EUROPEAN PATENT OFFICE
U.S. PATENT AND TRADEMARK OFFICE

CPC NOTICE OF CHANGES 1639

DATE: AUGUST 1, 2024

PROJECT DP11747

The following classification changes will be effected by this Notice of Changes:

Action	**Subclass**	**Group(s)**
DEFINITIONS:		
Definitions New:	B22F	10/10, 10/12, 10/20, 10/22, 10/25, 10/28, 10/31, 10/32, 10/322, 10/36, 10/362, 10/364, 10/366, 10/368, 10/38, 10/385, 10/39, 10/40, 10/43, 10/47, 10/50, 10/60, 10/62, 10/64, 10/66, 10/68, 10/70, 10/73, 10/77, 10/80, 10/85
	B22F	12/00, 12/10, 12/13, 12/17, 12/20, 12/22, 12/222, 12/224, 12/226, 12/30, 12/33, 12/37, 12/38, 12/41, 12/42, 12/43, 12/44, 12/45, 12/46, 12/47, 12/48, 12/49, 12/50, 12/52, 12/53, 12/55, 12/57, 12/58, 12/60, 12/63, 12/67, 12/70, 12/80, 12/82, 12/84, 12/88, 12/90
Definitions Modified:	B22F	10/00, 10/14, 10/16, 10/18, 10/30, 10/34, 10/37
	B22F	12/86

No other subclasses/groups are impacted by this Notice of Changes.

This Notice of Changes includes the following *[Check the ones included]:*

1. CLASSIFICATION SCHEME CHANGES
   - ☐ A. New, Modified or Deleted Group(s)
   - ☐ B. New, Modified or Deleted Warning(s)
   - ☐ C. New, Modified or Deleted Note(s)
   - ☐ D. New, Modified or Deleted Guidance Heading(s)
2. DEFINITIONS
   - ☒ A. New or Modified Definitions (Full definition template)
   - ☐ B. Modified or Deleted Definitions (Definitions Quick Fix)
3. ☐ REVISION CONCORDANCE LIST (RCL)
4. ☐ CHANGES TO THE CPC-TO-IPC CONCORDANCE LIST (CICL)
5. ☐ CHANGES TO THE CROSS-REFERENCE LIST (CRL)

2. A. DEFINITIONS (new)

B22F10/10

Definition statement

This place covers:

Processes where a green body is first formed and where the metallic article is usually obtained by subsequent de-binding and sintering.

The green body comprises metallic powder bonded by a binder which may include organic or inorganic material.

B22F10/12

Definition statement

This place covers:

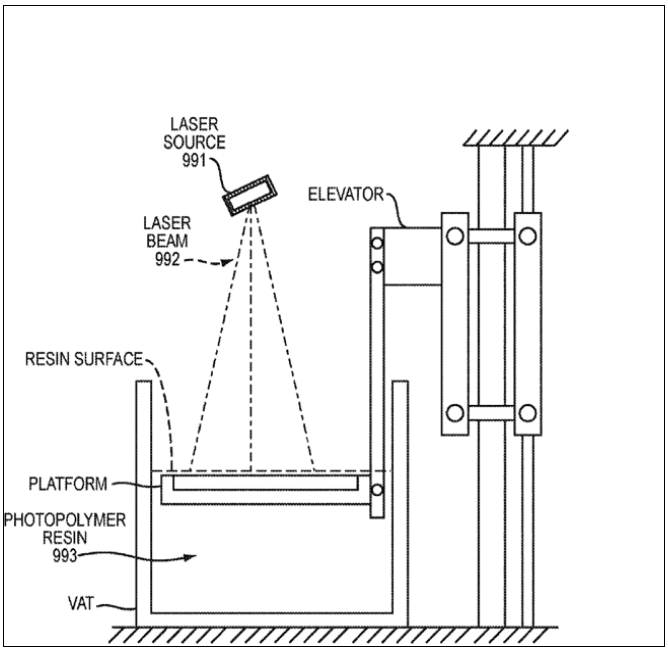
Processes where a light source is used to cure a mixture comprising a photopolymer (light-activated resin) and a metallic powder to form a green body.

In the stereolithography [SLA] process, the light source traces the contour of a part, solidifying the photopolymer of the mixture.

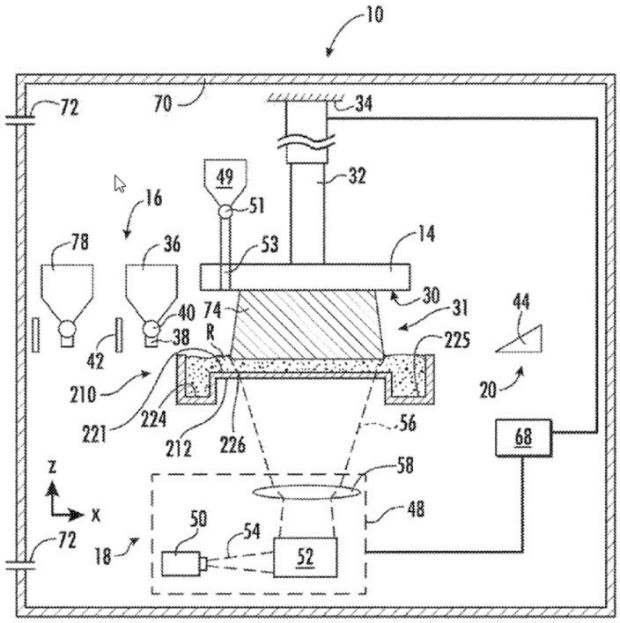
In the digital light processing [DLP] process, the solidification of the photopolymer of the mixture occurs using a digital light projector screen to flash an image of each layer at once.

Illustrative examples of subject matter classified in this place:

1. Stereolithography [SLA]



2. Digital light processing [DLP]



B22F10/20

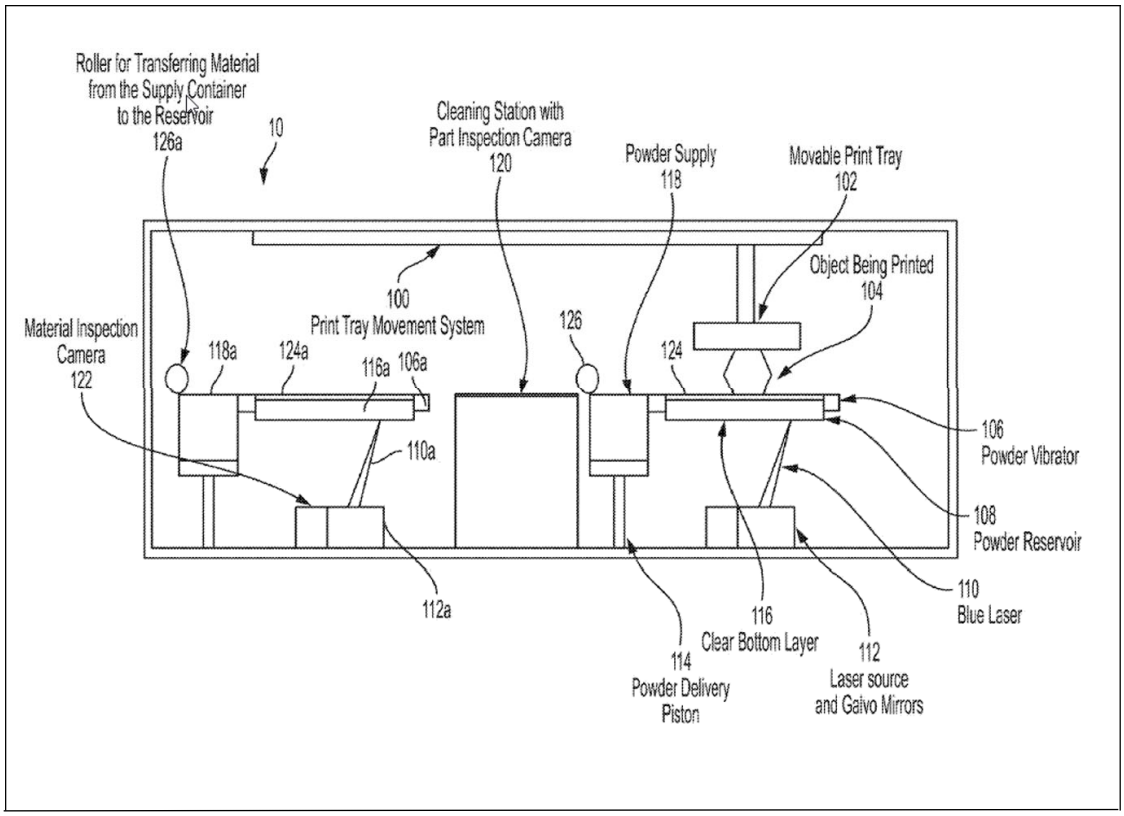
Definition statement

This place covers:

Manufacture of articles where the final metallic part is formed directly without need for subsequent sintering. The latter in this case is considered an after treatment.

Illustrative example of subject matter classified in this place:

Inverted laser sintering [ILS]



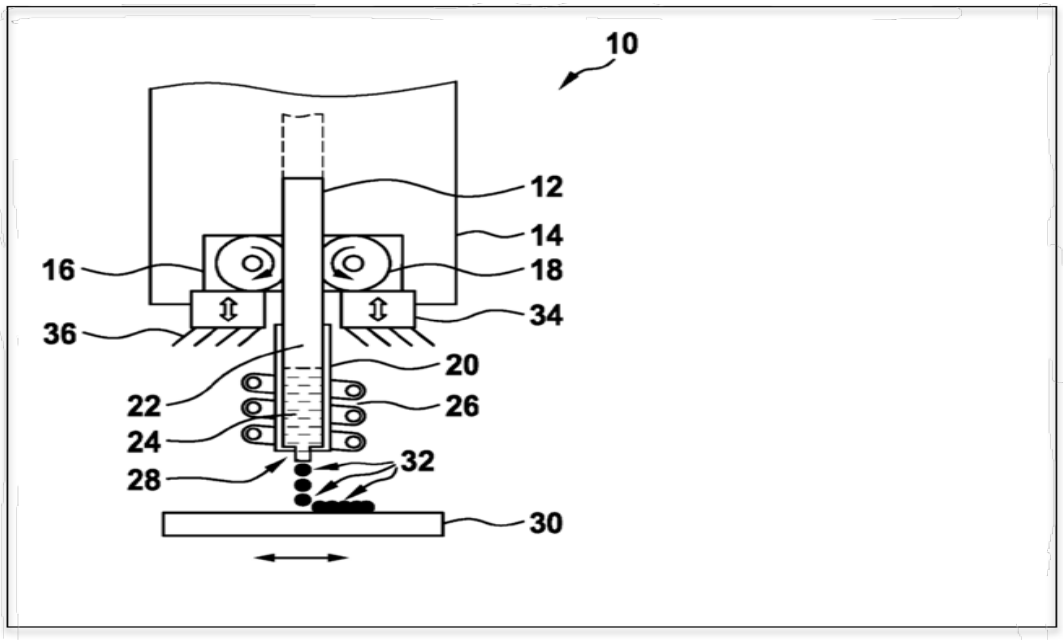
B22F10/22

Definition statement

This place covers:

Processes where molten metal is deposited directly onto a substrate or previously fabricated preform, for example, as droplets, i.e. drop-on-demand [DOD].

Illustrative example of subject matter classified in this place:



Additive manufacturing using a print head (10) for ejecting droplets (32) of liquid metal (24). The wire (12) in a solid phase (22), is pushed into a melting chamber (20) and melted into its liquid phase (24). At the far end of the melting chamber is an exit orifice (28) for the ejection of gobs (32) of molten wire.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Moulding by spraying metal on a surface	B22D23/003
Manufacture of workpieces or articles from metallic powder by spraying molten metal, i.e. spray sintering or spray casting	B22F3/115
Coating by spraying molten metal	C23C4/123
Separation of the coating material from the substrate	C23C4/185

B22F10/25

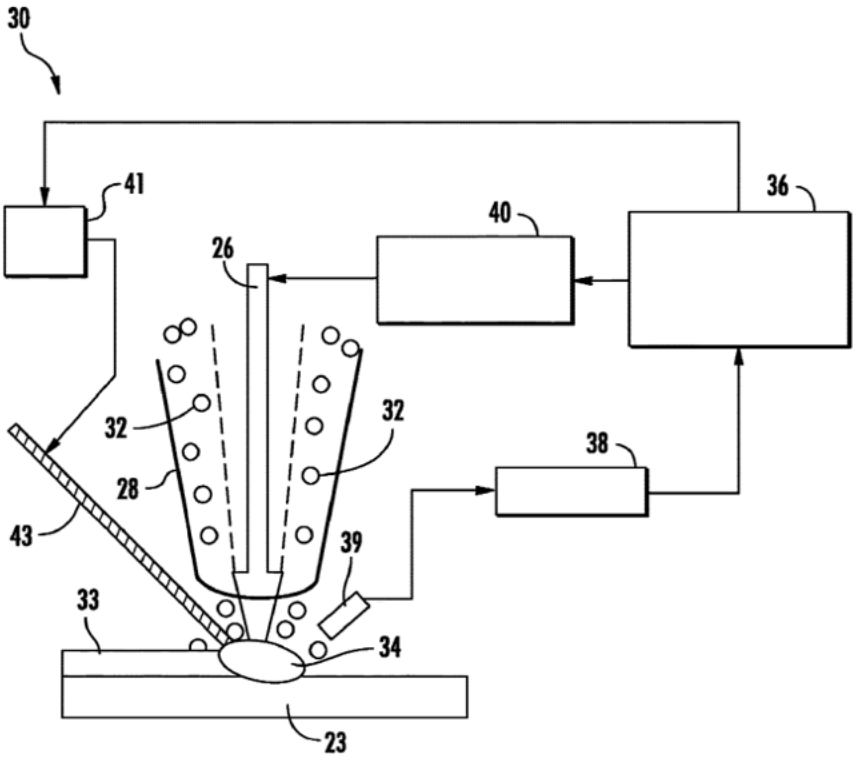
Definition statement

This place covers:

Processes where metal particles are deposited into a melt pool that has been generated on the surface of a substrate or previously fabricated preform by using an energy source, forming an article layer by layer. Typical energy sources are laser and electron beams and plasma.

Illustrative example of subject matter classified in this place:

Direct metal deposition [DMD]



Laser (26), DMD head (28), powder (32) and melt pool (34) are disclosed.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metal wire melting to create build up weld	B23K

B22F10/28

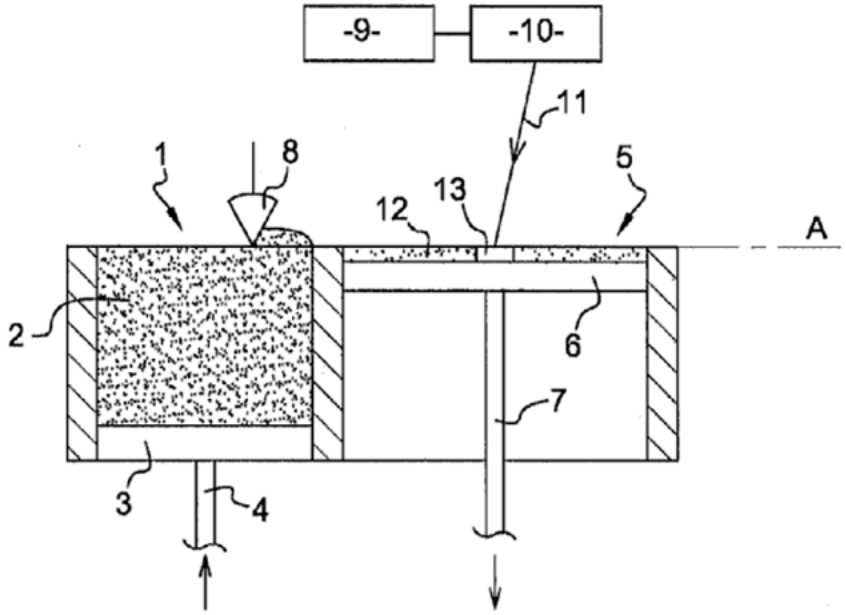
Definition statement

This place covers:

Processes where metal particles are selectively consolidated by melting or sintering them together using a heat source such as laser or electron beam. The powder surrounding the consolidated part acts as support material.

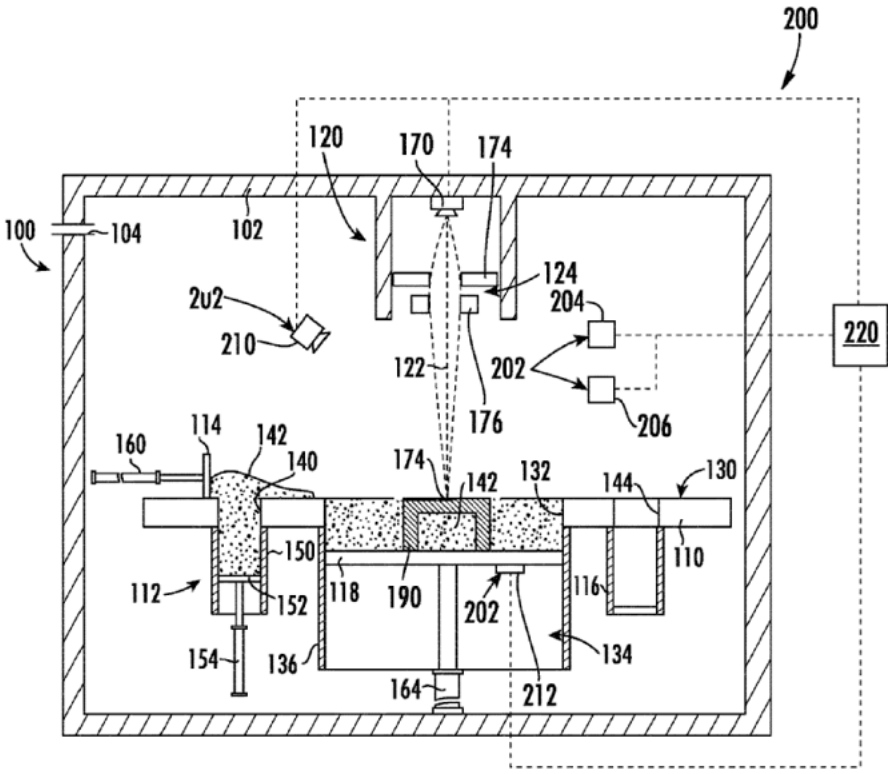
Illustrative examples of subject matter classified in this place:

1.



Selective melting in powder bed using laser or electron beam (11).

2.



Electron beam (122) melting in powder (142) bed.

