

ECLA**EUROPEAN CLASSIFICATION****B22F**

WORKING METALLIC POWDER; MANUFACTURE OF ARTICLES FROM METALLIC POWDER; MAKING METALLIC POWDER (processes or devices for granulating materials in general [B01J2/00](#); making ceramics by compacting or sintering C04B, e.g. [C04B35/64](#); 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 [C25C5/00](#)) [C9409]

[N: **WARNING** [C2012.01]

1. The following IPC groups are not used in the internal ECLA classification scheme. Subject matter covered by these groups is classified in the following ECLA groups: [B22F3/035](#) covered by [B22F3/03](#)
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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.

B22F1/00

Special treatment of metallic powder, e.g. to facilitate working, to improve properties [N: (treatment of powder by mechanical means, e.g. by grinding, milling, rolling [B22F9/04](#)); **Metallic powders per se, e.g. mixtures of particles of different composition** (C04, C08 take precedence; [N: amorphous powder [B22F9/00M](#))]

B22F1/00A

- [N: Metallic powders per se; Mixtures of metallic powders; Metallic powders mixed with a lubricating or binding agent (making ferrous alloys using a mixture of prealloyed powders [C22C33/02A](#))]

B22F1/00A2

- • [N: Metallic powder characterised by its shape or structure, e.g. fibre structure]

B22F1/00A2B

- • • [N: Metallic powder characterised by size or surface area only] [N9711]

[N: **WARNING**

Groups [B22F1/00A2B](#) and [B22F1/00A2B2](#) are not complete, see also [B22F1/00A2](#)

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B22F1/00A2B2

- • • • [N: by size mixtures or distribution] [N9711]

B22F1/00A2B4

- • • • [N: Nanometer sized particles] [N9711]

B22F1/00A2B4D

- • • • • [N: Dispersions or suspensions thereof] [N0706] [N: WARNING: Not complete, see also B22F1/00A2B4] [N0706]

B22F1/00A2B4F

- • • • • [N: Nanofibres or nanotubes] [N0706] [N: WARNING: Not complete, see also B22F1/00A2B4] [N0706]

- B22F1/00A2F . . . [N: Fibre structure (B22F1/00A2B4F takes precedence)] [C0706]
- B22F1/00A2N . . . [N: Nanometer size structures] [N0006]
- B22F1/00A2S . . . [N: Spherical powder]
- B22F1/00A2S2 [N: Hollow particles]
- B22F1/00A2V . . . [N: Flake form powders] [N0706] [N: WARNING: Not complete, see also B22F1/00A2] [N0706]
- B22F1/00A4 . . . [N: Metallic powders mixed with a lubricating or binding agent or organic material]
- B22F1/00A4C . . . [N: Powders coated with organic material] [N0706]
- B22F1/00A4N . . . [N: Non-organic or metal salt binders or lubricants] [N0706]
- B22F1/00A4S . . . [N: Organic materials comprising a solvent e.g. for slip casting] [N0706]
- B22F1/00A4W . . . [N: Mixtures obtained by warm mixing] [N0706]

- B22F1/00B . . . [N: Special treatment of metallic powder, e.g. to facilitate working, to improve properties (coating with organic material B22F1/00A4C)] [C0706]
- B22F1/00B1 . . . [N: Thermal or thermo-mechanical treatment]
- B22F1/00B2 . . . [N: Chemical treatment, e.g. passivation]
- B22F1/00B4 . . . [N: Treatment resulting in the production of agglomerates]

- B22F1/02 . . . comprising coating of the powder [N: (coating with organic material B22F1/00A4C; chemical surface treatment B22F1/00B2)] [C0706]
- B22F1/02B . . . [N: Metallic coating]

- B22F3/00** **Manufacture of workpieces or articles from metallic powder characterised by the manner of compacting or sintering; Apparatus specially adapted therefor; [N: Presses and furnaces]**

- B22F3/00B . . . [N: Starting from powder comprising reducible metal compounds (making ferrous alloys starting from compounds [C22C33/02B](#))]
- B22F3/00F . . . [N: Manufacture of articles essentially made from metallic fibres]
- B22F3/00H . . . [N: Apparatus, e.g. furnaces (in general [F27B](#))]
- B22F3/00K . . . [N: Filling molds with powder (feeding material to presses in general [B30B15/30B](#))]
- B22F3/00L . . . [N: Loading or unloading powder metal objects (transport in general [B65G](#))]
- B22F3/00M . . . [N: Amorphous articles]
- B22F3/00M2 . . . [N: by diffusion starting from non-amorphous articles prepared by powder metallurgy]

- B22F3/00S . . . [N: Selective deposition modelling ([B22F3/105S](#) takes precedence)] [N0006] [C0207]

- B22F3/02 . . . Compacting only
- B22F3/03 . . . Press-moulding apparatus therefor [N9411]
- B22F3/04 . . . by applying fluid pressure [N: e.g. by cold isostatic pressing [CIP]] [C1201]
- B22F3/04S [N: Semi-isostatic pressure] [N0006]
- B22F3/06 . . . by centrifugal forces

