C22C ALLOYS (flints C06C 15/00; treatment of alloys C21D, C22F)

NOTES
1. In this subclass, the following terms or expressions are used with the meanings indicated:
   • "alloys" includes also:
     a. metallic composite materials containing a substantial proportion of fibres or other somewhat larger particles;
     b. ceramic compositions containing free metal bonded to carbides, diamond, oxides, borides, nitrides or silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides or sulfides, other than as macroscopic reinforcing agents;
   • "based on" requires at least 50% by weight of the specified constituent or of the specified group of constituents.
2. In the absence of an indication to the contrary, in groups C22C 5/00 - C22C 32/00 an alloy is classified in the last appropriate place.
3. In this subclass it is desirable to classify the individual aspects of combinations of processes or materials for powder metallurgy using Combination Sets with symbols chosen from groups C22C 1/00 - C22C 43/00 or from groups B22F 1/00 - B22F 9/00.
4. In this subclass the special database "ALLOYS" is used. This system includes patent documents classified in groups C22C 1/04 and C22C 5/00 - C22C 49/14 and provides information on the composition of the alloys, their uses and characteristics.

WARNINGS
1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:
   C22C 101/00, C22C 101/20 covered by C04B 35/62227
   C22C 101/02 covered by C04B 35/62231
   C22C 101/04 covered by C04B 35/62236
   C22C 101/06 covered by C04B 35/62245
   C22C 101/08 covered by C04B 35/62272
   C22C 101/10 covered by D01F 9/12
   C22C 101/12 covered by C04B 35/62277
   C22C 101/14 covered by C04B 35/62281
   C22C 101/16 covered by C04B 35/62286
   C22C 101/18 covered by C04B 35/62295
   C22C 101/22 covered by C04B 35/62279
   C22C 111/00-C22C 111/02 covered by C22C 47/00, C22C 49/00
   C22C 121/00-C22C 121/02 covered by C22C 47/02 - C22C 47/068, C22C 49/00
2. 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.

Non-ferrous alloys, i.e. alloys based essentially on metals other than iron (master alloys for iron and steel C22C 35/00; alloys containing radioactive material C22C 43/00; amorphous alloys C22C 45/00; alloys containing fibres or filaments C22C 47/00, C22C 49/00)

1/00 Making alloys (powder-metallurgical apparatus or processes, not specially modified for making alloys B22F; by electrothermical methods C22B 4/00; by electrolysis C25C)

1/002. (Making amorphous alloys (processes for making amorphous material by powder metallurgy B22F))
1/005. (Making alloys with holding in the range of the solid-liquid phase)

1/007. [Preparing arsenides or antimonides, especially of the III-VI-compound type, e.g. aluminium or gallium arsenide]
1/02. by melting ([C22C 1/1036 takes precedence])
1/023. [Alloys based on nickel]
1/026. [Alloys based on aluminium]
1/03. using master alloys
1/04. by powder metallurgy (C22C 1/08, [C22C 1/05, C22C 1/10, C22C 32/00, C22C 47/00, C22C 49/00] take precedence)
1/0408. [Light metal alloys]
1/0416. [Aluminium-based alloys]
1/0425. [Copper-based alloys]
1/0433. [Nickel- or cobalt-based alloys]
Non-ferrous alloys, i.e. alloys based essentially on metals other than iron

1/0441 . . . [Alloys based on intermetallic compounds of the type rare earth - Co, Ni]
1/045 . . . [Alloys based on refractory metals]
1/0458 . . . [Alloys based on titanium, zirconium, hafnium]
1/0466 . . . [Alloys based on noble metals]
1/0475 . . . [Impregnated alloys]
1/0483 . . . [Alloys based on the low melting point metals Zn, Pb, Sn, Cd, In or Ga]
1/0491 . . . [comprising intermetallic compounds (C22C 1/0441 takes precedence)]
1/05 . . . Mixtures of metal powder with non-metallic powders (C22C 1/08, C22C 47/00, C22C 49/00 take precedence)
1/051 . . . [Making hard metals based on borides, carbides, nitrides, oxides or silicides; Preparation of the powder mixture used as the starting material]
1/053 . . . [with in situ forming of the hard compound (C22C 1/058 takes precedence)]
1/055 . . . [using carbon]
1/056 . . . [using gas]
1/058 . . . [by reaction sintering (i.e. gasless reaction starting from a mixture of solid metal compounds)]
1/06 . . . with the use of special agents for refining or deoxidising
1/08 . . . Alloys with open or closed pores (by powder metallurgy B22F 3/11)
2001/081 . . . [Casting porous metals into porous preform skeleton without foaming]
2001/082 . . . [with removal of the preform]
2001/083 . . . [Foaming process in molten metal other than by powder metallurgy]
2001/085 . . . [with external pressure or pressure buildup to make porous metals]
2001/086 . . . [Gas foaming process]
2001/087 . . . [after casting in solidified or solidifying metal to make porous metals]
2001/088 . . . [Foaming process with solid metal other than by powder metallurgy]
1/10 . . . Alloys containing non-metals (C22C 1/05, C22C 1/08, C22C 47/00, C22C 49/00 take precedence)
1/1005 . . . [Pretreatment of the non-metallic additives (pretreatment of non-metallic fibres C22C 47/02)]