B22F10/31

Definition statement

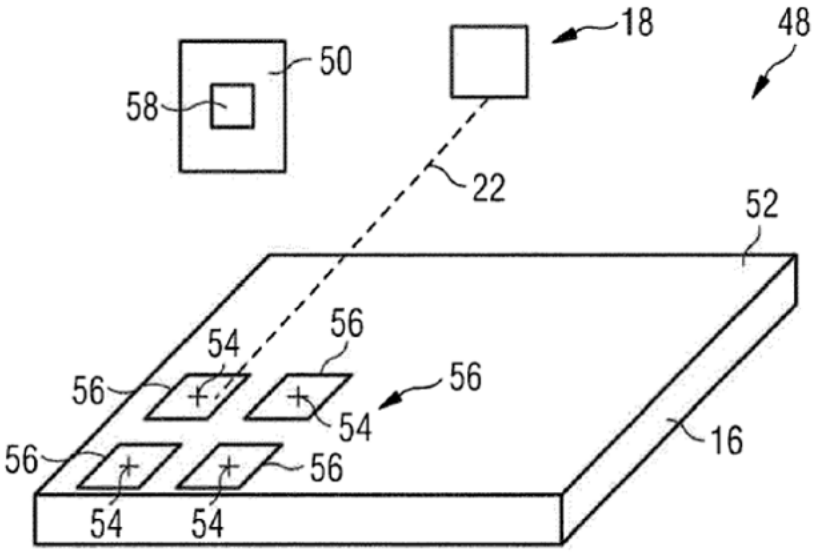
This place covers:

Process control with the purpose of calibrating either process steps or apparatus settings, e.g. before or during manufacturing.

For example, the position of the laser beam spot is calibrated within the building plane in selective laser melting [SLM].

Illustrative example of subject matter classified in this place:

Calibration of irradiation system in SLM



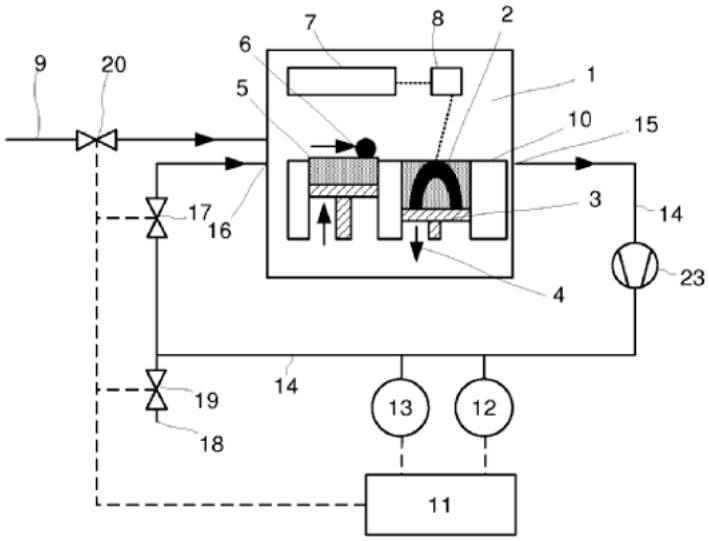
B22F10/32

Definition statement

This place covers:

Process control with the purpose of controlling the atmosphere within the additive manufacturing apparatus, e.g. composition or pressure within a build chamber.

Illustrative example of subject matter classified in this place:



Atmosphere control for SLM using a hydrogen sensor (12) and an oxygen sensor (13) for controlling the atmosphere in the processing chamber (1) based on the sensor values.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Recycling of gas	B22F10/77

B22F10/322

Definition statement

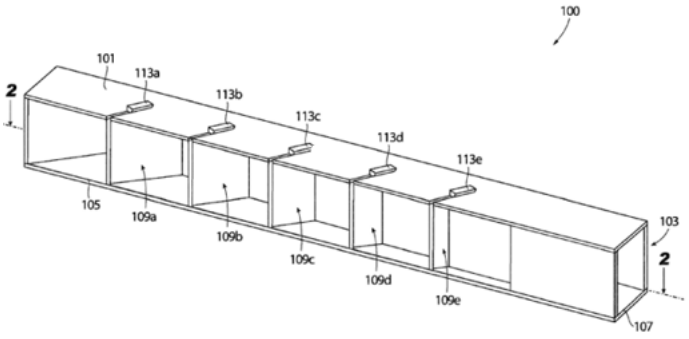
This place covers:

Process control with the purpose of controlling the gas flow, e.g. rate or direction, within the additive manufacturing apparatus before or during the additive manufacture.

Process control such as removal of fumes generated during the additive manufacture.

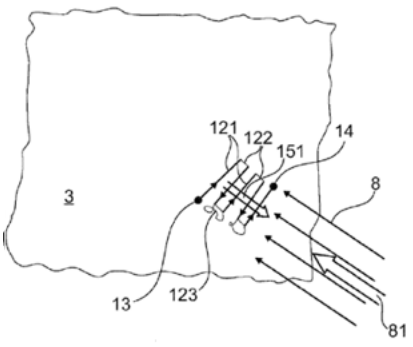
Illustrative examples of subject matter classified in this place:

1.



Controlling gas flow above the build plate, where flow filed sensor data is used to modify the flow with the help of actuators (113 a-e) connected to baffles (109 a-e) of an exhaust manifold (100).

2.



Controlling shielding gas flow direction (81) dependent on, e.g. the direction of scanning (151).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Recycling of gas	B22F10/77
Gas flow means	B22F12/70

B22F10/36

Definition statement

This place covers:

Process control related to the energy beam. Note that process control of other types of energy sources, such as LED arrays or lamps, is also classified here.

Special rules of classification

Controlling energy beam parameters, such as scan speed and intensity, is classified in B22F 10/36, while controlling energy beam parameters for the purpose of calibration is classified in B22F10/31.

B22F10/362

Definition statement

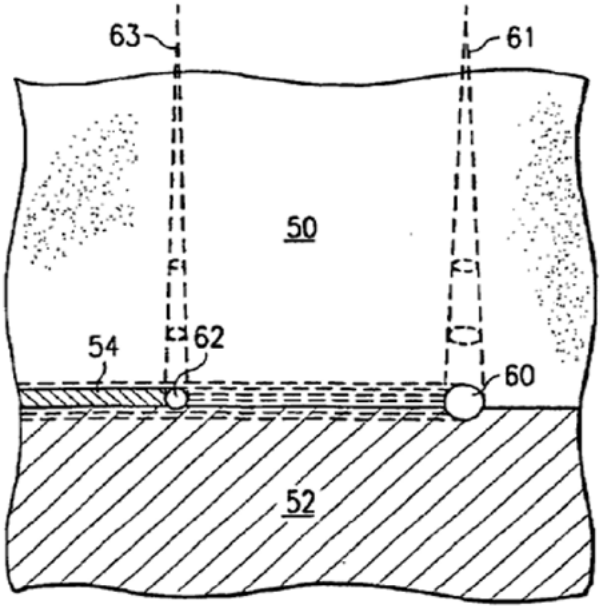
This place covers:

Process control with the purpose of providing preheating within the additive manufacturing apparatus by controlling the energy beam parameters, such as power or spot size, wherein preheating refers to any heating operation that takes place prior to the selective treatment of the powder, such as sintering, melting or binding, to form a section of the workpiece.

Preheating may relate to the heating of the metallic powder or may relate to the heating of the additive manufacturing apparatus, such as a build platform.

Illustrative example of subject matter classified in this place:

Preheating in selective laser melting/sintering [SLM/SLS]



B22F10/364

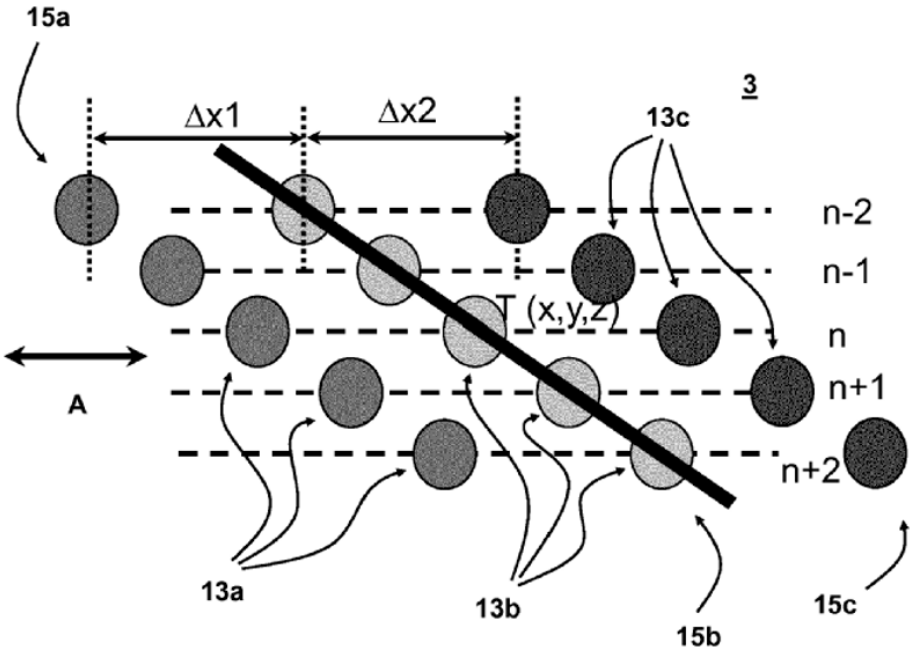
Definition statement

This place covers:

Process control with the purpose of providing post-heating within the additive manufacturing apparatus by controlling the energy beam parameters, such as power or spot size, wherein post-heating refers to any heating operation that takes place after the selective treatment of the powder, such as sintering, melting or binding, to form a section of the workpiece.

Post-heating may relate to the remelting of the section of the workpiece, typically for smoothening the surface.

Illustrative example of subject matter classified in this place:



Arrays (15a-c) of beam spots (13a-13c) for both preheating (a) and post-heating (c) in addition to fusing (b).

B22F10/366

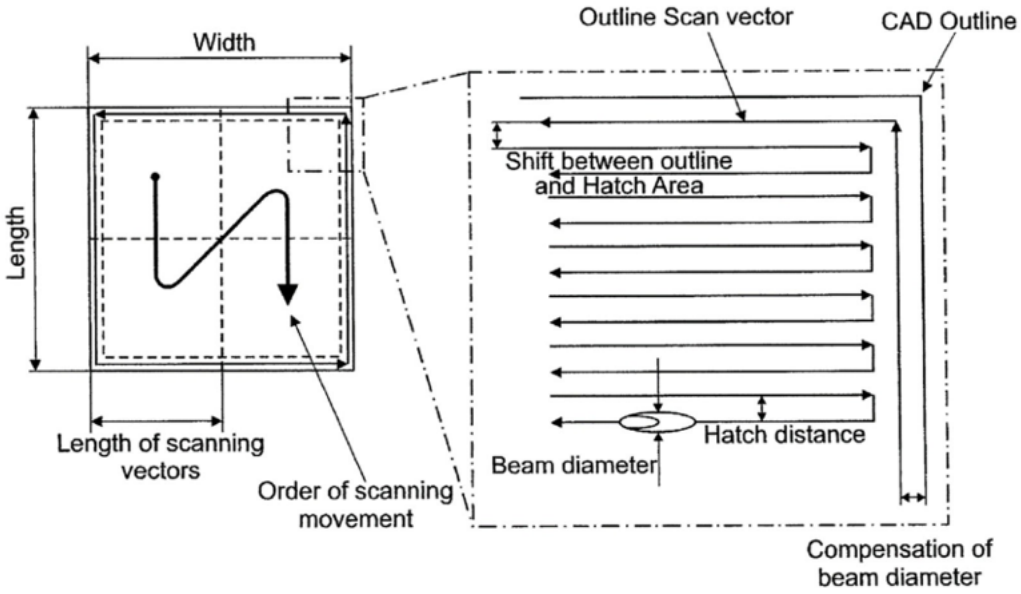
Definition statement

This place covers:

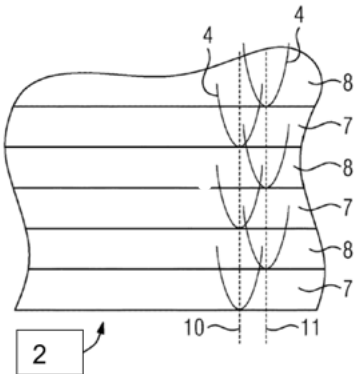
Process control with the purpose of controlling the beam parameters to implement a desired scanning. The aspect control may relate to scanning parameters, such as hatch distance, scan path, rastering, or overlap, or scan strategies to selectively sinter or fuse the powder in SLM or SLS, for example to improve productivity, optimize thermal conductivity or modify the microstructure of the workpiece.

Illustrative examples of subject matter classified in this place:

1. Track alignment in selective laser melting [SLM]



2.



SLS, where a contour position (10,11) of the object (2) is different for different layers (7,8).

B22F10/368

Definition statement

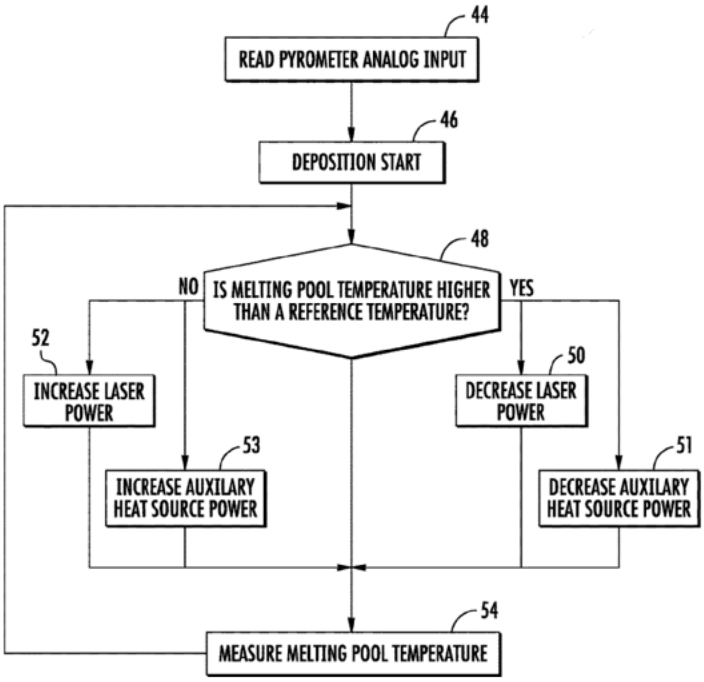
This place covers:

Process control with the purpose of controlling temperature or temperature gradients. The process aspect control may relate to operations such as

controlling the temperature in the melt pool in SLM or temperature gradients within the workpiece (or within the powder bed in SLS or SLM).

Illustrative example of subject matter classified in this place:

Temperature control of melt pool



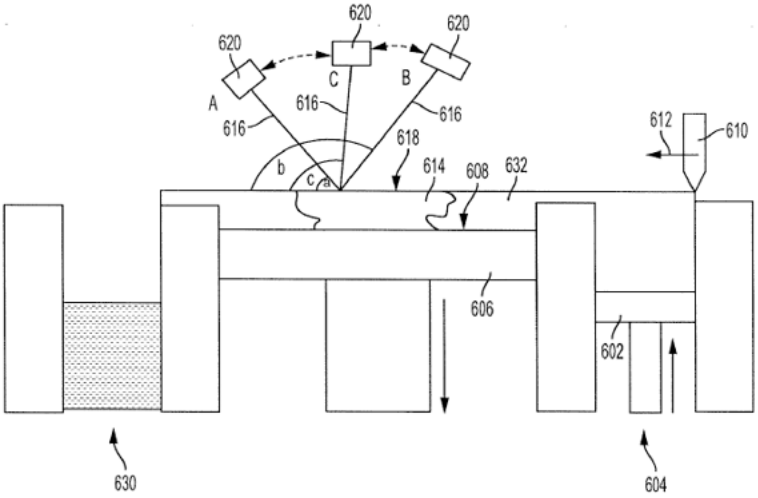
B22F10/38

Definition statement

This place covers:

Process control with the purpose of achieving specific properties of the manufactured product, such as surface smoothness, density, porosity or specific microstructure or grain orientation.

Illustrative example of subject matter classified in this place:



Additively manufacturing a turbine engine component, where grain orientation is controlled by varying the laser (616) irradiation angle (a, b, c) of the galvanometric scanner (620).

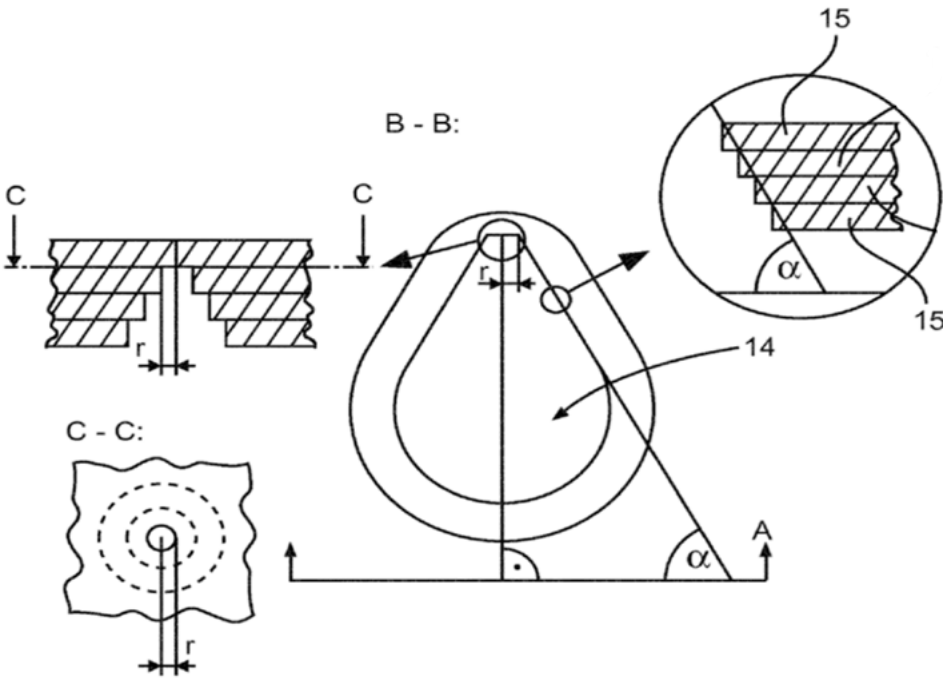
B22F10/385

Definition statement

This place covers:

Processes to control the formation of overhanging structures including down-skin surfaces and hollow portions inside the product by means other than support structures.