- B22F3/08 . . by explosive forces [N: (generating shock waves in general [G10K15/04B](#))]
- B22F3/087 . . using high energy impulses, e.g. magnetic field impulses [N9411]
- B22F3/093 . . using vibrations [N: or friction] [N9411] [C0207]

- B22F3/10 . Sintering only [C9411]
- B22F3/10A . . [N: Use of special medium during sintering, e.g. sintering aid]
- B22F3/10A2 . . . [N: Atmosphere ([B22F3/10C2](#) takes precedence)]
- B22F3/10A2C [N: Changing atmosphere]
- B22F3/10C . . [N: Multiple heating or additional steps ([B22F3/10A2C](#) takes precedence)]
- B22F3/10C2 . . . [N: Removal of binder or filler (removal of binder from ceramics [C04B35/638](#))]
- B22F3/10C2B [N: not by heating only]
- B22F3/10C4 . . . [N: Controlled cooling]
- B22F3/10L . . [N: Liquid phase sintering]
- B22F3/10R . . [N: by reaction ([B22F3/00B](#), [B22F3/23](#) take precedence)]
- B22F3/105 . . by using electric current [N: other than for infra-red radiant energy], laser radiation or plasma ([B22F3/11](#) takes precedence); [N: by ultrasonic bonding ([B22F3/115](#) takes precedence)]
- B22F3/105S . . . [N: Selective sintering, i.e. stereolithography (selective sintering of powdered plastics [B29C67/00R4B](#))] [N9601] [C1003]
- B22F3/11 . . Making porous workpieces or articles [N9705]
- B22F3/11B . . . [N: with particular physical characteristics] [N9705]
- B22F3/11B2 [N: Inhomogenous pore distribution (composite layers of porous nature [B22F7/00B](#))] [N9705]
- B22F3/11B4 [N: comprising hollow spheres or hollow fibres] [N9705] [C0207]
- B22F3/11B6 [N: comprising complex forms, e.g. honeycombs] [N9705]
- B22F3/11B8 [N: comprising internal reinforcements] [N9705]
- B22F3/11D [N: by using decomposable, meltable or sublimatable fillers] [N9705]
- B22F3/11D2 [N: involving a foaming process] [N9705]
- B22F3/11D4 [N: Inorganic fillers (carbonaceous or paper filler [B22F3/11D](#))] [N9705]
- B22F3/11D6 [N: by coating porous removable preforms] [N0006]
- B22F3/11E . . . [N: the porous products being formed by impregnation ([B22F3/11D6](#), [B22F3/26](#) take precedence)] [N9705]
- B22F3/11R . . . [N: involving an oxidation, reduction or reaction step] [N9705]
- B22F3/11T . . . [N: After-treatment maintaining the porosity ([B22F3/11E](#) takes precedence)] [N0207]

- B22F3/115 . . by spraying molten metal, i.e. spray sintering, spray casting [N: (also classified in [C23C4/12A](#), [C23C4/18B](#))]

- B22F3/12 . . Both compacting and sintering (by forging [B22F3/17](#)) [C9411]
- B22F3/12B . . [N: Containers or coating used therefor]
- B22F3/12B2 . . . [N: Container composition]
- B22F3/12B2G [N: Glass]
- B22F3/12B2H [N: Organic material]
- B22F3/12B2L [N: layered]

- B22F3/12B4 . . . [N: Initially porous container]
- B22F3/12B6 . . . [N: Container manufacturing]
- B22F3/12B6B [N: by coating or sealing the surface of the preformed article, e.g. by melting]
- B22F3/12B6D [N: by coating a model and eliminating the model before consolidation]
- B22F3/12B6F [N: Container formed as an undeformable model eliminated after consolidation]
- B22F3/12B6H [N: Solid insert eliminated after consolidation]
- B22F3/14 . . . simultaneously
- B22F3/15 . . . Hot isostatic pressing [N9411]
- B22F3/15L [N: by a pressure medium in liquid or powder form] [N0706]
- B22F3/16 . . . in successive or repeated steps [N: WARNING: Subgroups of B22F3/16 are not complete, see also B22F3/16] [N0706]
- B22F3/16M [N: Machining, working after consolidation] [N0706]
- B22F3/16P [N: Partial deformation or calibration] [N0706]
- B22F3/16P4 [N: Local deformation] [N0706]

- B22F3/17 . . . by forging [N9411]
- B22F3/17C . . . [N: Continuous compaction, e.g. rotary hammering (with axial pressure and without reduction of section [B22F3/20C](#))] [N9411]
- B22F3/17R . . . [N: Rocking die forging] [N9411]

- B22F3/18 . . . by using pressure rollers [C9411]

- B22F3/20 . . . by extruding [C9411]
- B22F3/20C . . . [N: Continuous compaction with axial pressure and without reduction of section]

