COOPERATIVE PATENT CLASSIFICATION

PERFORMING OPERATIONS; TRANSPORTING

SHAPING

CASTING; POWDER METALLURGY

WORKING METALLIC POWDER; MANUFACTURE OF ARTICLES FROM METALLIC POWDER; MAKING METALLIC POWDER (processes or devices for granulating materials in general B01J 2/00; making ceramics by compacting or sintering C04B, e.g. C04B 35/64; for the production of metals as such, see class C22; reduction or decomposition of metal compounds in general C22B; making alloys by powder metallurgy C22C; electrolytic production of metal powder C25C 5/00)

NOTES
1. This subclass covers the making of metallic powder only insofar as powder with specific physical characteristics is made;
2. In this subclass, the following terms or expressions are used with the meanings indicated:
   • "metallic powder" covers powders containing a substantial proportion of non-metallic material;
   • "powder" includes somewhat larger particles which are worked, obtained or behave in a manner similar to powder, e.g. fibres.

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:
   B22F 3/035 covered by B22F 3/03
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.

Special treatment of metallic powder, e.g. to facilitate working, to improve properties
1/00  . . . . . . [Flake form powders]
1/0055 . . . . [Metallic powders mixed with a lubricating or binding agent or organic material]
1/0062 . . . . [Powders coated with organic material]
2001/0066 . . . . [Organic binder comprising a mixture or obtained by reaction of more than one component other than solvent, lubricant]
1/007 . . . . [Non-organic or metal salt binders or lubricants]
1/0074 . . . . [Organic materials comprising a solvent, e.g. for slip casting]
1/0077 . . . . [Mixtures obtained by warm mixing]
1/0081 . . . . [Special treatment of metallic powder, e.g. to facilitate working, to improve properties (coating with organic material B22F 1/0062)]
1/0085 . . . . [Thermal or thermo-mechanical treatment]
1/0088 . . . . [Chemical treatment, e.g. passivation]
2001/0092 . . . . [Making a dispersion]
1/0096 . . . . [Treatment resulting in the production of agglomerates]
1/02 . . . . comprising coating of the powder {coating with organic material B22F 1/0062; chemical surface treatment B22F 1/0088]}
1/025 . . . . [Metallic coating]
3/00 Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor {; Presses and furnaces]
Both compacting and sintering (by forging)