Illustrative example of subject matter classified in this place:



A method for manufacturing a component having an overhang, wherein a local build-up angle (α), which occurs between two consecutive layer sections (15) of an overhang, does not fall below a predetermined minimum build-up angle to the base layer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structures for supporting workpieces or articles during manufacture and removed afterwards	B22F10/40

B22F10/39

Definition statement

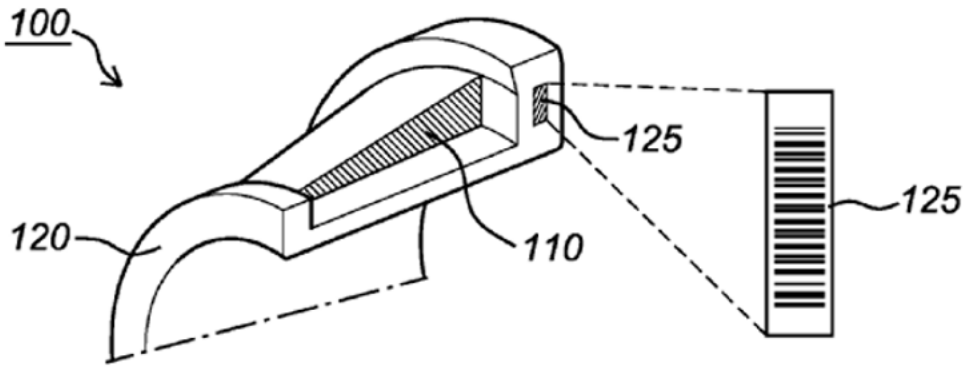
This place covers:

Process control concerning the history of a workpiece by means of documented recorded identification.

The history of the workpiece may include information relating to any step occurring before, during or after the additive manufacture of the workpiece, such as the material used to manufacture the workpiece, parameter values during the additive manufacture, plant location or customer name.

Traceability may be achieved by incorporating an identifier into the workpiece.

Illustrative example of subject matter classified in this place:



Identification barcode (125).

B22F10/40

Definition statement

This place covers:

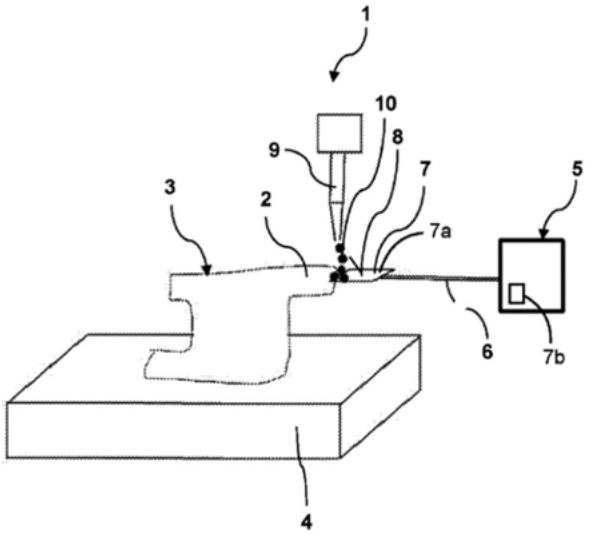
Process aspects relating to the provision of a support structure for the workpiece during its manufacture.

The term support structure may relate to a structure additively generated simultaneously with the workpiece, as it is typically the case in powder bed techniques, or may relate to an external support provided to enable the generation of a specific portion of the workpiece subjected to (mechanical) stress, such as may be the case in direct deposition techniques. The support structure is removed afterwards to recover the workpiece. The support structure does not need to be attached to the object to fulfil the requirement of conducting heat away from the object as in powder bed fusion.

Support devices as an alternative to additively manufactured support structures are also included in this group.

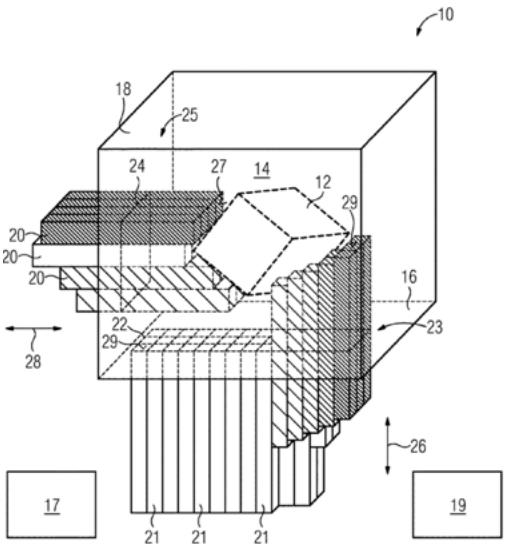
Illustrative examples of subject matter classified in this place:

1.



Support device (5) with at least one movable support arm (6) for temporary holding of at least one support element (7) arranged on the support arm during the additive manufacturing of a particular component (3) above the building platform (4).

2.



Bar elements (20, 21) for supporting manufactured article (12).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structures for supporting 3D objects during manufacture and intended to be sacrificed after completion thereof	B29C 64/40

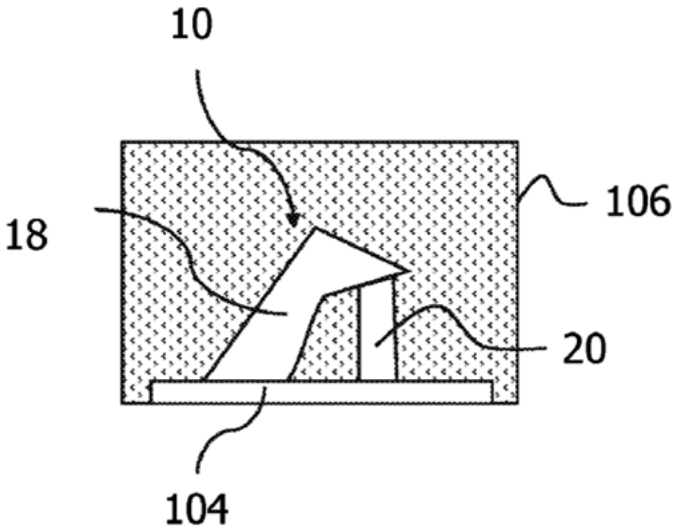
B22F10/43

Definition statement

This place covers:

Process aspects relating to the material selected to form the structure supporting the workpiece during its manufacture. The material is selected for a specific purpose, such as to facilitate the removal of the support structure or to improve its thermal conductivity.

Illustrative example of subject matter classified in this place:



Support structure (20) material with high thermal conductivity.

B22F10/47

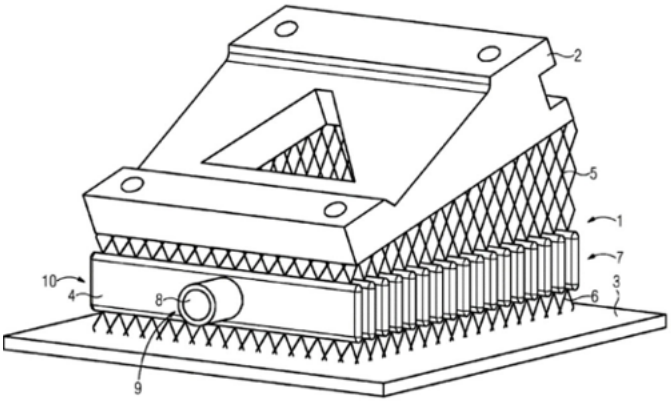
Definition statement

This place covers:

Process aspects relating to structural features of the structure supporting the workpiece during its manufacture. The structural features serve a specific purpose, such as to facilitate the removal of the support structure or to improve the mechanical support.

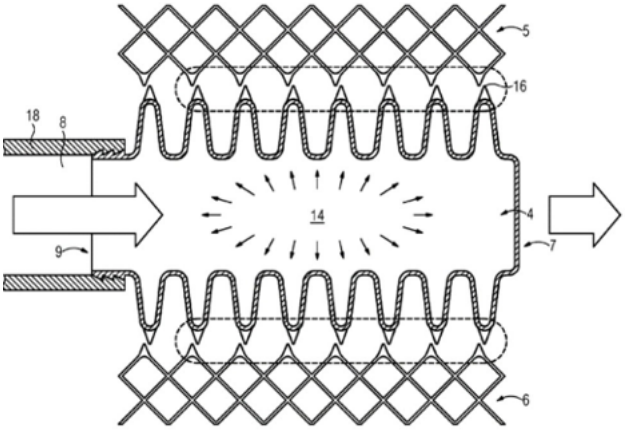
Illustrative example of subject matter classified in this place:

1a.



The support structure (1) connects the printed part (2) to the building plate (3). It comprises a first part (6), being arranged on the building plate (3), and a second part (5), being arranged below the printed part (2). The support structure (1) comprises a third part (4) which is arranged at a centre part (10) of the structure part (1), above the first part (6) and below the second part (5).

1b.



The bellows (4) comprises a pipe connector (8), forming one open end portion (9). The geometry of the bellows (4) makes it flexible and gives it the capability of elongating when a pressure (14) is applied on its internal surface.

B22F10/50

Definition statement

This place covers:

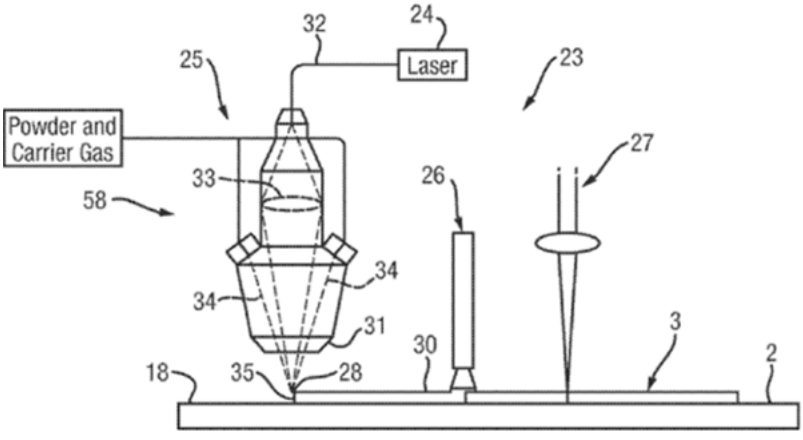
Process aspects relating to treatment applied to the workpiece during the additive manufacturing process itself, such as treatment provided to a specific section of the workpiece to achieve a specific purpose, e.g. to change the microstructure or improve the mechanical properties.

The treatments might be:

- chemical, such as leaching, coating or passivation;
- mechanical, such as removing material for forming recesses, removing material for grinding/polishing the surface or calibration or partial local deformation of the surface, e.g. sand blasting, shot peening, laser shock peening or ultrasonic peening;
- by means of electric, magnetic or electromagnetic fields;
- thermal treatment.

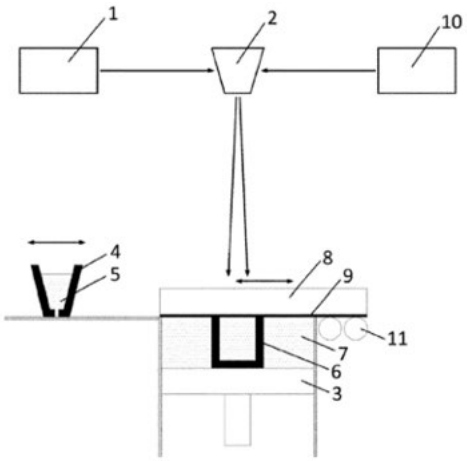
Illustrative examples of subject matter classified in this place:

1.



Direct energy deposition (25) of metallic powder + cryogenic quenching treatment (26) + laser shock peening (27).

2.



Applying laser shock peening between forming subsequent layers in SLM.

B22F10/60

Definition statement

This place covers:

Process aspects relating to treatments applied to the workpiece after its manufacture.

Removing support structures.

Relationships with other classification places

B22F3/24 concerns after treatment of powder metallurgy articles in general, whereas B22F10/60 concerns after treatment of articles made by additive manufacturing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Structures for supporting workpieces or articles during manufacture and removed afterwards	B22F10/40

B22F10/62

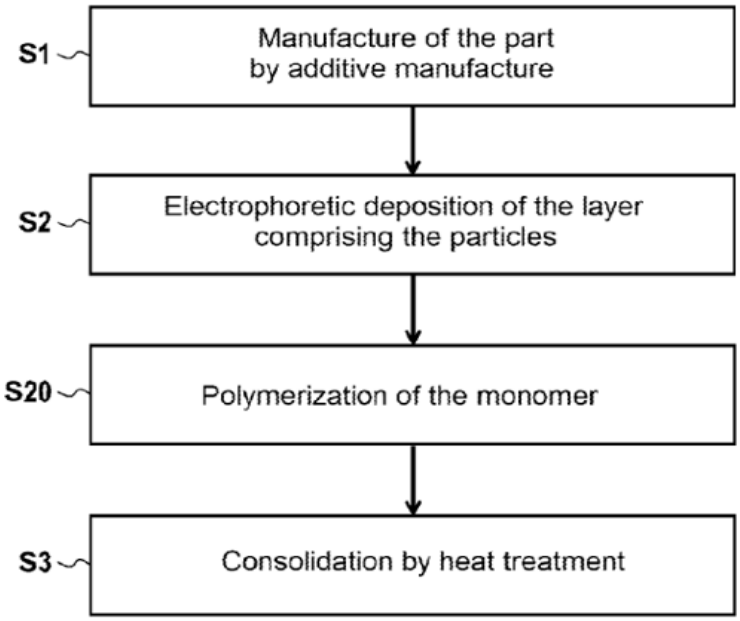
Definition statement

This place covers:

Process aspects relating to chemical treatments applied to the workpiece after its manufacture to serve a specific purpose such as to improve wear-, corrosion- or heat-resistance or to reduce surface rugosity. Typical chemical treatments may include leaching, coating or passivation.

Removing support structures by chemical means such as dissolution or electrochemistry.

Illustrative example of subject matter classified in this place:



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coating metallic material; Coating material with metallic material; Surface treatment of metallic material by diffusion into the surface, by chemical conversion or substitution; Coating by vacuum evaporation, by sputtering, by ion implantation or by chemical vapour deposition, in general	C23C
Processes for the electrolytic removal of material from objects	C25F
Processes for the electrolytic or electrophoretic production of coatings	C25D

B22F10/64

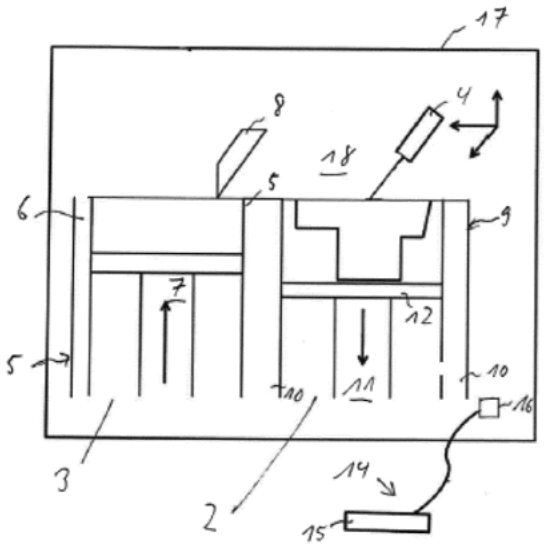
Definition statement

This place covers:

Process aspects relating to thermal treatments applied to the workpiece after its manufacture to serve a specific purpose such as to remove organic binders or to reduce porosity or modify the microstructure or mechanical properties. Typical thermal treatments may include thermal de-binding, sintering, hot isostatic pressing or annealing.

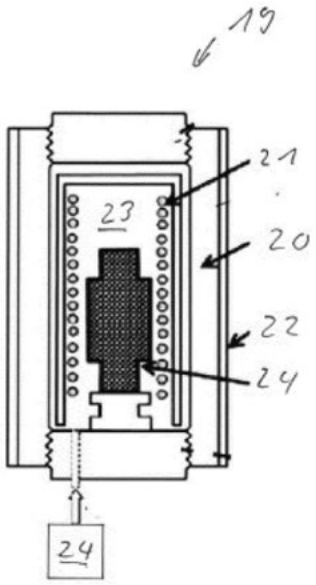
Illustrative example of subject matter classified in this place:

1.a



Step 1: Manufacture of a workpiece by selective laser sintering/melting [SLS/SLM].

1.b



Step 2: Hot isostatic pressing after SLS/SLM to increase the density of the workpiece.

References

Limiting references

This place does not cover:

Control of energy beam parameters for post heating	B22F 10/364

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sintering	B22F3/10
Removal of binder or filler	B22F3/1021
Thermal after-treatment of workpieces or articles	B22F2003/248
Hot isostatic pressing	B22F3/15
Both compacting and sintering in successive or repeated steps	B22F3/16

Special rules of classification

In this group, C-Sets are used. The detailed information about the C-Sets construction and the associated syntax rules are found in the Special rules of classification in B22F.

For example, after-treatments corresponding to specific processes in B22F3/00, e.g. hot isostatic pressing [HIP] in B22F3/15 or removal of binder in B22F3/1021, should also be classified with a C-Set of the following type, the example being for SLM followed by HIP: (B22F2998/10, B22F10/64, B22F3/15).

B22F10/66

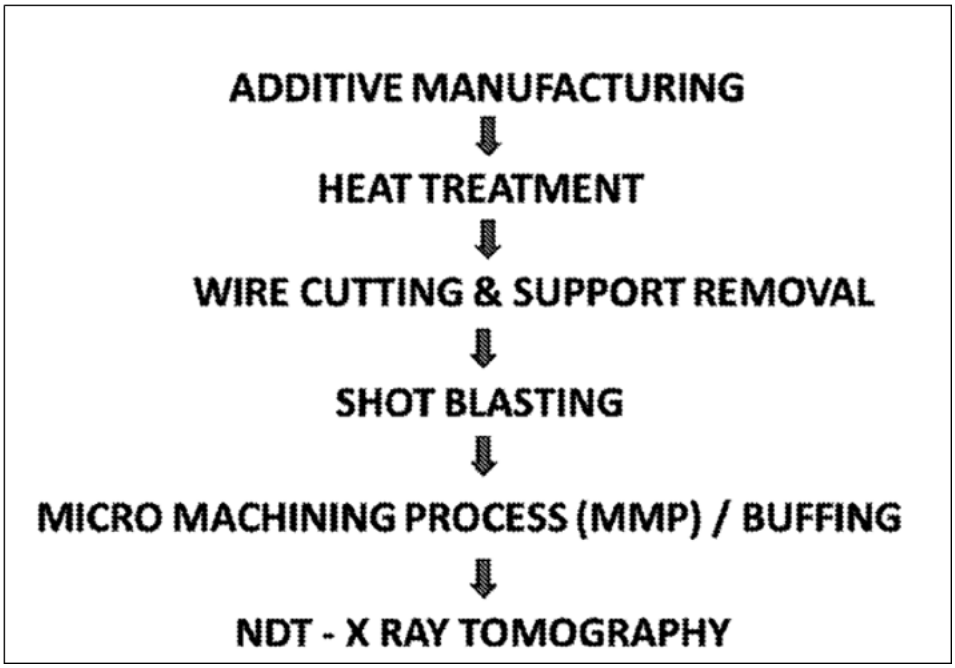
Definition statement

This place covers:

Process aspect relating to mechanical treatments applied to the workpiece after its manufacture to serve a specific purpose such as to modify the shape, surface finish, mechanical properties or microstructure of the workpiece.

Typical mechanical treatments applied to the workpiece may include removing material such as by grinding, polishing, sand blasting or local deformation of the workpiece surface such as shot peening, laser shock peening or ultrasonic peening.