- B22F3/22 . . . for producing castings from a slip
- B22F3/22C . . . [N: by freeze-casting or in a supercritical fluid]
- B22F3/22D . . . [N: by injection molding] [N0706] [WARNING: Not complete, see also B22F3/22] [N0706]
- B22F3/22E . . . [N: by organic binder assisted extrusion] [N0706] [N: WARNING: Not complete, see also B22F3/22] [N0706]

- B22F3/23 . . . involving a self-propagating high-temperature synthesis or reaction sintering step [N: (making cermets by reaction sintering [C22C1/05R](#))]

- B22F3/24 . . . After-treatment of workpieces or articles [N: ([B22F3/11T](#) takes precedence)] [C0207]
- B22F3/26 . . . Impregnating [N: (making ferrous alloys by impregnation [C22C33/02C](#))]

- B22F5/00** **Manufacture of workpieces or articles from metallic powder characterised by the special shape of the product**

- B22F5/00F . . . [N: Articles made for being fractured or separated into parts] [N9705]
- B22F5/00L . . . [N: of flat products, e.g. sheets ([B22F3/11B](#) takes precedence; by using pressure rollers only see [B22F3/18](#))] [N0207]
- B22F5/00M . . . [N: of moulds]

- B22F5/00P . [N: of engine cylinder parts or of piston parts other than piston rings (of piston rings B22F5/02)] [N0706]
- B22F5/00T . [N: of turbine components other than turbine blades (of turbine blades B22F5/04)] [N0706]
- B22F5/02 . of piston rings
- B22F5/04 . of turbine blades
- B22F5/06 . of threaded articles, e.g. nuts
- B22F5/08 . of toothed articles, e.g. gear wheels; of cam discs
- B22F5/08H . . [N: with helical contours] [N0706]
- B22F5/10 . of articles with cavities or holes, not otherwise provided for in the preceding subgroups
- B22F5/10T . . [N: Tube or ring forms] [N0706] [N: WARNING: Not complete, see also B22F5/10] [N0706]
- B22F5/12 . of wires [N: (of tubes [B22F5/10](#))] [C9411]

- B22F7/00** **Manufacture of composite layers, workpieces, or articles, comprising metallic powder, by sintering the powder, with or without compacting** [N: wherein at least one part is obtained by sintering or compression (application of coating layers by use of metal powders, see C23C)]
- B22F7/00B . [N: of porous nature]
- B22F7/00B2 . . [N: comprising at least one non-porous part] [N9705]
- B22F7/00B2F . . . [N: the porous part being obtained by foaming] [N0006]
- B22F7/00C . [N: characterised by the composition] [N0006]
- B22F7/02 . of composite layers [N: ([B22F7/00B](#) takes precedence)]
- B22F7/04 . . with one or more layers not made from powder, e.g. made from solid metal
- B22F7/06 . of composite workpieces or articles from parts, e.g. to form tipped tools [N: ([B22F7/00B](#) takes precedence)]
- B22F7/06C . . [N: involving the connection or repairing of preformed parts] [N9705]
- B22F7/06C2 . . . [N: using an intermediate powder layer] [N9705]
- B22F7/08 . . with one or more parts not made from powder [N: ([B22F7/06C](#) takes precedence)]

- B22F8/00** **Manufacture of articles from scrap or waste metal particles** [N9411]

- B22F9/00** **Making metallic powder or suspensions thereof**
- B22F9/00M . [N: amorphous or microcrystalline]
- B22F9/00M2 . . [N: by diffusion, e.g. solid state reaction]

- B22F9/00M2B . . . [N: Transformation into amorphous state by milling]
- B22F9/00M4 . . [N: Transformation of amorphous into microcrystalline state]
- B22F9/00M6 . . [N: Rapid solidification processing]

- B22F9/02 . using physical processes
- B22F9/02H . . [N: Hydrogen absorption]
- B22F9/02S . . [N: Spray drying of solutions or suspensions] [N0006]
- B22F9/04 . . starting from solid material, e.g. by crushing, grinding or milling ([N: [C22C1/10F](#) takes precedence]; crushing, grinding or milling, in general, see the relevant subclasses, e.g. [B02C](#)) [C0207]

- B22F9/06 . . starting from liquid material
- B22F9/08 . . . by casting, e.g. through sieves or in water, by atomising or spraying (using electric discharge [B22F9/14](#))
- B22F9/08D [N: atomising using a fluid (using centrifugal force [B22F9/10](#))] [N1201]
- B22F9/10 using centrifugal force
- B22F9/12 . . starting from gaseous material
- B22F9/14 . . using electric discharge

- B22F9/16 . using chemical processes
- B22F9/18 . . with reduction of metal compounds
- B22F9/20 . . . starting from solid metal compounds
- B22F9/22 using gaseous reductors
- B22F9/24 . . . starting from liquid metal compounds, e.g. solutions
- B22F9/26 using gaseous reductors
- B22F9/28 . . . starting from gaseous metal compounds
- B22F9/30 . . with decomposition of metal compounds, e.g. by pyrolysis
- B22F9/30C . . . [N: of metal carbonyls]