**WARNING**

Groups C22C 1/1005, C22C 1/101 and C22C 1/1015 are not complete, see also C22C 1/10

1/101 . . . [by coating]
1/1015 . . . [by preparing or treating a non-metallic additive preform]
2001/1021 . . . [the preform being ceramic]
1/1026 . . . [starting from a solution or a suspension of (a) compound(s) of at least one of the alloy constituents]
1/1031 . . . [starting from (a) gaseous compound(s) or (a) vapour(s) of at least one of the constituents]
1/1036 . . . [starting from a melt (infiltration of sintered ceramic preforms with molten metal C04B 41/51)]

1/1042 . . . [by atomising (atomising molten metal B22F 9/08)]
2001/1047 . . . [by mixing and casting liquid metal matrix composites]
2001/1052 . . . [by mixing and casting metal matrix composites with reaction]
2001/1057 . . . [Reactive infiltration]
2001/1063 . . . [Gas reaction, e.g. lanside]
1/1068 . . . [Making hard metals based on borides, carbides, nitrides, oxides, silicides]
2001/1073 . . . [Infiltration or casting under mechanical pressure, e.g. squeeze casting]
1/1078 . . . [by internal oxidation of material in solid state]
1/1084 . . . [by mechanical alloying (blending, milling)]
2001/1089 . . . [by partial reduction or decomposition of a solid metal compound]
1/1094 . . . [comprising an after-treatment]

**NOTE**

Documents classified in group C22C 1/1094 are also classified in subclass C22F

3/00 Removing material from alloys to produce alloys of different constitution [separation of the constituents of alloys]
3/005 . . . [Separation of the constituents of alloys]
5/00 Alloys based on noble metals
5/02 . . . Alloys based on gold
5/04 . . . Alloys based on a platinum group metal
5/06 . . . Alloys based on silver
5/08 . . . with copper as the next major constituent
5/10 . . . with cadmium as the next major constituent
7/00 Alloys based on mercury
9/00 Alloys based on copper
9/01 . . . with aluminium as the next major constituent
9/02 . . . with tin as the next major constituent
9/04 . . . with zinc as the next major constituent
9/05 . . . with manganese as the next major constituent
9/06 . . . with nickel or cobalt as the next major constituent
9/08 . . . with lead as the next major constituent
9/10 . . . with silicon as the next major constituent
11/00 Alloys based on lead
11/02 . . . with an alkali or an alkaline earth metal as the next major constituent
11/04 . . . with copper as the next major constituent
11/06 . . . with tin as the next major constituent
11/08 . . . with antimony or bismuth as the next major constituent
11/10 . . . with tin
12/00 Alloys based on antimony or bismuth
13/00 Alloys based on tin
13/02 . . . with antimony or bismuth as the next major constituent
14/00 Alloys based on titanium
16/00 Alloys based on zirconium
18/00 Alloys based on zinc
18/02 . . . with copper as the next major constituent
18/04 . . . with aluminium as the next major constituent
Non-ferrous alloys, i.e. alloys based essentially on metals other than iron