Illustrative example of subject matter classified in this place:



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Partial deformation or calibration in the successive or repeated steps of manufacture of metallic workpieces or articles from metallic powder	B22F3/164
Making recesses, grooves etc. on the surface by removing material	B22F2003/245
Removing material: carving, cleaning, grinding, hobbing, honing, lapping, polishing, milling, shaving, skiving or turning the surface	B22F2003/247

Special rules of classification

When classifying the treatment of the workpieces in B22F10/66, the after treatments corresponding to specific processes in B22F3/00 should also be classified there, e.g. removing material should be classified in B22F2003/247.

B22F10/68

Definition statement

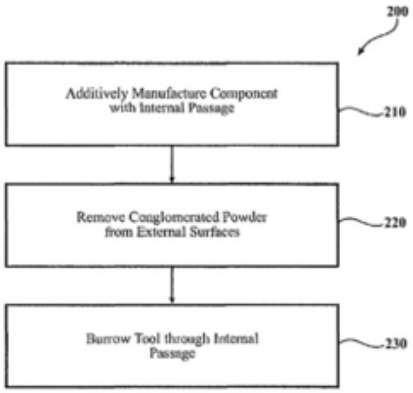
This place covers:

Process aspects relating to cleaning or washing operations performed on the workpiece after its manufacture.

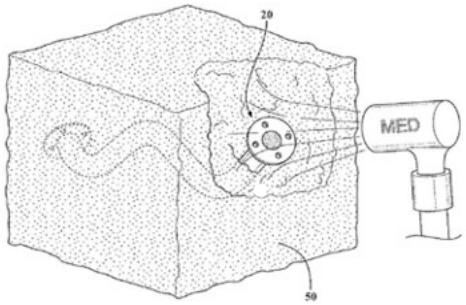
Depowdering, i.e. cleaning or washing operations relating to the removal of residual powder within or on the workpiece.

Illustrative examples of subject matter classified in this place:

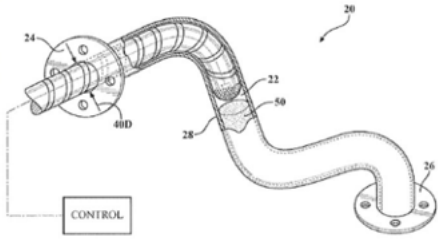
1.



2.



3.



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

After-treatment of metallic workpieces or articles by removing material: carving, cleaning, grinding, hobbing, honing, lapping, polishing, milling, shaving, skiving or turning the surface	B22F2003/247
Cleaning in general; Prevention of fouling in general	B08B

B22F10/70

Definition statement

This place covers:

Process aspects relating to recycling operations, which may occur before, during or after the additive manufacture of the workpiece.

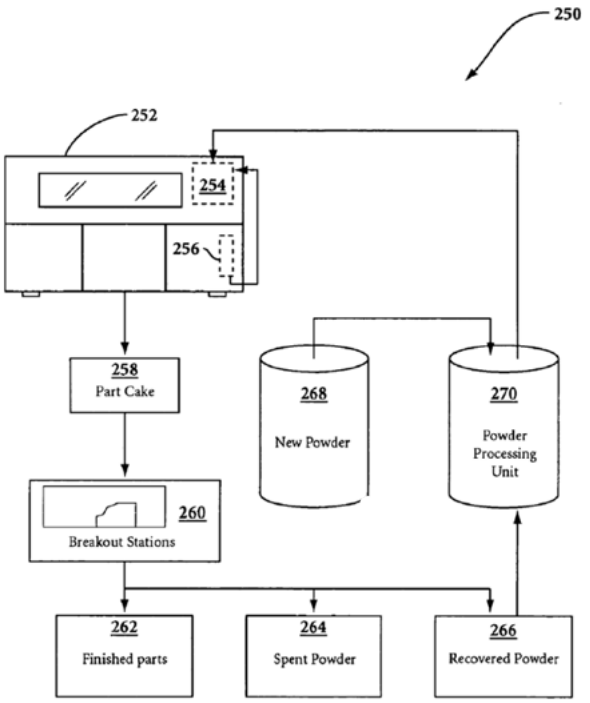
B22F10/73

Definition statement

This place covers:

Process aspects relating to recycling operations of the powder used for the additive manufacture of the workpiece. The process aspects may relate to operations such as recycling powder overflow when laying down a layer of powder in selective laser sintering [SLS] or selective laser melting [SLM], or to recycling of powder resulting from cleaning operations of the workpiece after build-up.

Illustrative example of subject matter classified in this place:



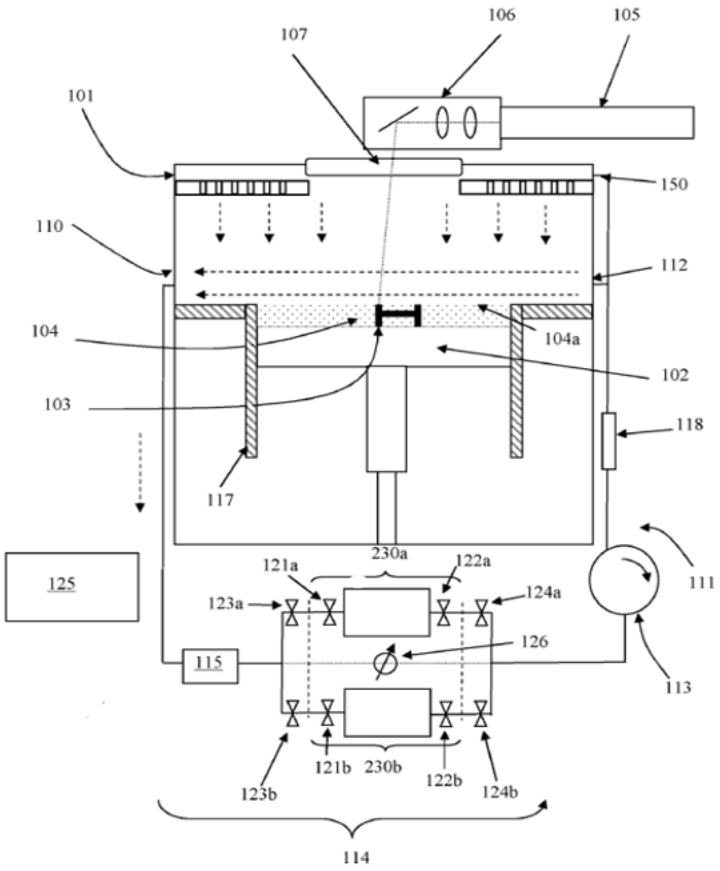
B22F10/77

Definition statement

This place covers:

Process aspects relating to recycling operations of gas used for the additive manufacture of the workpiece. The process aspects may relate, for example, to filter arrangements for cleaning the process gas from fumes or particles generated by the selective irradiation of powder in SLM or SLS.

Illustrative example of subject matter classified in this place:



SLS/SLM apparatus with filter system (114). Process emissions, such as spatters and condensates are removed from the process gas by the filter system (114) before gas recirculation within the build chamber (101).

B22F10/80

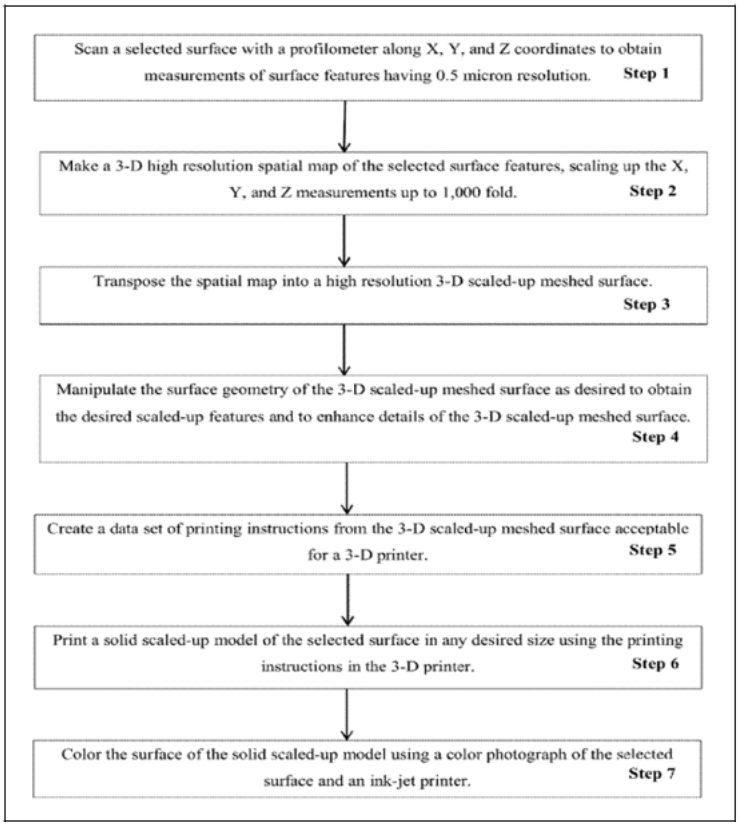
Definition statement

This place covers:

Process aspects relating to data acquisition or data processing, which take place before, during or after the additive manufacture of the workpiece.

Simulation steps for generating a three-dimensional model of the workpiece to be manufactured.

Illustrative example of subject matter classified in this place:



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electric digital data processing	G06F
Computer-aided design applied to additive manufacturing	G06F 2113/10

B22F10/85

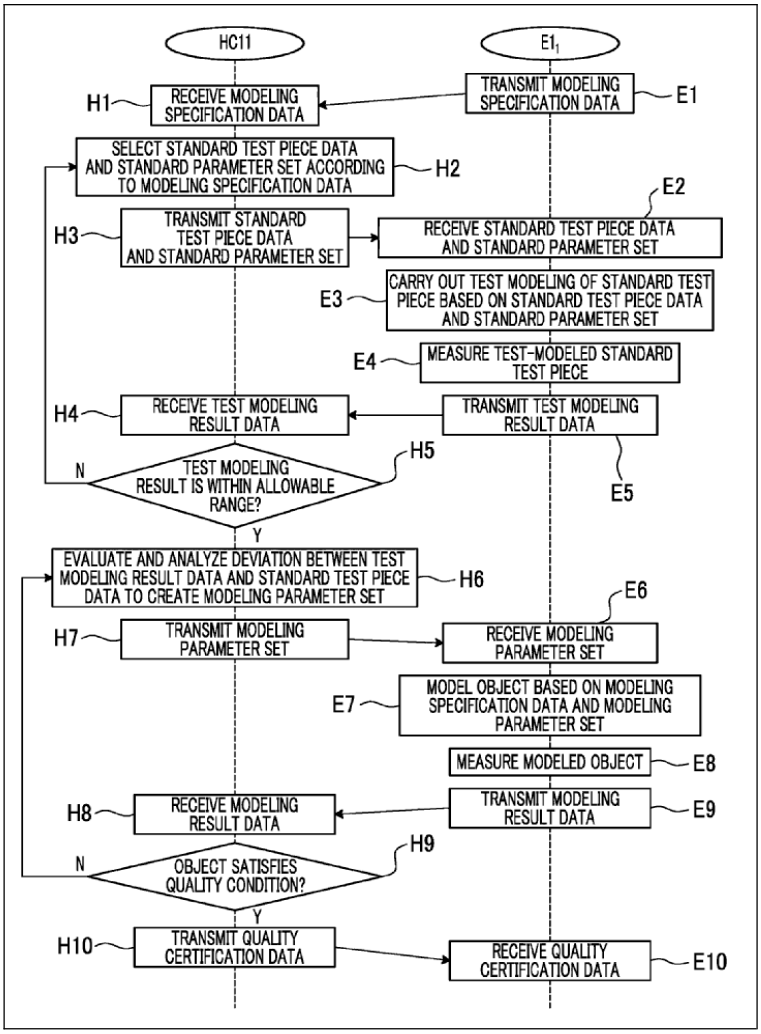
Definition statement

This place covers:

Process aspects relating to data acquisition or data processing for controlling the additive manufacture of the workpiece. For instance, using a database of previous manufacturing runs to determine process parameters.

Data acquisition for quality checks of the workpiece and/or the functioning of the manufacturing apparatus itself during or after build-up.

Illustrative example of subject matter classified in this place:



B22F12/00

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatus for additive manufacturing of plastics or material in a plastic state; Details thereof or accessories therefor	B29C 64/20

Apparatus for additive manufacturing; Details thereof or accessories therefor	B33Y 30/00
Typewriters or selective printers for marking on special material	B41J 3/407
Electron guns	H01J 3/02
Discharge tubes for applying thin layers on objects	H01J 37/00
Electron sources; Electron guns, arrangements of electrodes and associated parts for generating or controlling the discharge, with provision for introducing objects or material to be exposed to the discharge	H01J 37/06
Apparatus or processes for manufacturing printed circuits using printing techniques to apply the conductive material	H05K 3/12
Devices using the process of light amplification by stimulated emission of radiation [laser] to amplify or generate light; Devices using stimulated emission of electromagnetic radiation in wave ranges other than optical	H01S

B22F12/10

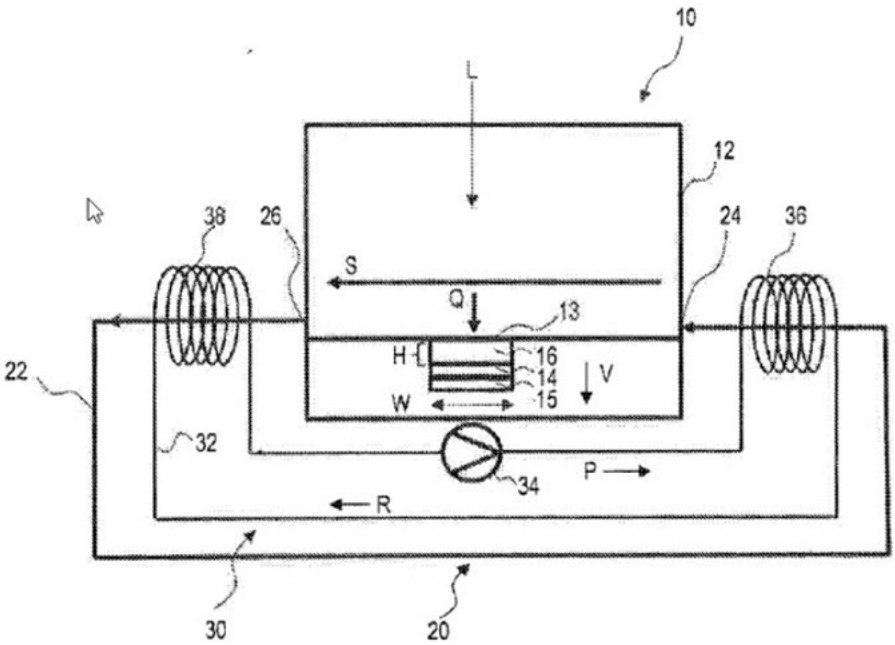
Definition statement

This place covers:

Devices comprising auxiliary heating means for a purpose other than preheating the powder material or heating the build chamber or build platform. The auxiliary heating means may relate to heating means for heating a process gas or the manufactured article, for example.

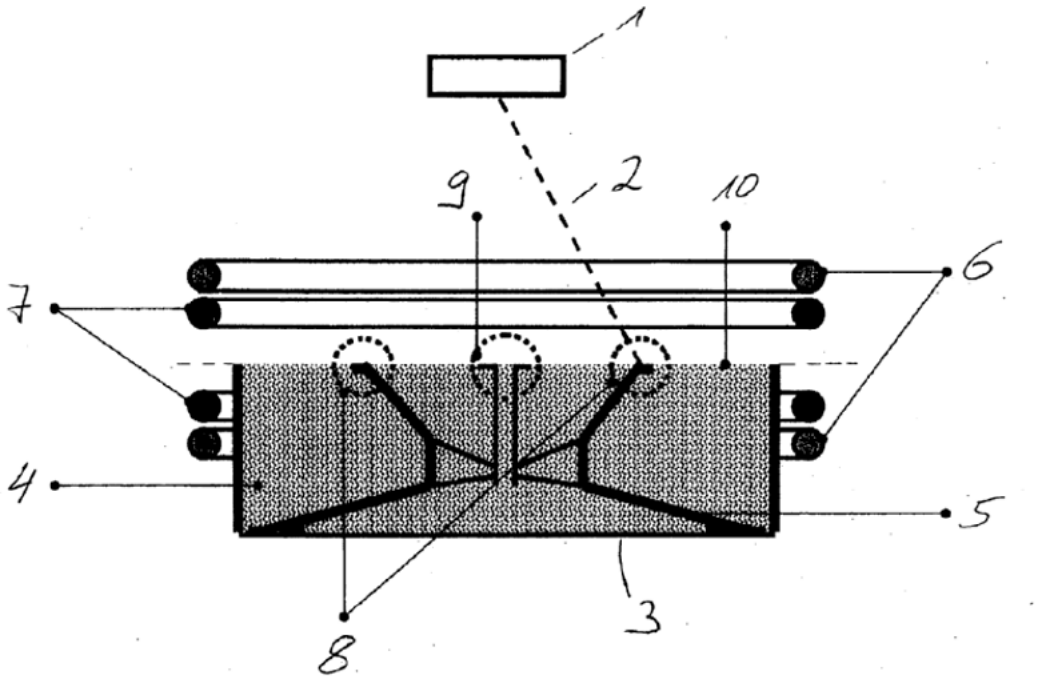
Illustrative examples of subject matter classified in this place:

1.



Heating means (36) to heat the process gas.

2.



Induction heating coils (6, 7) and heating component (5) in powder bed in container (3).

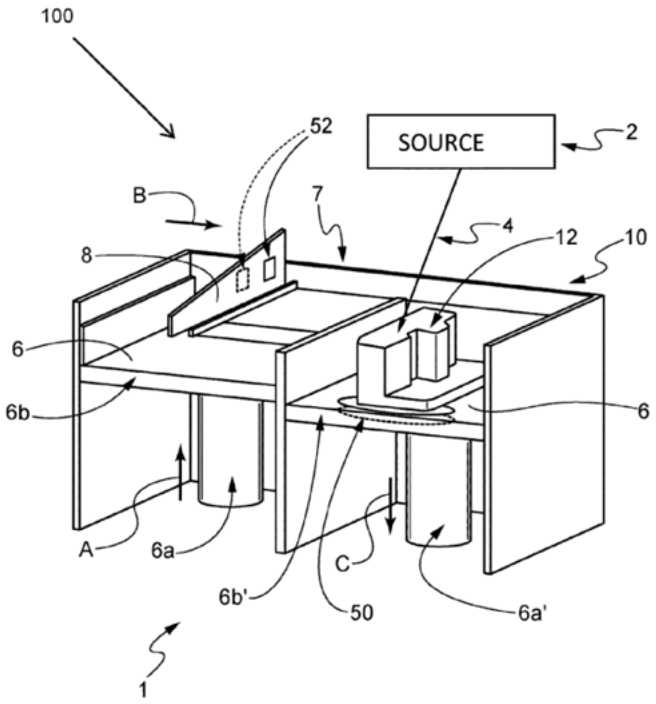
B22F12/13

Definition statement

This place covers:

Devices comprising auxiliary heating means for directly preheating the powder material used to additively manufacture a workpiece. For instance, lamps or coils above the powder bed. Auxiliary heating means for heating a material in the powder feeding device, e.g. hopper.