3/12 . . . [Containers or coating used therefor]
3/1208 . . . [Container composition]
3/1216 . . . [Glass]
3/1225 . . . [Organic material]
3/1241 . . . [layered]
3/125 . . . [Initially porous container]
3/1258 . . . [Container manufacturing]
3/1266 . . . [by coating or sealing the surface of the preformed article, e.g. by melting]
3/1275 . . . [by coating a model and eliminating the model before consolidation]
3/1283 . . . [Container formed as an undeformable model eliminated after consolidation]
3/1291 . . . [Solid insert eliminated after consolidation]
3/14 . . . simultaneously
3/2003/145 . . . [by warm compacting, below debindering temperature]
3/15 . . . Hot isostatic pressing
3/2003/153 . . . [by pressure medium in liquid or powder form]
3/16 . . . in successive or repeated steps
3/162 . . . [Machining, working after consolidation]
3/164 . . . [Partial deformation or calibration]
2003/166 . . . [Surface deformation, blasting, burnishing, sizing, coining]
3/168 . . . [Local deformation]
3/17 . . by forging
3/172 . . . [Continuous compaction, e.g. rotary hammering (with axial pressure and without reduction of section B22F 3/204)]
2003/175 . . . [by hot forging, below sintering temperature]
3/177 . . . [Rocking die forging]
3/18 . . by using pressure rollers
2003/185 . . . [by hot rolling, below sintering temperature]
3/20 . . by extruding
2003/202 . . . [with back pressure]
3/204 . . . [Continuous compaction with axial pressure and without reduction of section]
2003/206 . . . [Hydrostatic or hydraulic extrusion]
2003/208 . . . [Warm or hot extruding]
3/22 . . for producing castings from a slip
3/222 . . . [by freeze-casting or in a supercritical fluid]
3/225 . . . [by injection molding]
3/227 . . . [by organic binder assisted extrusion]
3/23 . . involving a self-propagating high-temperature synthesis or reaction sintering step ([making cermets by reaction sintering C22C 1/058])
3/24 . . . After-treatment of workpieces or articles ([B22F 3/146 takes precedence])
2003/241 . . . [Chemical after-treatment on the surface]
2003/242 . . . [Coating]
2003/244 . . . [Leaching]
2003/245 . . . [Making recesses, grooves etc on the surface by removing material]
2003/247 . . . [Removing material: carving, cleaning, grinding, hobbing, honing, lapping, polishing, milling, shaving, skiving, turning the surface]
2003/248 . . . [Thermal after-treatment]
3/26 . . . Impregnating [(making ferrous alloys by impregnation C22C 33/0242)]
5/00 Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product
2005/001 . . . [Cutting tools, earth boring or grinding tool other than table ware]
2005/002 . . . [Tools other than cutting tools]
5/003 . . . [Articles made for being fractured or separated into parts]
2005/004 . . . [Article comprising helical form elements ([B22F 3/1103 takes precedence)]
2005/005 . . . [Article surface comprising protrusions]
5/006 . . . [of flat products, e.g. sheets ([B22F 3/1103 takes precedence; by using pressure rollers only see B22F 3/18])]
5/007 . . . [of moulds]
5/008 . . . [of engine cylinder parts or of piston parts other than piston rings (of piston rings B22F 5/02)]
5/009 . . . [of turbine components other than turbine blades (of turbine blades B22F 5/04)]
5/02 . . . of piston rings
5/04 . . . of turbine blades
5/06 . . . of threaded articles, e.g. nuts
5/08 . . . of toothed articles, e.g. gear wheels; of cam discs
5/085 . . . [with helical contours]
5/10 . . . of articles with cavities or holes, not otherwise provided for in the preceding subgroups
2005/103 . . . [Cavity made by removal of insert]
5/106 . . . [Tube or ring forms]
5/12 . . . of wires ([of tubes B22F 5/10])
7/00 Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting [wherein at least one part is obtained by sintering or compression (application of coating layers by use of metal powders, see C23C)]
7/002 . . . [of porous nature]
7/004 . . . [comprising at least one non-porous part]
7/006 . . . [of the porous part being obtained by foaming]
7/008 . . . [characterised by the composition]
7/002 . . . [of composite layers ([B22F 7/002 takes precedence])]
7/04 . . . [with one or more layers not made from powder, e.g. made from solid metal]
2007/042 . . . [characterised by the layer forming method]
2007/045 . . . [accompanied by fusion or impregnation]
2007/047 . . . [non-pressurised baking of the paste or slurry containing metal powder]
7/06 . . . of composite workpieces or articles from parts, e.g. to form tipped tools ([B22F 7/002 takes precedence])
7/062 . . . [involving the connection or repairing of preformed parts]
7/064 . . . [using an intermediate powder layer]
2007/066 . . . [using impregnation]
2007/068 . . . [repairing articles]
7/08 . . . [with one or more parts not made from powder ([B22F 7/002 takes precedence])]
8/00 Manufacture of articles from scrap or waste metal particles
9/00 Making metallic powder or suspensions thereof
2009/001 . . . [from scrap particles]
9/002 . . . [amorphous or microcrystalline]
9/004 . . . [by diffusion, e.g. solid state reaction]
9/005 . . . [Transformation into amorphous state by milling]
9/007 . . . [Transformation of amorphous into microcrystalline state]
9/008 . . . [Rapid solidification processing]
9/02 . . . using physical processes
9/023 . . . [Hydrogen absorption]
9/026 . . . [Spray drying of solutions or suspensions]
9/04 . . . starting from solid material, e.g. by crushing, grinding or milling ([C22C 1/1084 takes precedence]); crushing, grinding or milling, in general, see the relevant subclasses, e.g. B02C]
2009/041 . . . [by mechanical alloying, e.g. blending, milling]
2009/042 . . . [using a particular milling fluid]
2009/043 . . . [by ball milling]
2009/044 . . . [by jet milling]
2009/045 . . . [by other means than ball or jet milling]
2009/046 . . . [by cutting]
2009/047 . . . [by rolling]
Metallic composition of the powder or its coating