19/00 Alloys based on nickel or cobalt
19/002 . [with copper as the next major constituent]
19/005 . [with Manganese as the next major constituent]
19/007 . [with a light metal (alkali metal Li, Na, K, Rb, Cs; earth alkali metal Be, Mg, Ca, Sr, Ba, Al Ga, Ge, Ti) or B, Si, Zr, Hf, Sc, Y, lanthanides, actinides, as the next major constituent]
19/03 . based on nickel
19/05 . . . with chromium
19/051 . . . . [and Mo or W]
19/052 . . . . . [with the maximum Cr content being at least 40%]
19/053 . . . . . [with the maximum Cr content being at least 30% but less than 40%]
19/055 . . . . . [with the maximum Cr content being at least 20% but less than 30%]
19/056 . . . . . [with the maximum Cr content being at least 10% but less than 20%]
19/057 . . . . . [with the maximum Cr content being less than 10%]
19/058 . . . . [without Mo and W]
19/07 . based on cobalt

20/00 Alloys based on cadmium
21/00 Alloys based on aluminium
21/003 . [containing at least 2.6% of one or more of the elements: tin, lead, antimony, bismuth, cadmium, and titanium]
21/006 . [containing Hg]
21/02 . with silicon as the next major constituent
21/04 . . . Modified aluminium-silicon alloys
21/06 . with magnesium as the next major constituent
21/08 . . . with silicon
21/10 . with zinc as the next major constituent
21/12 . with copper as the next major constituent
21/14 . . . with silicon
21/16 . . . with magnesium
21/18 . . . with zinc

22/00 Alloys based on manganese

23/00 Alloys based on magnesium
23/02 . with aluminium as the next major constituent
23/04 . with zinc or cadmium as the next major constituent
23/06 . with a rare earth metal as the next major constituent

24/00 Alloys based on an alkali or an alkaline earth metal

25/00 Alloys based on beryllium

26/00 Alloys containing diamond (or cubic or wurtzitic boron nitride, fullerenes or carbon nanotubes)
2026/001 . . . [Fullerenes]
2026/002 . . . [Carbon nanotubes]
2026/003 . . . [Cubic boron nitrides only]
2026/005 . . . [with additional metal compounds being borides]
2026/006 . . . [with additional metal compounds being carbides]
2026/007 . . . [with additional metal compounds being nitrides]
2026/008 . . . [with additional metal compounds other than carbides, borides or nitrides]

27/00 Alloys based on rhenium or a refractory metal not mentioned in groups C22C 14/00 or C22C 16/00
27/02 . Alloys based on vanadium, niobium, or tantalum
27/04 . Alloys based on tungsten or molybdenum
27/06 . Alloys based on chromium

28/00 Alloys based on a metal not provided for in groups C22C 5/00 - C22C 27/00
29/00 Alloys based on carbides, oxides, nitrides, borides, or silicides, e.g. cermets, or other metal compounds, e.g. oxynitrides, sulfides ([C22C 26/00 takes precedence])
29/005 . . . [comprising a particular metallic binder]
29/02 . based on carbides or carbonitrides
29/04 . . . based on carbonitrides
29/06 . . . based on carbides, but not containing other metal compounds
29/062 . . . . [based on B, C]
29/065 . . . . [based on SiC]
29/067 . . . . [comprising a particular metallic binder]
29/08 . . . based on tungsten carbide
29/10 . . . . based on titanium carbide
29/12 . . . based on oxides
29/14 . . . based on borides
29/16 . . . based on nitrides ([containing cubic BN or wurtzitic BN and diamond C22C 26/00])
29/18 . . . based on silicides

30/00 Alloys containing less than 50% by weight of each constituent
30/02 . containing copper
30/04 . containing tin or lead
30/06 . containing zinc

32/00 Non-ferrous alloys containing at least 5% by weight but less than 50% by weight of oxides, carbides, borides, nitrides, silicides or other metal compounds, e.g. oxynitrides, sulfides whether added as such or formed in situ

NOTE
This group comprises also dispersion hardened alloys with less than 5% of dispersed compounds