Illustrative example of subject matter classified in this place:



Illuminators (52) to preheat the powder in the powder bed (6), where the manufacture of the workpiece (12) takes place.

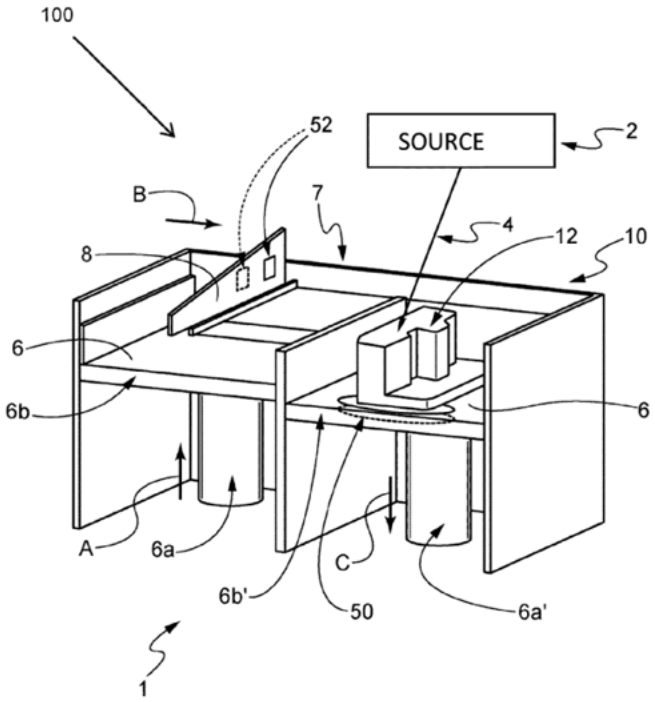
B22F12/17

Definition statement

This place covers:

Devices comprising auxiliary heating means for heating the build chamber or platform.

Illustrative example of subject matter classified in this place:



Induction system (50) to heat the build platform (6b').

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

build chamber	powder bed sleeve

B22F12/20

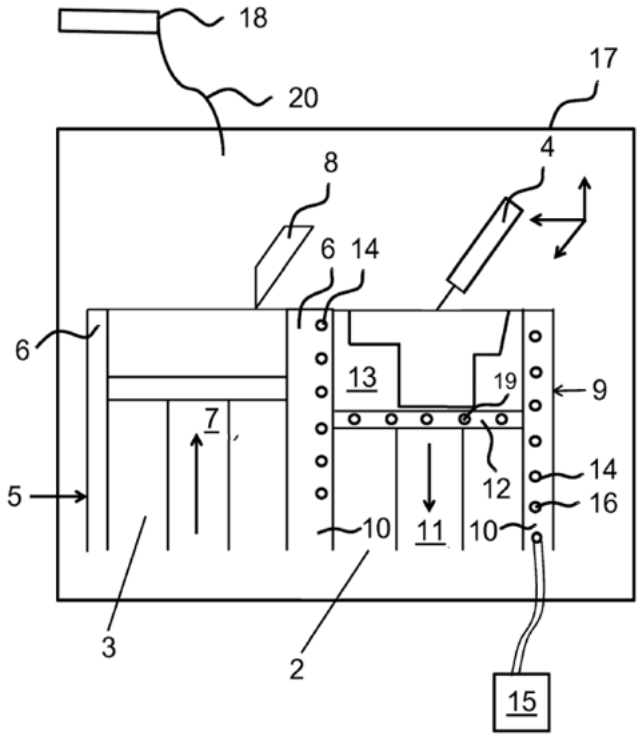
Definition statement

This place covers:

Devices comprising cooling means such as cooling fluid circuits in the build platform or build chamber housing in selective laser sintering [SLS] or selective laser melting [SLM] devices or cooling fluid nozzles above the powder bed.

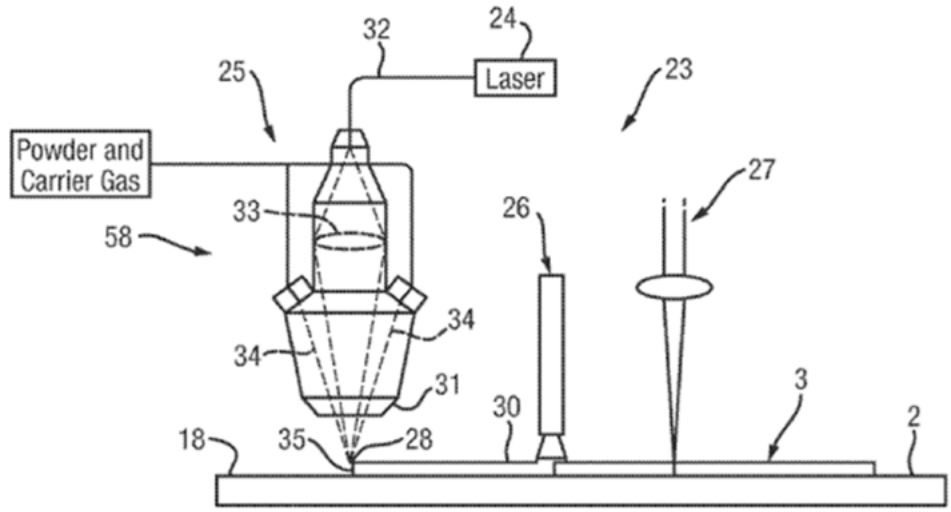
Illustrative examples of subject matter classified in this place:

1.



Cooling chamber (14) in the wall (10) of the build chamber of an SLS/SLM apparatus.

2.



Direct energy deposition (25) of metallic powder with subsequent cryogenic quenching treatment (26).

B22F12/22

Definition statement

This place covers:

Driving means capable of motion along all directions, possibly including rotation.

Illustrative example of subject matter classified in this place:

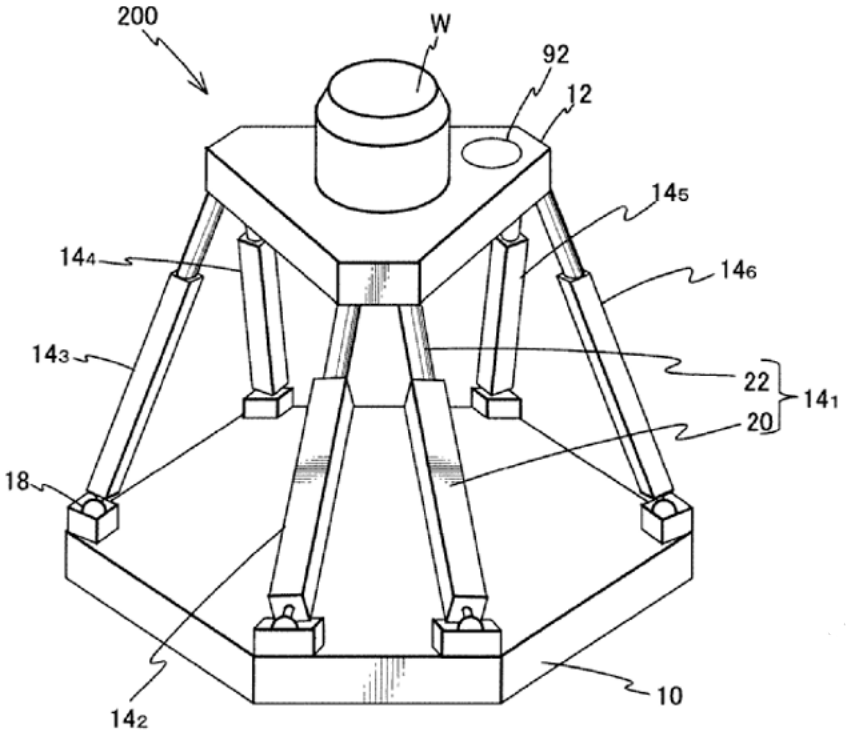


Table (12) for holding workpiece (W), positionable with 6 degrees of freedom by pneumatic control of rods (14).

Special rules of classification

In this group, C-Sets are used. The detailed information about the C-Sets construction and the associated syntax rules are found in the Special rules of classification in B22F.

For example, a type of motion of the radiation means or platform not provided for in the respective subgroups and motion of other components can be classified using a C-Set. A cooling means with vertical motion is classified as (B22F2999/00, B22F12/20, B22F12/222).

When the invention is in the construction of the driving means for moving a platform or radiation means, the appropriate group(s) under B22F12/22 should be given in addition to the groups related to movement of those components in general:

- Translatory movement of the radiation means is covered by B22F12/46.

- Movement of the platform by translation in the deposition place is covered by B22F12/33 and rotation of the platform by B22F12/37.

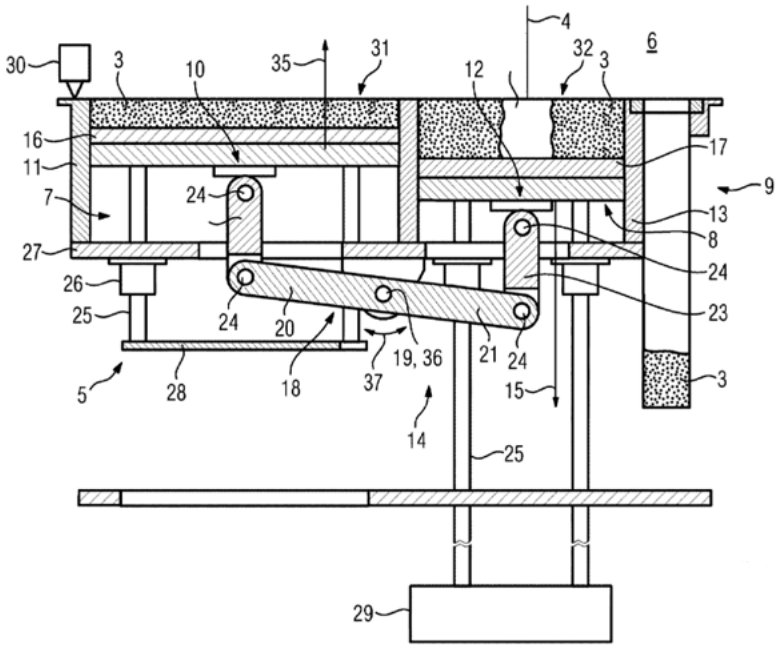
B22F12/222

Definition statement

This place covers:

Devices comprising driving means for motion along a direction orthogonal to the plane of a build layer.

Illustrative example of subject matter classified in this place:



Lever device (14) providing vertical motion of build plate carrier (12) and dose plate carrier (10) in a selective laser sintering melting [SLS/SLM] apparatus.

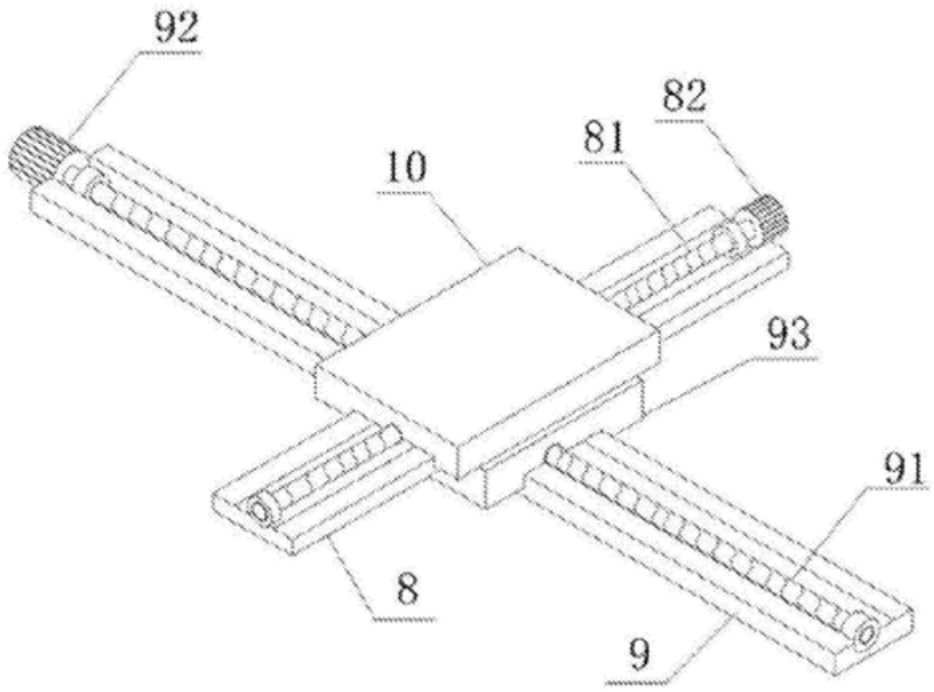
B22F12/224

Definition statement

This place covers:

Devices comprising driving means for motion along a direction within the plane of a build layer.

Illustrative example of subject matter classified in this place:



A platform (10) movable in the deposition plane using screw motors (82, 92).

B22F12/226

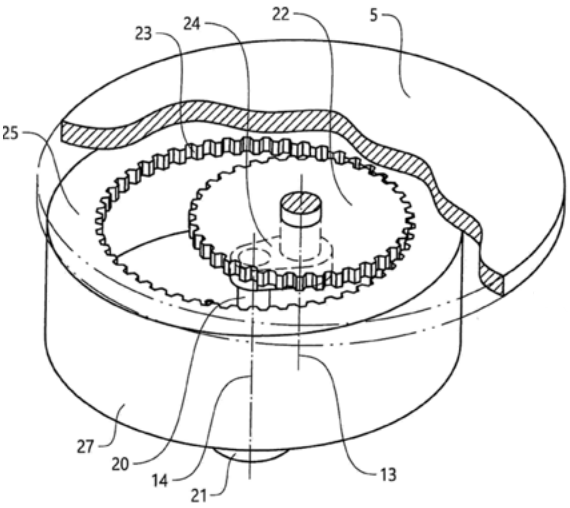
Definition statement

This place covers:

Devices comprising driving means for rotary motion.

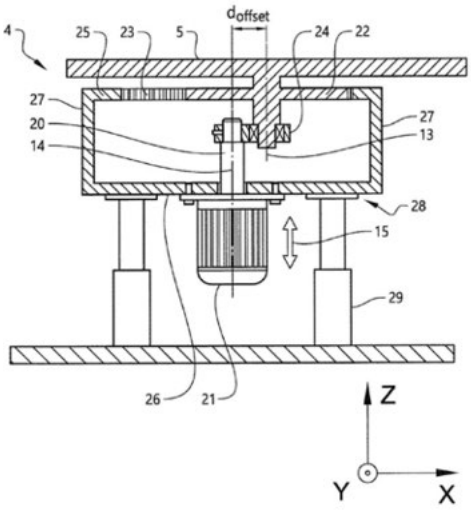
Illustrative examples of subject matter classified in this place:

1.



Driving means (20-25) to provide rotation and increase tangential speed at the centre region of the build platform (5) in a selective laser sintering/melting [SLS/SLM] apparatus.

2.



Driving means (20-25) to provide rotation of the build platform (5) in an SLS/SLM apparatus.

B22F12/30

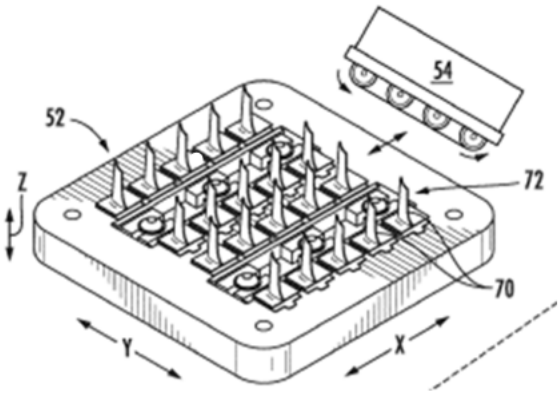
Definition statement

This place covers:

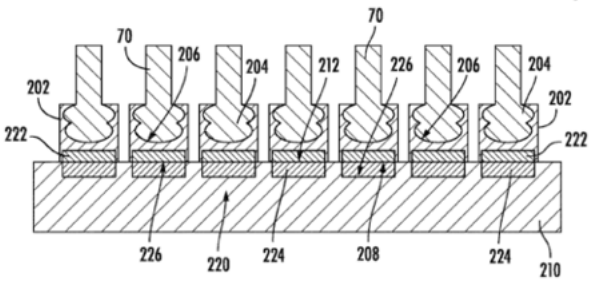
Means for receiving the material from which workpieces will be additively manufactured. Typical means are, for example, a build platform in an SLM or SLS device movable in a vertical direction.

Illustrative example of subject matter classified in this place:

1a.



1.b



Build platform (210) for powder bed based additive manufacturing gas turbine blades (70) comprising component fixtures (202) for holding worn air foils.

Special rules of classification

In this group, C-Sets are used. The detailed information about the C-Sets construction and the associated syntax rules are found in the Special rules of classification in B22F.

For platforms movable in a more complex fashion than translation and rotation, a C-Set together with groups B22F12/22 - B22F12/226 can be used. For example, a platform that is movable with 6 degrees of freedom is classified as (B22F2999/00, B22F12/30, B22F12/22).

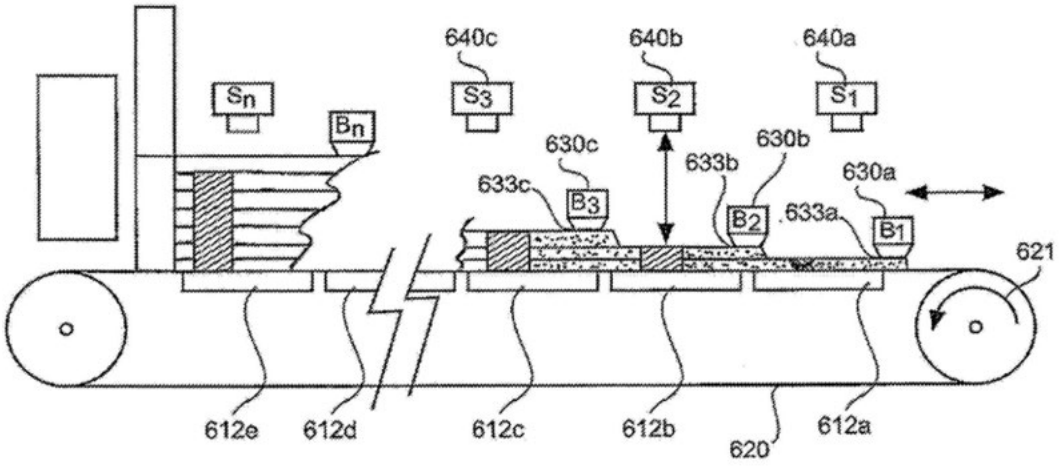
B22F12/33

Definition statement

This place covers:

Means for receiving the material from which workpieces will be additively manufactured and which are able to move in translation in the deposition plan, such as platforms moved by a belt.