Controlling

Aspects of the compositions, gradients

Metallic composition of the powder or its coating
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2301/25</td>
<td>Noble metals, i.e. Ag, Au, Os, Pd, Pt, Rh, Ru</td>
</tr>
<tr>
<td>2301/255</td>
<td>Silver or gold</td>
</tr>
<tr>
<td>2301/30</td>
<td>Low melting point metals, i.e. Zn, Pb, Sn, Cd, In, Ga</td>
</tr>
<tr>
<td>2301/35</td>
<td>Iron</td>
</tr>
<tr>
<td>2301/355</td>
<td>Rare Earth - Fe intermetallic alloys</td>
</tr>
<tr>
<td>2301/40</td>
<td>Intermetallics other than rare earth-Co or -Ni or -Fe intermetallic alloys</td>
</tr>
<tr>
<td>2301/45</td>
<td>Rare earth metals, i.e. Sc, Y, Lanthanides (57-71)</td>
</tr>
<tr>
<td>2302/00</td>
<td>Metal Compound, non-Metallic compound or non-metal composition of the powder or its coating</td>
</tr>
<tr>
<td>2302/05</td>
<td>Boride</td>
</tr>
<tr>
<td>2302/10</td>
<td>Carbide</td>
</tr>
<tr>
<td>2302/105</td>
<td>Silicium carbide (SiC)</td>
</tr>
<tr>
<td>2302/15</td>
<td>Carbonitride</td>
</tr>
<tr>
<td>2302/20</td>
<td>Nitride</td>
</tr>
<tr>
<td>2302/205</td>
<td>Cubic boron nitride</td>
</tr>
<tr>
<td>2302/25</td>
<td>Oxide</td>
</tr>
<tr>
<td>2302/253</td>
<td>Aluminum oxide (Al₂O₃)</td>
</tr>
<tr>
<td>2302/256</td>
<td>Silicium oxide (SiO₂)</td>
</tr>
<tr>
<td>2302/30</td>
<td>Oxynitride</td>
</tr>
<tr>
<td>2302/35</td>
<td>Complex boride, carbide, carbonitride, nitride, oxide or oxynitride</td>
</tr>
<tr>
<td>2302/40</td>
<td>Carbon, graphite</td>
</tr>
<tr>
<td>2302/403</td>
<td>Carbon nanotube</td>
</tr>
<tr>
<td>2302/406</td>
<td>Diamond</td>
</tr>
<tr>
<td>2302/45</td>
<td>Others, including non-metals</td>
</tr>
<tr>
<td>2303/00</td>
<td>Functional details of metal or compound in the powder or product,</td>
</tr>
<tr>
<td>2303/01</td>
<td>Main component</td>
</tr>
<tr>
<td>2303/05</td>
<td>Compulsory alloy component</td>
</tr>
<tr>
<td>2303/10</td>
<td>Optional alloy component</td>
</tr>
<tr>
<td>2303/15</td>
<td>Intermetallic</td>
</tr>
<tr>
<td>2303/20</td>
<td>Coating by means of particles</td>
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<tr>
<td>2303/25</td>
<td>Coating by means of fibres</td>
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<tr>
<td>2303/30</td>
<td>Coating alloy</td>
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<tr>
<td>2303/35</td>
<td>Molten metal infiltrating a metal preform</td>
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<tr>
<td>2303/40</td>
<td>Layer in a composite stack of layers, workpiece or article</td>
</tr>
<tr>
<td>2303/405</td>
<td>Support layer</td>
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<tr>
<td>2303/45</td>
<td>Part of a final mixture to be processed further</td>
</tr>
<tr>
<td>2304/00</td>
<td>Physical aspects of the powder</td>
</tr>
<tr>
<td>2304/05</td>
<td>Submicron size particles</td>
</tr>
<tr>
<td>2304/052</td>
<td>Particle size below 1nm</td>
</tr>
<tr>
<td>2304/054</td>
<td>Particle size between 1 and 100 nm</td>
</tr>
<tr>
<td>2304/056</td>
<td>Particle size above 100 nm up to 300 nm</td>
</tr>
<tr>
<td>2304/058</td>
<td>Particle size above 300 nm up to 1 micrometer</td>
</tr>
<tr>
<td>2304/10</td>
<td>Micron size particles, i.e. above 1 micrometer up to 500 micrometer</td>
</tr>
<tr>
<td>2304/15</td>
<td>Millimeter size particles, i.e. above 500 micrometer</td>
</tr>
<tr>
<td>2998/00</td>
<td>Supplementary information concerning processes or compositions relating to powder metallurgy</td>
</tr>
<tr>
<td>2998/10</td>
<td>Processes characterised by the sequence of their steps</td>
</tr>
<tr>
<td>2999/00</td>
<td>Aspects linked to processes or compositions used in powder metallurgy</td>
</tr>
</tbody>
</table>