32/0005 . . . [with at least one oxide and at least one of carbides, nitrides, borides or silicides as the main non-metallic constituents]
32/001 . [with only oxides]
32/0015 . . . [with only single oxides as main non-metallic constituents]
32/0026 . . . [Matrix based on noble metals, Cu or alloys thereof]
32/0026 . . . [Matrix based on Ni, Co, Cr or alloys thereof; Matrix based on Fe for ODS steels (matrix based on Fe for steels other than ODS C22C 33/00, by powder metallurgy C22C 33/02)]
32/0031 . . . [Matrix based on refractory metals, W, Mo, Nb, Hf, Ta, Zr, Ti, V or alloys thereof]
32/0036 . . . [Matrix based on Al, Mg, Be or alloys thereof]
32/0042 . . . . [Matrix based on low melting metals, Pb, Sn, In, Zn, Cd or alloys thereof]
32/0047 . . . [with carbides, nitrides, borides or silicides as the main non-metallic constituents]
32/0052 . . . . [only carbides]
32/0057 . . . . . [based on B, C]
32/0063 . . . . . [based on SiC]
Non-ferrous alloys, i.e. alloys based essentially on metals other than iron

C22C

32/0068 . . {only nitrides}
32/0073 . . {only borides}
32/0078 . . {only silicides}
32/0084 . {carbon or graphite as the main non-metallic constituent}
32/0089 . {with other, not previously mentioned inorganic compounds as the main non-metallic constituent, e.g. sulfides, glass}
32/0094 . {with organic materials as the main non-metallic constituent, e.g. resin}

**Ferrous alloys, i.e. alloys based on iron** (alloys containing radioactive material C22C 43/00; amorphous alloys C22C 45/00; alloys containing fibres or filaments C22C 47/00; C22C 49/00; heat treatment thereof C21D)

33/00 Making ferrous alloys
33/003 . {making amorphous alloys}
33/006 . {compositions used for making ferrous alloys}
33/02 . by powder metallurgy (working metallic powder B22F)
33/0207 . . [Using a mixture of prealloyed powders or a master alloy (mixtures of metal powder in general B22F 1/0003)]
33/0214 . . {comprising P or a phosphorus compound}
33/0221 . . {comprising S or a sulfur compound}
33/0228 . . {comprising other non-metallic compounds or more than 5% of graphite}
33/0235 . . {Starting from compounds, e.g. oxides (manufacture of articles starting from powder comprising reducible metal compounds in general B22F 3/0011)]
33/0242 . . {using the impregnating technique (impregnating articles in general B22F 3/26)}
33/025 . . {having an intermetallic of the REM-Fe type which is not magnetic}
33/0257 . . {characterised by the range of the alloying elements}
33/0264 . . . {the maximum content of each alloying element not exceeding 5%}
33/0271 . . . . . {with only C, Mn, Si, P, S As as alloying elements, e.g. carbon steel}
33/0278 . . . . . {with at least one alloying element having a minimum content above 5%}
33/0285 . . . . . {with Cr, Co, or Ni having a minimum content higher than 5%}
33/0292 . . . . . . {with more than 5% preformed carbides, nitrides or borides}
33/04 . by melting
33/06 . . using master alloys
33/08 . Making cast-iron alloys
33/10 . . including procedures for adding magnesium
33/12 . . . by fluidised injection

35/00 Master alloys for iron or steel
35/005 . {based on iron, e.g. ferro-alloys}

**NOTE**
In the absence of an indication to the contrary, in groups C22C 37/00, C22C 38/00 an alloy is classified in the last appropriate place that provides for one of the alloying components.

37/00 Cast-iron alloys
37/04 . containing spheroidal graphite
37/06 . . containing chromium
37/08 . . with nickel
37/10 . . containing aluminium or silicon

38/00 Ferrous alloys, e.g. steel alloys (cast-iron alloys C22C 37/00)
38/001 . . {containing N}
38/002 . . {containing In, Mg, or other elements not provided for in one single group C22C 38/001 - C22C 38/60}
38/004 . . {Very low carbon steels, i.e. having a carbon content of less than 0,01%}
38/005 . . {containing rare earths, i.e. Sc, Y, Lanthanides}
38/007 . . {containing silver}
38/008 . . {containing tin}
38/02 . . containing silicon
38/04 . . containing manganese
38/06 . . containing aluminium
38/08 . . containing nickel ((C22C 38/105 takes precedence))
38/10 . . containing cobalt
38/105 . . . {containing Co and Ni}
38/12 . . containing tungsten, tantalum, molybdenum, vanadium, or niobium
38/14 . . containing titanium or zirconium
38/16 . . containing copper
38/18 . . containing chromium
38/20 . . . with copper
38/22 . . . with molybdenum or tungsten
38/24 . . . with vanadium
38/26 . . . with niobium or tantalum
38/28 . . . with titanium or zirconium
38/30 . . . with cobalt
38/32 . . . with boron
38/34 . . . with more than 1.5% by weight of silicon
38/36 . . . with more than 1.7% by weight of carbon
38/38 . . . with more than 1.5% by weight of manganese
38/40 . . . with nickel
38/42 . . . . with copper
38/44 . . . . with molybdenum or tungsten
38/46 . . . . with vanadium
38/48 . . . . with niobium or tantalum
38/50 . . . . with titanium or zirconium
38/52 . . . . with cobalt
38/54 . . . . with boron
38/56 . . . . with more than 1.7% by weight of carbon
38/58 . . . . with more than 1.5% by weight of manganese
38/60 . . . . containing lead, selenium, tellurium, or antimony, or more than 0.04% by weight of sulfur