Illustrative example of subject matter classified in this place:



Substrates (612a-e) in translator movement within deposition plane.

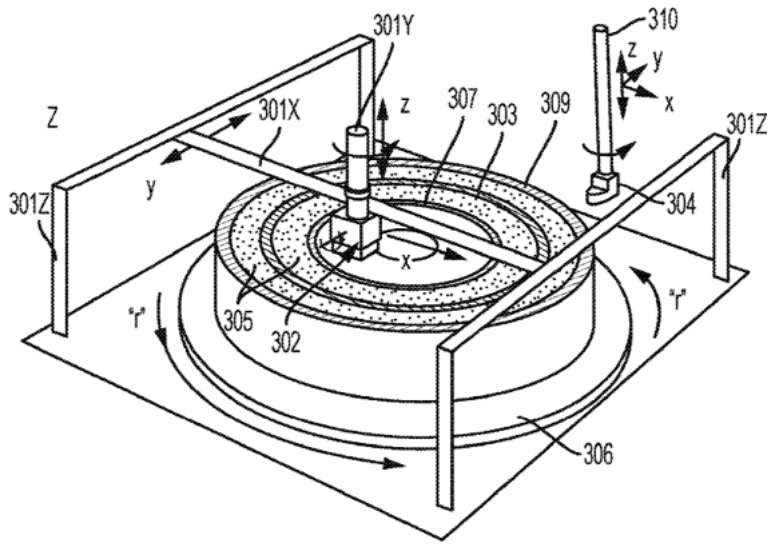
B22F12/37

Definition statement

This place covers:

Means for receiving the material from which workpieces will be additively manufactured and which are rotatable or can be tilted. For example, a rotatable build platform in an SLS/SLM device.

Illustrative example of subject matter classified in this place:



Rotatable build platform (306) for powder bed fusion.

B22F12/38

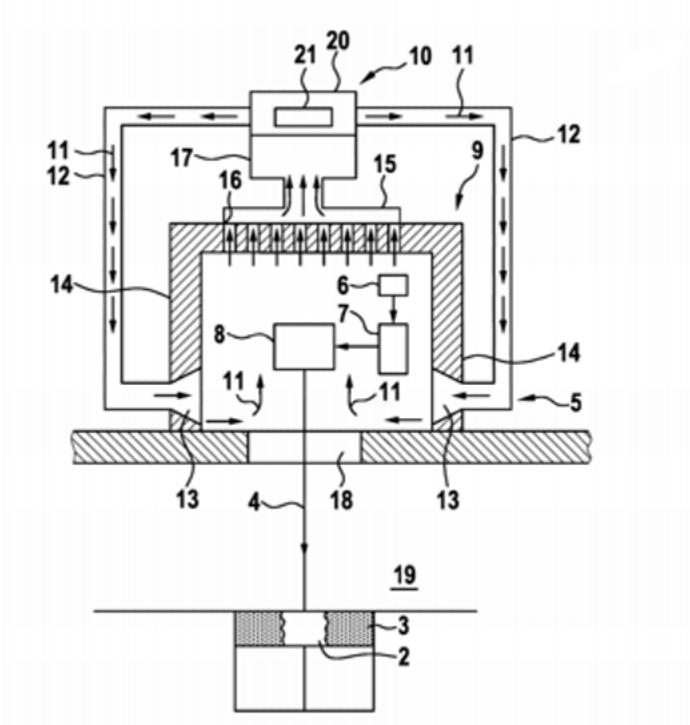
Definition statement

This place covers:

Specific features of any housing within the additive manufacturing apparatus, not just the housing of the apparatus as a whole. For example, the features may relate to the build chamber housing, the powder reservoir housing (build box) or the energy source housing.

The features of the housing may relate to aspects such as thermal insulation, gas- or powder-tightness or gas flow.

Illustrative example of subject matter classified in this place:



Housing (9) for irradiation device provided with stream inlet (13) and vents (16) for generating a gas stream.

B22F12/41

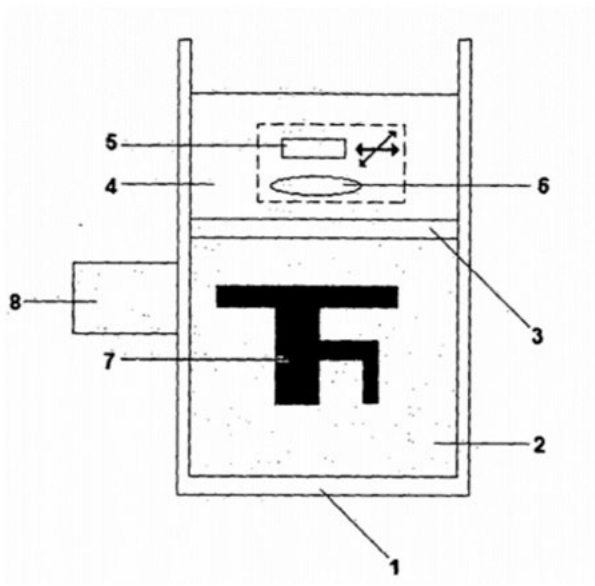
Definition statement

This place covers:

Device aspects relating to the type of radiation means for selectively fusing or binding particles together.

The radiation means may be of the electromagnetic type, such as laser, ultraviolet or infrared lamps, or of the particulate type, such as an electron beam, or of the acoustic type, such as ultrasound.

Illustrative example of subject matter classified in this place:



Focused ultrasound additive manufacturing powder bed (2) with ultrasound source (5) and ultrasound optics (6).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Auxiliary heating means	B22F12/10
Welding for purposes other than joining	B23K10/027
Electron-beam welding for purposes other than joining	B23K15/0086
Non-electric welding by making use of vibrations, e.g. ultrasonic welding	B23K20/10
Build-up laser welding	B23K26/342

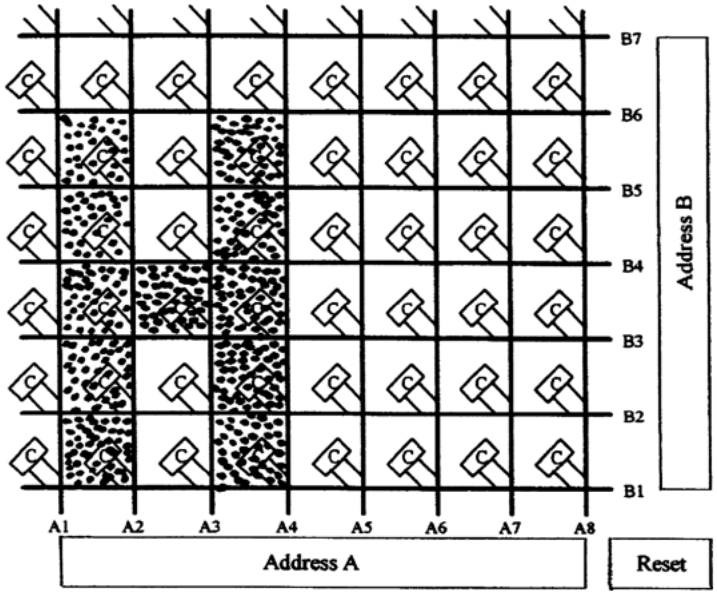
B22F12/42

Definition statement

This place covers:

Devices comprising light emitting diodes [LED] as radiation means.

Illustrative example of subject matter classified in this place:



Programmable planar LED light source matrix for curing binder in a metal powder bed to bind the metallic powder in a selected area (H) at once to increase the build speed compared to a point-by-point illumination.

B22F12/43

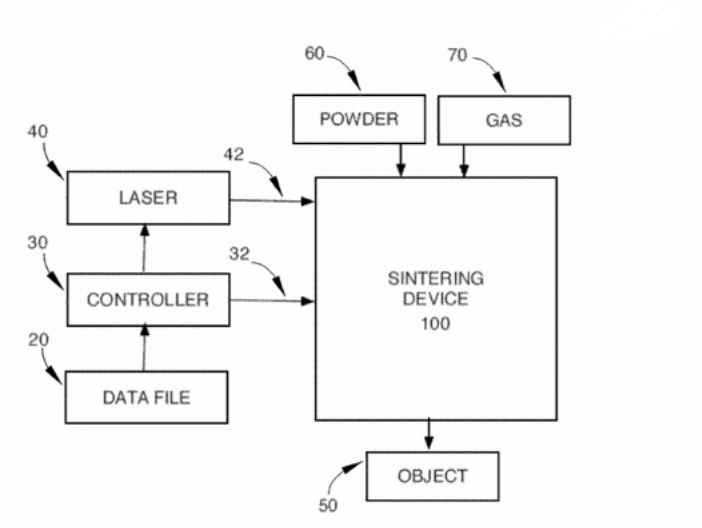
Definition statement

This place covers:

Devices comprising pulsed, frequency modulated radiation means such as, for example, pulsed laser for selectively fusing or binding particles together in selective laser sintering [SLS] or selective laser melting [SLM].

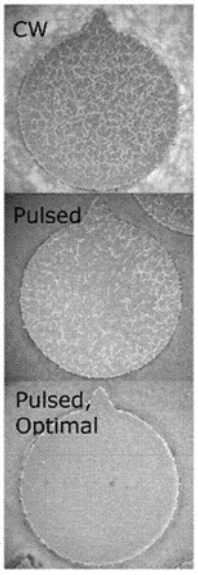
Illustrative examples of subject matter classified in this place:

1.



Selective laser melting/sintering [SLM/SLS] by pulsed laser (40) to reduce porosity or microcracks in Al alloys.

2.



Comparison of pulsed wave/continuous wave laser [CW] for Al alloys reduction of microcracks with pulsed wave laser.

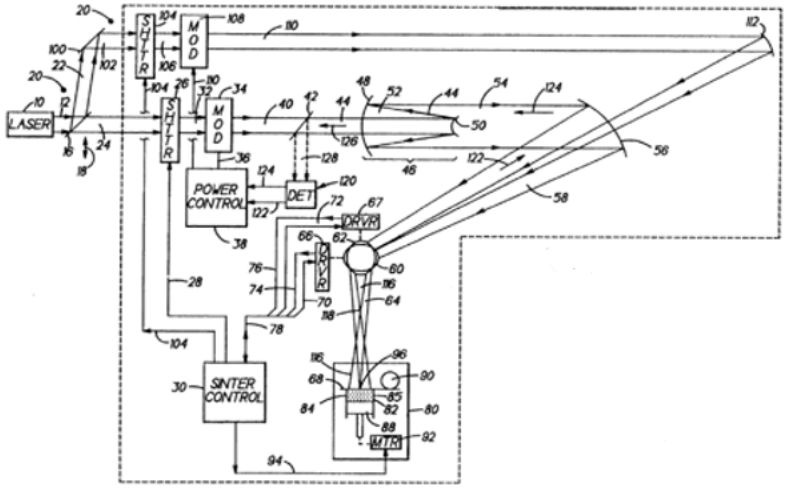
B22F12/44

Definition statement

This place covers:

Devices characterised by a spatial relation or features of the radiation means.

Illustrative example of subject matter classified in this place:



SLM apparatus with a laser source (10) and optics for creating a focused beam (58, 96) and an unfocused beam.

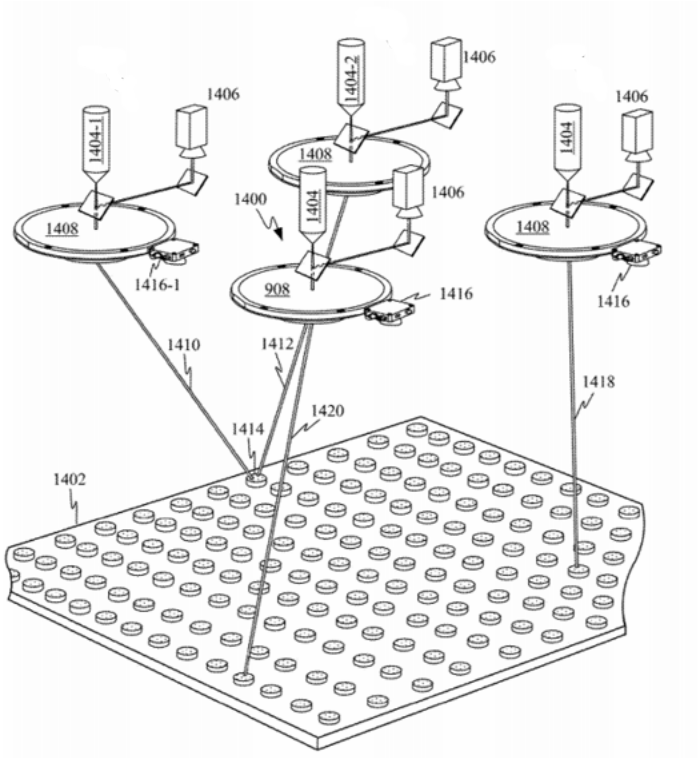
B22F12/45

Definition statement

This place covers:

Devices with multiple radiation means.

Illustrative example of subject matter classified in this place:



Selective laser melting [SLM] with multiple lasers (1404, 1404-1, 1404-2). Each laser is configured to fuse particles in a defined region of the build plane (1402).

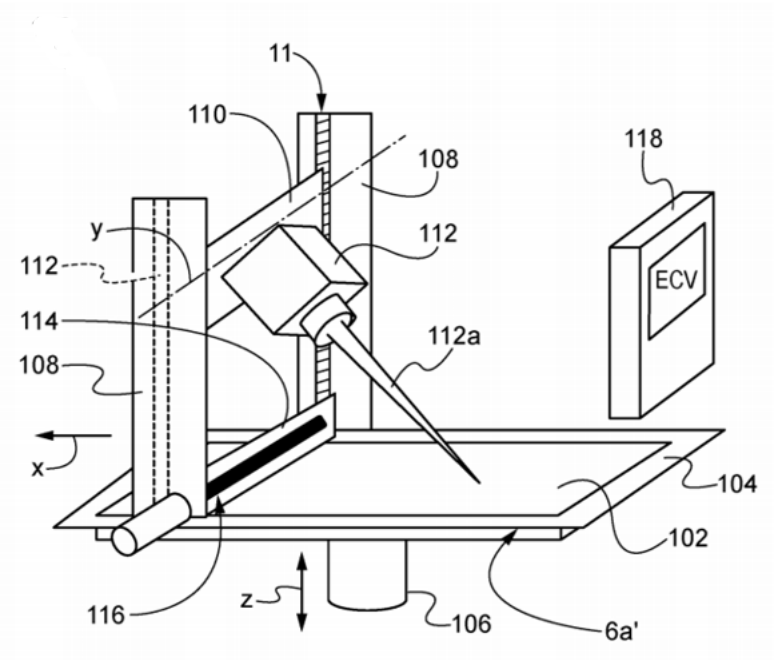
B22F12/46

Definition statement

This place covers:

Devices comprising radiations means able to move in translation.

Illustrative example of subject matter classified in this place:



SLM with a laser diode source (112) moving in translation along direction x and vertically by means of cross member (110).

Special rules of classification

In this group, C-Sets are used. The detailed information about the C-Sets construction and the associated syntax rules are found in the Special rules of classification in B22F.

For radiation means movable in a more complex fashion than translation, a C-Set together with groups B22F12/22 - B22F12/226 can be used. For example, a radiation means movable with 6 degrees of freedom is classified as: (B22F2999/00, B22F12/40, B22F12/22).

B22F12/47

Definition statement

This place covers:

Devices comprising radiation means able to move in translation within the deposition plane, such as a laser moving in translation within the deposition plan in selective laser sintering [SLS], selective laser melting [SLM] or direct metal deposition [DMD].

B22F12/48

Definition statement

This place covers:

Devices comprising radiation means able to move in the vertical direction, such as a laser moving vertically in selective laser sintering [SLS], selective laser melting [SLM], or direct metal deposition [DMD].

B22F12/49

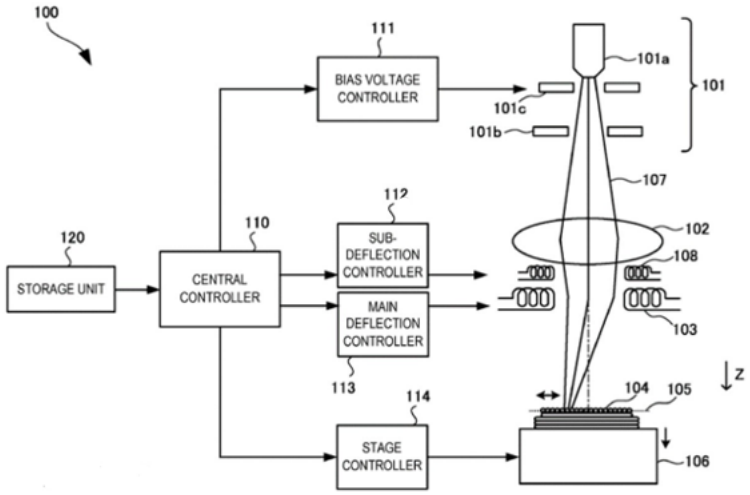
Definition statement

This place covers:

Devices for scanning an energy beam along the surface of, e.g. the powder bed.

Devices such as galvanometric scanners and digital micromirror devices.

Illustrative example of subject matter classified in this place:



Electron beam melting apparatus (100) with a main deflector (103) and a sub-deflector (108).

B22F12/50

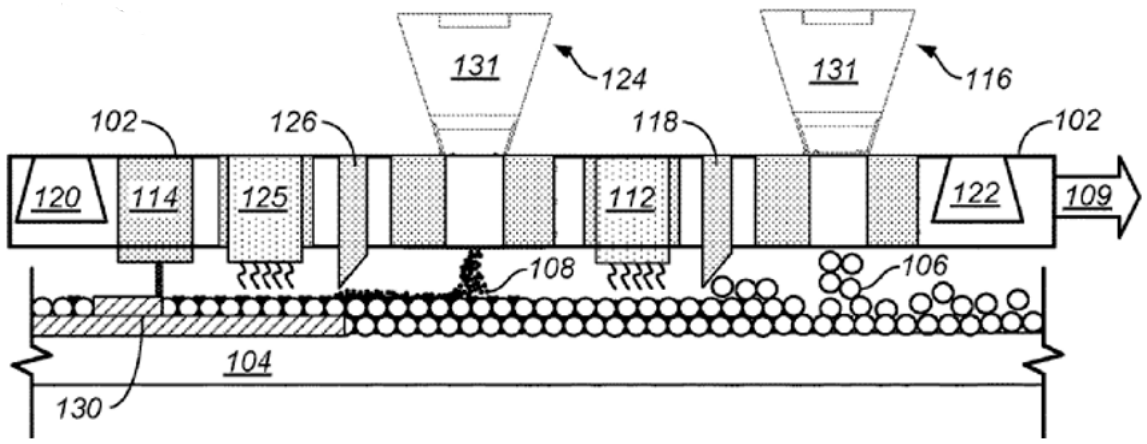
Definition statement

This place covers:

Means for feeding materials, e.g. build or support materials, to the process or apparatus.

