particular sequence of the process steps

Modeling of the process, e.g. for control purposes; CII

Treatment of slags originating from iron or steel processes

**WARNING**

Groups C21B 2400/00 - C21B 2400/08 are incomplete pending reclassification of documents from groups C21B 3/04, C21B 3/06, C21B 3/08, and C21B 3/10.

Groups C21B 2400/00 - C21B 2400/08, and groups C21B 3/04, C21B 3/06, C21B 3/08 and C21B 3/10 should be considered in order to perform a complete search.

Physical or chemical treatment of slags

Methods of cooling or quenching molten slag

with the direct use of steam or liquid coolants, e.g. water

using air, inert gases or removable conductive bodies

with the permanent addition of cooled slag or other solids

Removing sulfur

Separating slag from liquid, e.g. from water, after quenching

Stirring or agitating by pressurised fluids or by moving apparatus

Specific shape of slag after cooling

Sheets

Briquettes or moulded bodies other than sheets

Apparatus features

including rotating parts

Disc-shaped or conical parts for cooling, dispersing or atomising of molten slag rotating along vertical axis

Drums whereby slag is poured on or in between

Rotating beds on which slag is cooled

Conveyors on which slag is cooled

Jet nozzles or pressurised fluids for cooling, fragmenting or atomising slag

Thermally-conductive removable bodies, e.g. balls

Receptacle features where the slag is treated

with a sealed or controlled environment

open to atmosphere

Tanks to collect the slag, e.g. water tank

Tower structures for cooling, being confined but not sealed

Fluidised bed for cooling

with energy recovery