43/00 Alloys containing radioactive materials
45/00 Amorphous alloys
45/001 . . {with Cu as the major constituent}
45/003 . . {with one or more of the noble metals as major constituent}
45/005 . . {with Mg as the major constituent}
45/006 . . {with Cr as the major constituent}
45/008 . . {with Fe, Co or Ni as the major constituent (C22C 45/02, C22C 45/04 take precedence)}
45/02 . . with iron as the major constituent
45/04 . . with nickel or cobalt as the major constituent
45/06 . . with beryllium as the major constituent
45/08 . . with aluminium as the major constituent
Ferrous alloys, i.e. alloys based on iron

with molybdenum, tungsten, niobium, tantalum, titanium, or zirconium (or Hf) as the major constituent

Alloys containing fibres or filaments

WARNING

The subgroups of C22C 47/00 and C22C 49/00 might be incomplete as some of the patent documents classified C22C 47/08, C22C 47/16 and C22C 49/00 might need reclassification to one or more subgroups or to C22C 47/02 and subgroups

47/00 Making alloys containing metallic or non-metallic fibres or filaments

2047/005 . . . . . . (Working of filaments or rods into fibre reinforced metal by mechanical deformation)

47/02 . . . Pretreatment of the fibres or filaments

47/025 . . . (Aligning or orienting the fibres)

WARNING

Not complete, see also C22C 47/02

47/04 . . . . . . by coating, e.g. with a protective or activated covering

47/06 . . . . . . by forming the fibres or filaments into a preformed structure, e.g. using a temporary binder to form a mat-like element

47/062 . . . . . . (from wires or filaments only)

WARNING

Groups C22C 47/062, C22C 47/064, C22C 47/066 and C22C 47/068 are not complete, see also C22C 47/02 or C22C 47/06

47/064 . . . . . . (Winding wires)

47/066 . . . . . . (Weaving wires)

47/068 . . . . . . (Aligning wires)

47/08 . . . . . . by contacting the fibres or filaments with molten metal, e.g. by infiltrating the fibres or filaments placed in a mould (C22C 47/16 takes precedence)

47/10 . . . . . . Infiltration in the presence of a reactive atmosphere; Reactive infiltration

47/12 . . . . . . Infiltration or casting under mechanical pressure

47/14 . . . . . . by powder metallurgy, i.e. by processing mixtures of metal powder and fibres or filaments

47/16 . . . . . . by thermal spraying of the metal, e.g. plasma spraying (atomising molten metal comprising fibres see also C22C 1/1042)

47/18 . . . . . . using a preformed structure of fibres or filaments

47/20 . . . . . . by subjecting to pressure and heat an assembly comprising at least one metal layer or sheet and one layer of fibres or filaments

2047/205 . . . . . . (placing wires inside grooves of a metal layer)

49/00 Alloys containing metallic or non-metallic fibres or filaments

49/02 . . . . . . characterised by the fibres or filaments

Non-ferrous alloys, i.e. alloys based essentially on metals other than iron (master alloys for iron and steel C22C 35/00; alloys containing radioactive material C22C 43/00; amorphous alloys C22C 45/00; alloys containing fibres or filaments C22C 47/00, C22C 49/00)

2202/00 Physical properties

2202/02 . . . . . . Magnetic

2202/04 . . . . . . Hydrogen absorbing

2204/00 End product comprising different layers, coatings or parts of cermet

Light metals

Aluminium

Iron group metals

Refractory metals

Titanium

Intermetallic matrix material