For instance, containers alongside the powder bed build sleeve, from which powder is supplied to a recoater blade by raising the bottom of the reservoir.

Illustrative example of subject matter classified in this place:



Printhead (102) for powder bed devices comprising means for feeding material (131).

B22F12/52

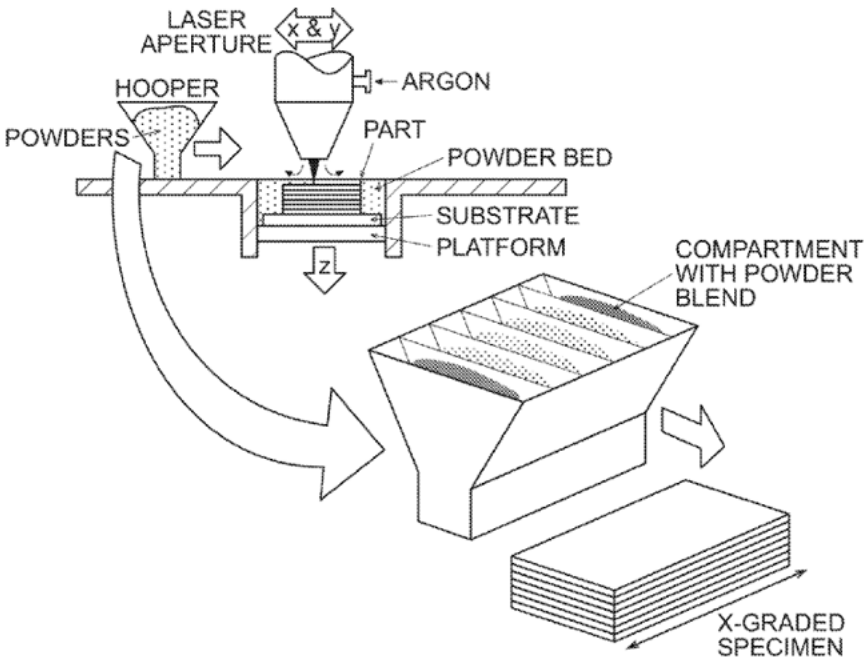
Definition statement

This place covers:

Hoppers for feeding, e.g. build or support material. For instance, in powder bed devices, the hoppers are reservoirs from which powder is supplied to a recoater blade by the powder being deposited on the working surface from above.

Illustrative example of subject matter classified in this place:

Powder hopper for SLM



B22F12/53

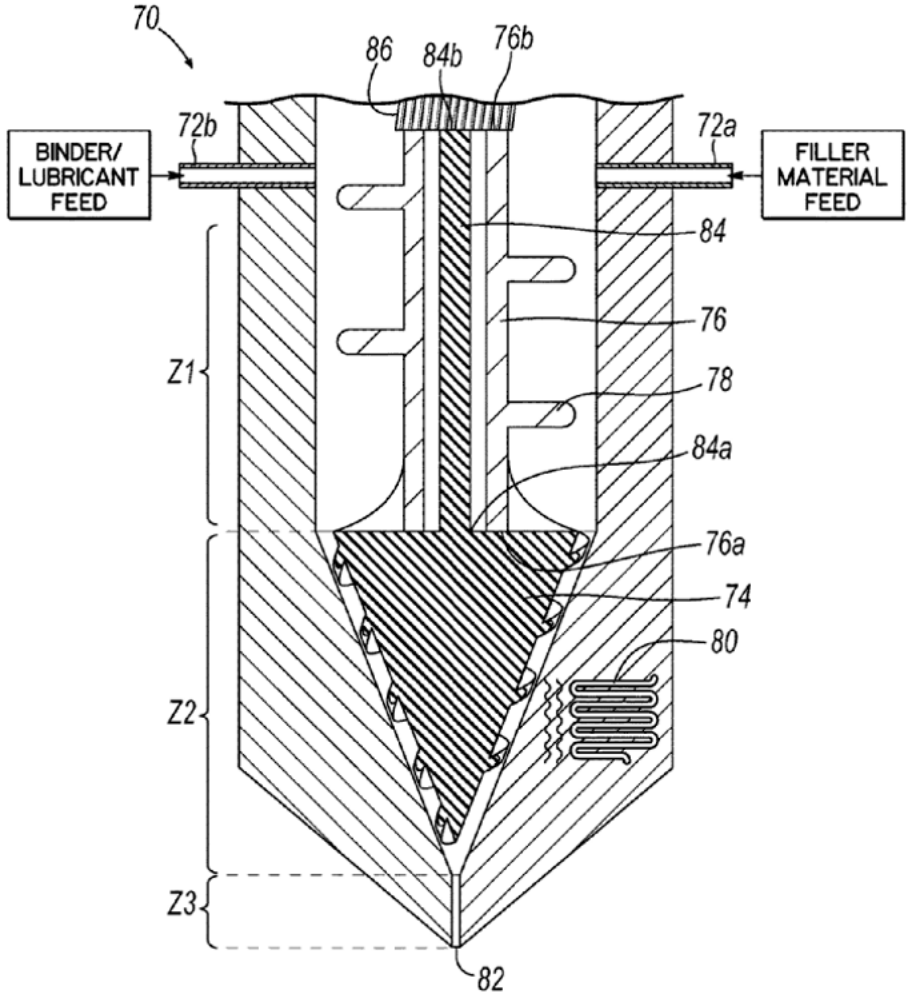
Definition statement

This place covers:

Nozzles for feeding of material. For instance, nozzles for depositing metallic particles, such as in DMD, molten metal or a mixture comprising metal particles and a binder, such as deposition by extrusion, onto a platform or substrate. Nozzles such as those for feeding organic binder in powder bed devices should also be classified here.

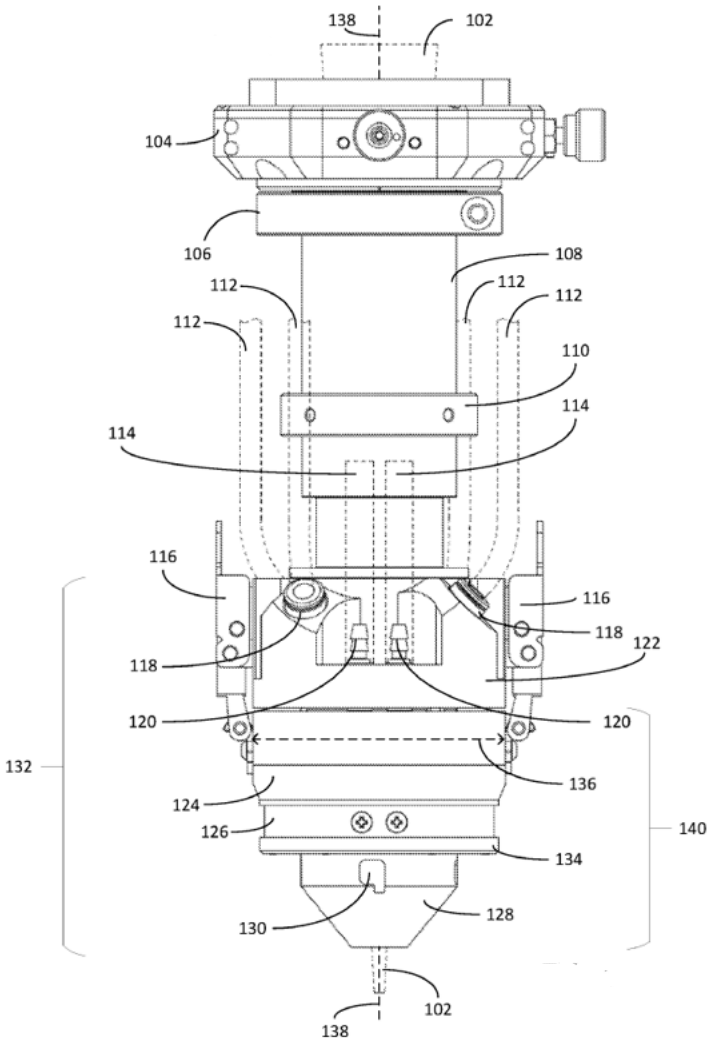
Illustrative examples of subject matter classified in this place:

1.



System assembly (70) for extruding material, comprising a binder and a filler. The assembly (70) comprises a mixing device (76, 78), a heating device (80) and an outlet nozzle (82).

2.



Laser metal deposition head (132) comprising a nozzle assembly (140). The powder is provided to powder inlets (118) and guided through the nozzle assembly (140) to the focal point of the laser beam (102).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Heads, nozzles of additive manufacturing apparatus for plastics	B29C 64/209
Selective printing mechanisms, i.e. mechanisms printing otherwise than from a form	B41J

Spraying apparatus; Nozzles	B05B
Apparatus for applying fluent materials to surfaces	B05C

B22F12/55

Definition statement

This place covers:

Multiple means for feeding material. For instance, one feeding mean on each side of a build platform or substrate in powder bed devices.

B22F12/57

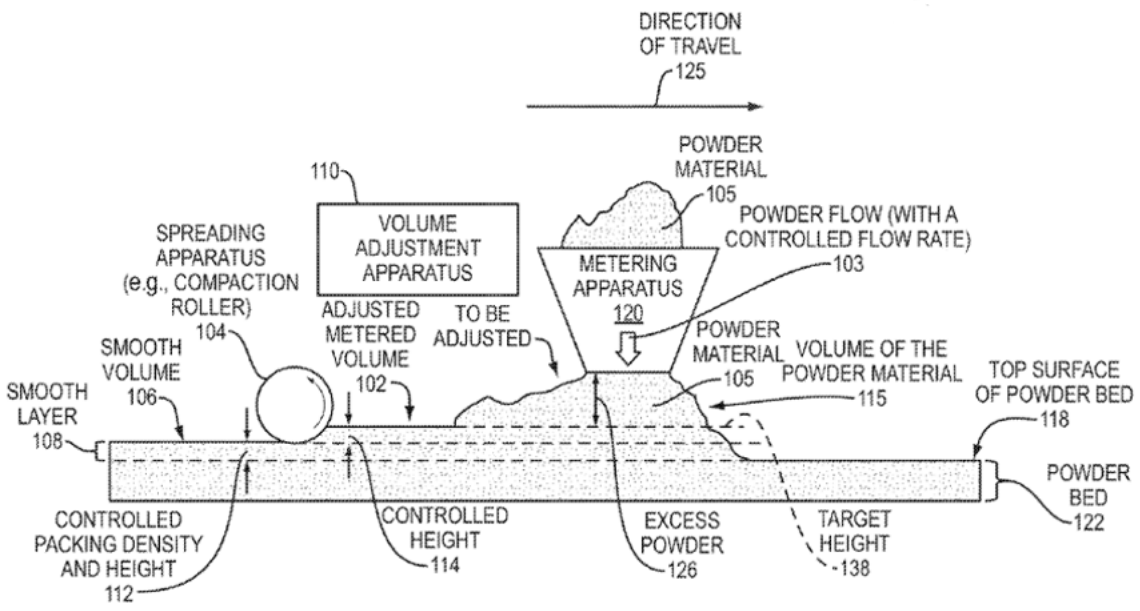
Definition statement

This place covers:

Means for metering material. For instance, means for metering powder material to be deposited onto a build platform or substrate in powder bed devices.

Illustrative example of subject matter classified in this place:

Powder bed device



The powder material (105) is metered onto the top surface (118) of the powder bed.

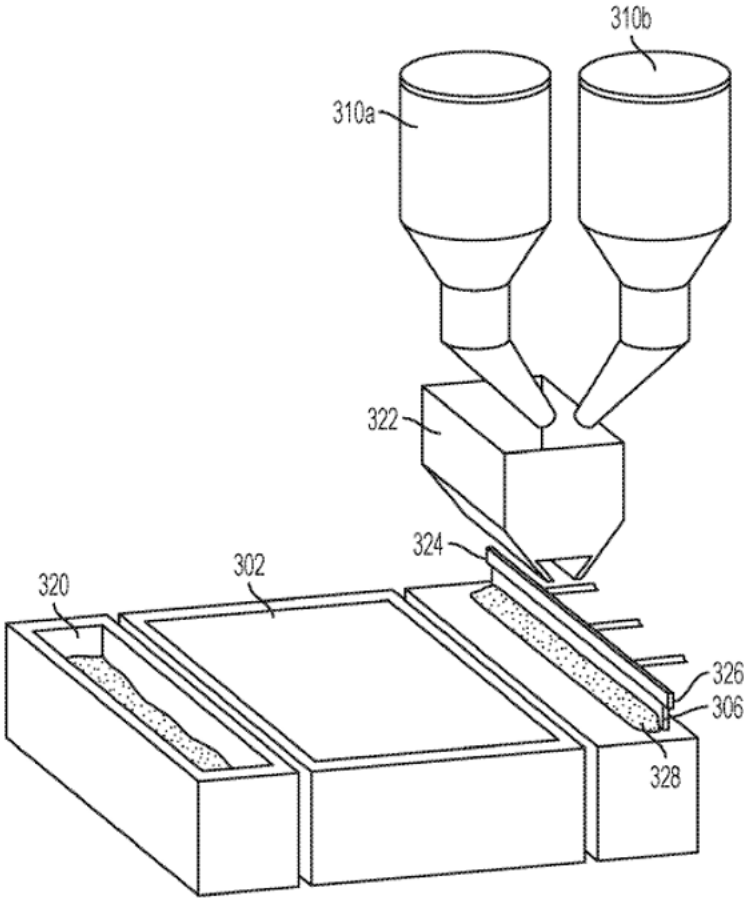
B22F12/58

Definition statement

This place covers:

Means for changing the material composition. For instance, means for mixing powder material to be deposited onto a build platform or substrate in powder bed devices.

Illustrative example of subject matter classified in this place:



Powder bed device comprising a first powder reservoir (310a) with a first powder composition and a second powder reservoir (310b) with a second powder and a dispenser (322) for receiving a blend of the first and second powder according to a desired composition of the blend.

B22F12/60

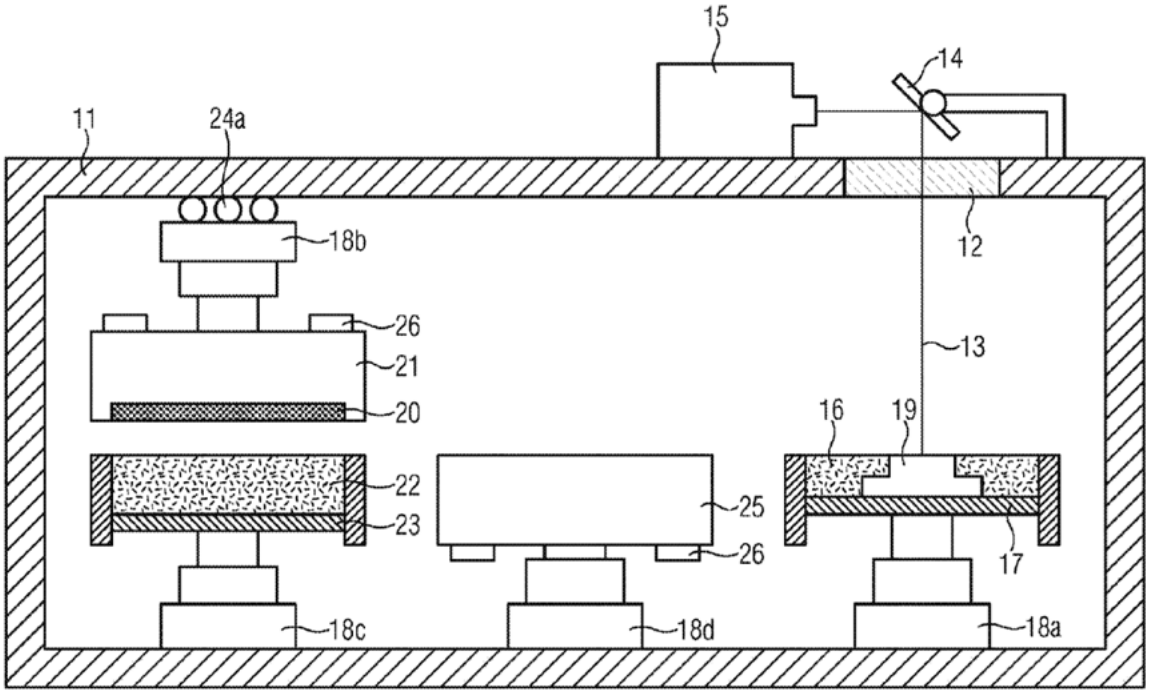
Definition statement

This place covers:

Planarisation or compression devices.

Illustrative example of subject matter classified in this place:

Selective laser melting [SLM]



Compacting plate (25) for compacting layer (20) in dosing device (21) before application of layer (20) on powder bed (16).

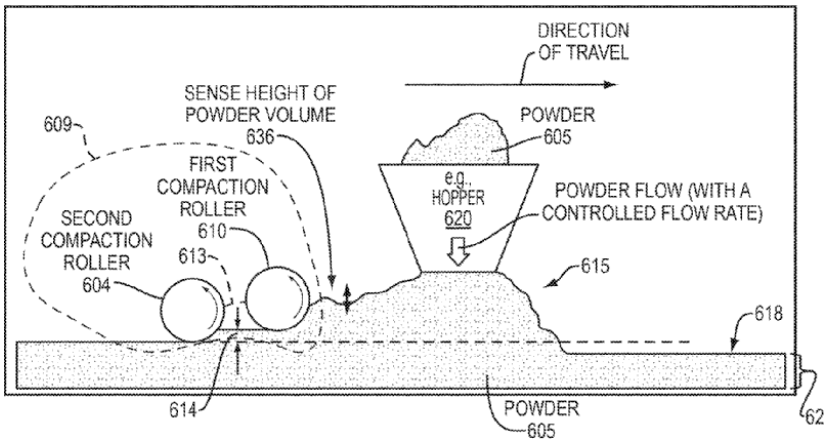
B22F12/63

Definition statement

This place covers:

Rollers for compressing the powder layer.

Illustrative example of subject matter classified in this place:



B22F12/67

Definition statement

This place covers:

Arrangements where a recoater blade (doctor blade) is used to flatten the powder layer on the powder bed.

Illustrative example of subject matter classified in this place:

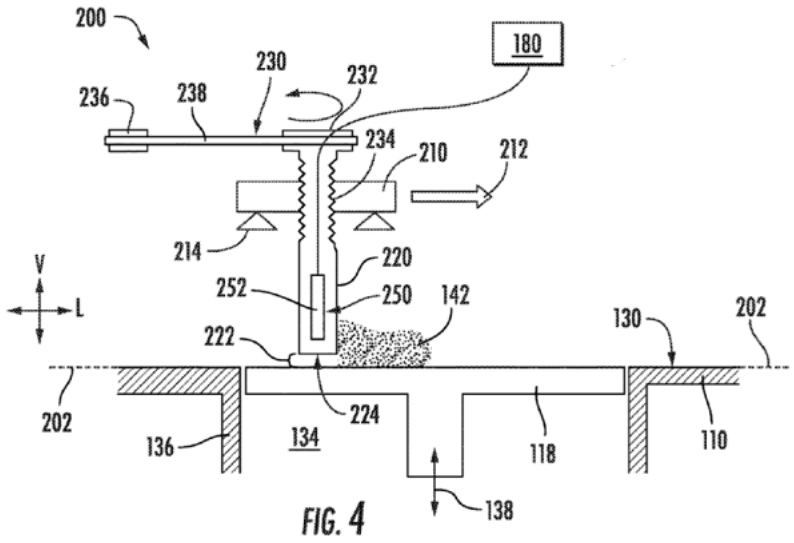


FIG. 4

Recoating assembly (200) with a recoater blade (220) movably coupled to a support beam (210).

B22F12/70

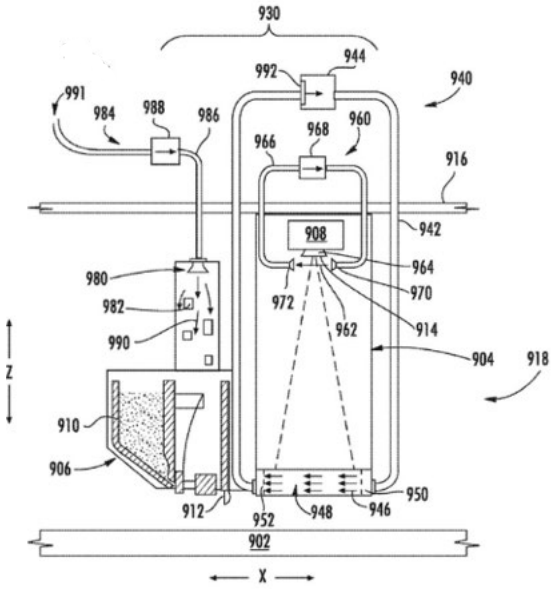
Definition statement

This place covers:

Units either within or connected to the additive manufacturing apparatus for gas flow.

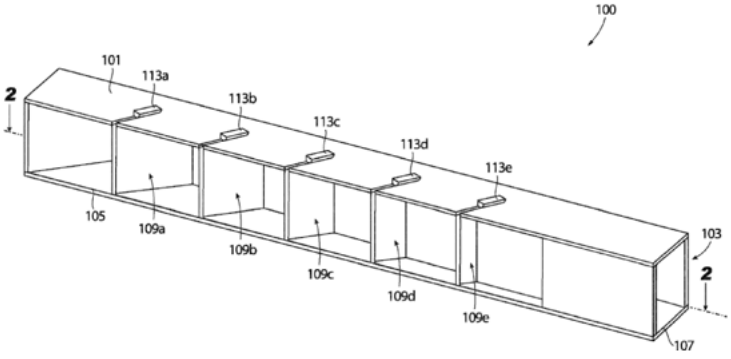
Illustrative examples of subject matter classified in this place:

1.



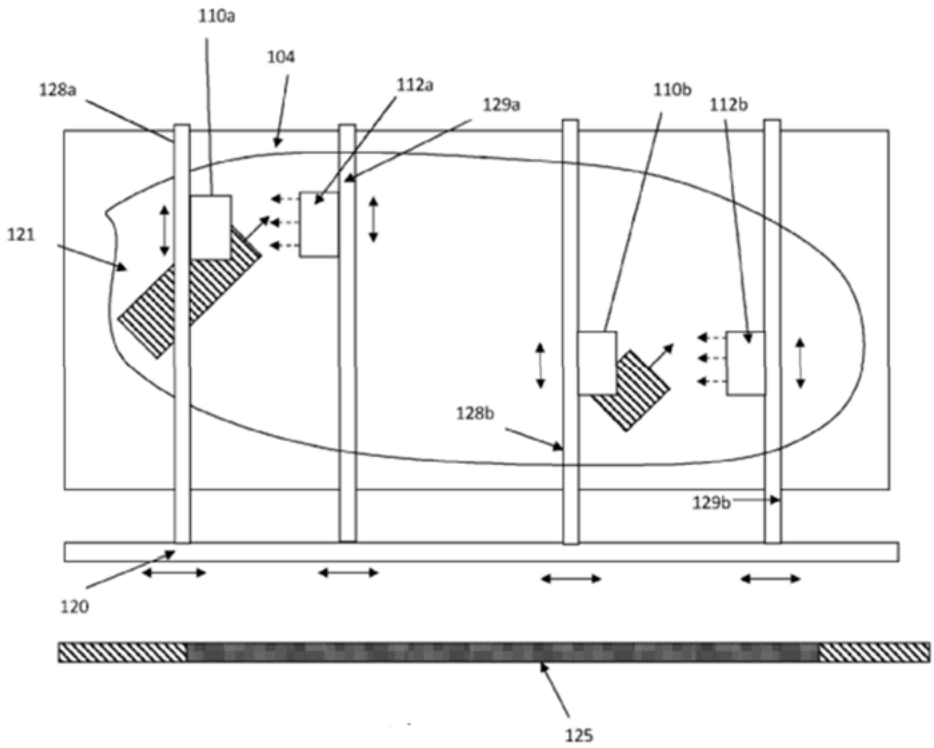
Gantry (916) movable above the build platform (902) having a condensate evacuation subsystem (940) circulating a first gas (946) through the build area (918) and a closed loop subsystem (960) for circulating a second gas (962) over a sensitive component (964).

2.



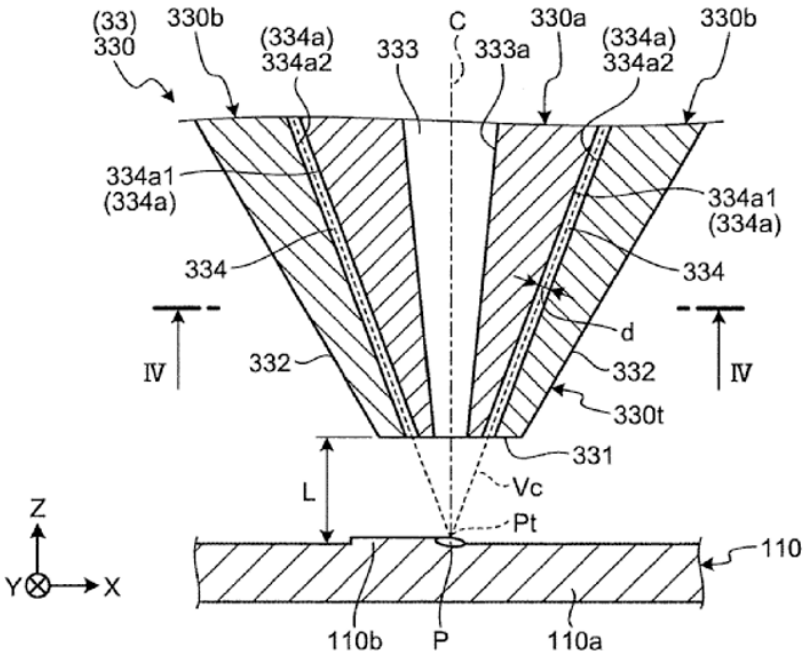
Additive manufacturing system comprising an exhaust manifold (100) with baffles (109a-e) movable with actuators (113a-e).

3.



Powder-bed-based additive manufacturing device comprising a movable pair of nozzles (112a and 112b) for blowing an inert gas, and a movable suction device (110a and 110b) for exhausting contaminated gas.

4.



Nozzle for direct metal deposition of metallic powder onto the surface of a base (110a) or onto the surface of an object (110) with constant gap (d) between body component (330a) and (330b) of the nozzle.

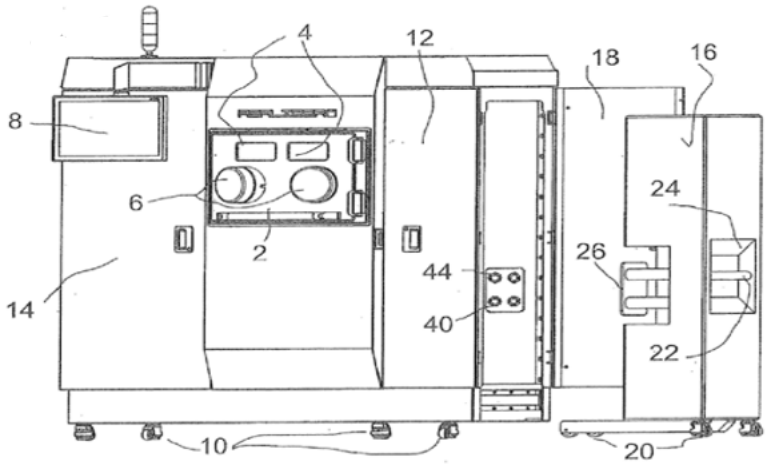
B22F12/80

Definition statement

This place covers:

Additive manufacturing [AM] production plants and production lines, modular designs for AM systems.

Illustrative example of subject matter classified in this place:



AM apparatus with an interchangeable module (16) incorporating a powder supply and recovery apparatus.

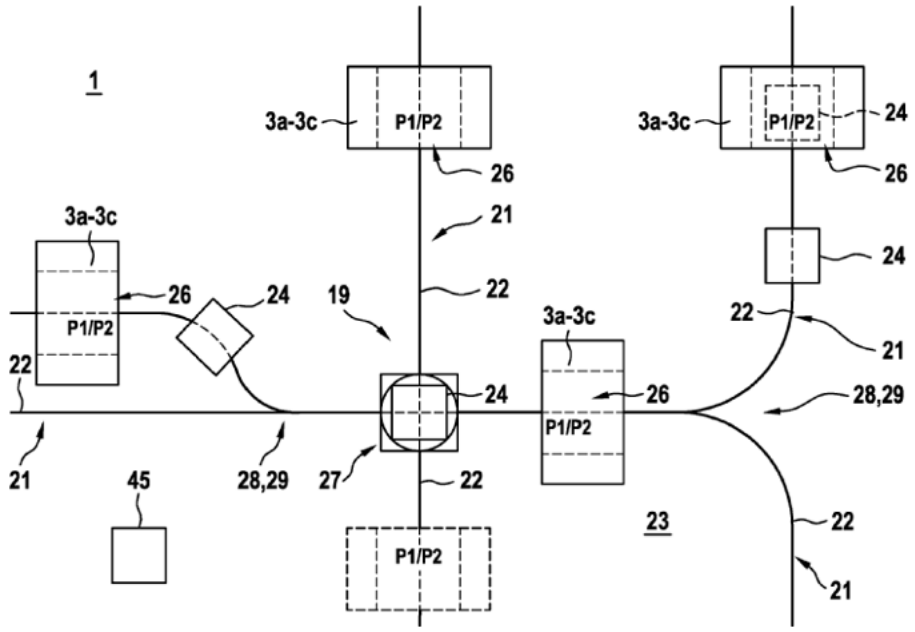
B22F12/82

Definition statement

This place covers:

Systems where an additive manufacturing apparatus or device is combined with other processing devices.

Illustrative example of subject matter classified in this place:



Plant (1) with several machines (26) with process stations for preprocessing (3a), additive manufacturing (3b) and post-processing (3c).

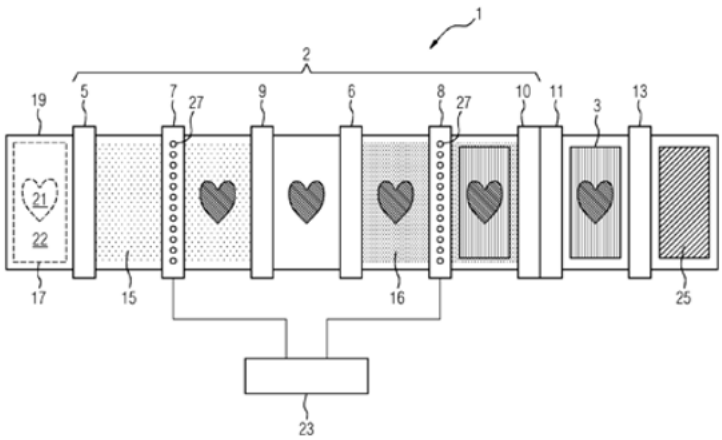
B22F12/84

Definition statement

This place covers:

Systems where additive manufacturing and other processing of articles can be performed in parallel within a single device.

Illustrative example of subject matter classified in this place:



Additive manufacturing apparatus (1) with deposition (5), fusing (7) and powder removal (9) units for first material (15) and corresponding units (6,8,10) for second material (16), followed by sintering (11) and coating (13) units.

B22F12/88

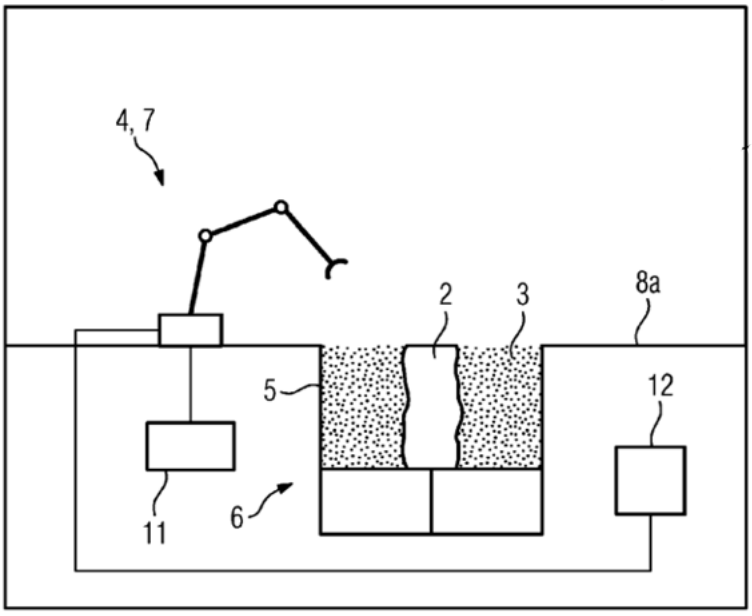
Definition statement

This place covers:

Moving and handling of additively manufactured products.

Also, unpacking devices and devices for removing leftover powder by rotating and/or vibrating the article after manufacturing. Unpacking devices may comprise any manipulation devices (e.g. robot, crane or gantry) configured to grasp/seize the three-dimensional article after manufacturing and to release it from surrounding unused build material.

Illustrative example of subject matter classified in this place:



Unpacking device (4) for unpacking article (2) from unsolidified construction material (3).

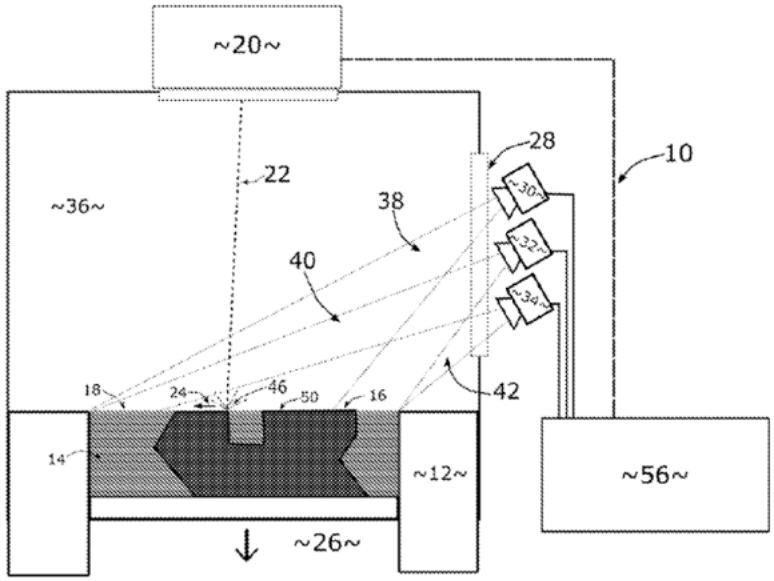
B22F12/90

Definition statement

This place covers:

Arrangements of sensors for monitoring or process control.

Illustrative example of subject matter classified in this place:



A plurality of image sensors (30, 32, 34) and a processor (56) for combining the fields of view of the sensors to a single image.

2. A. DEFINITIONS (modified)

B22F10/00

Replace: The existing Relationships text with the following updated text.

Relationships with other classification places

Group B29C 64/00 covers additive manufacturing of plastics or materials in a plastic state, not otherwise provided for.

Subclass B33Y covers additive manufacturing, irrespective of the process or material used. Furthermore, subclass B33Y is for obligatory supplementary classification of subject matter containing an aspect of additive manufacturing already classified as such in other classification places.

Groups B28B1/00 and C04B35/00 cover additive manufacturing of ceramics. Reference is made to making ceramic green bodies or pre-forms by computer aided shaping in C04B2235/6026, to aspects relating to heat treatments of ceramic bodies such as green ceramics or pre-sintered ceramics, including local sintering, e.g. laser sintering, in C04B2235/665 and (ceramic) mixtures specially adapted for three-dimensional printing in C04B2111/00181.

The relevant groups under B29C64/00, B22F, or B28B or C04B are applied according to the nature of the end product—polymer, metallic or ceramic, respectively.

Metallic articles manufactured by additive manufacturing, but where the manufacturing method is only described in general (e.g. simply as “additive manufacturing” or “3D printing”, or where several methods are listed with no particular emphasis), should only be classified in B33Y80/00 and B22F5/00 and/or the specific product class.

Workpieces or articles from metallic powder characterised by the special shape of the product are classified in group B22F5/00.

Compositions are classified in the appropriate groups in subclass C22C.

Repairing turbine components by additive methods is covered in B23P6/007.

Generation and modification of 3D models of the shape as such (voxel models, boundary representations or polygon meshes) is covered by G06T17/00.

Aspects of computer-aided design, such as design optimisation and analysis/simulation, are covered by G06F30/00.

References

Replace: The existing Informative references table with the following updated table.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Preparation of cocoa products	A23G 1/00
Shaping or working of foodstuff	A23P 10/00
Making of dental prostheses	A61C 13/00
Making customized prostheses implantable into the body	A61F2/30942
Making customized prostheses not-implantable into the body	A61F2/5046
Materials for prostheses or for coating prostheses	A61L 27/00
Moulds or cores for foundry moulding	B22C 9/00
Build-up welding by means of gas flame	B23K5/18
Build-up welding by means of arc	B23K9/04
Build-up welding by means of plasma	B23K10/027
Build-up welding by means of resistance heating	B23K11/0013
Build-up welding by means electron beam	B23K15/0086
Build-up welding by applying impact or other pressure	B23K20/1215
Build-up welding by means of slag	B23K25/005
Build-up welding by laser	B23K 26/342
Repairing turbine components by build-up welding	B23P6/007
Producing shaped articles from ceramic or cementitious material	B28B 1/00
Moulds, cores or mandrels for shaping clay or other ceramic compositions	B28B 7/00
Additive manufacturing of plastics	B29C 64/00
Ancillary operations in connection with laminating processes	B32B 38/00
Forme preparation for the manufacture or reproduction of printing surfaces	B41C 1/00
Typewriters or selective printers for marking on special material	B41J 3/407
Braille printing	B41M 3/16
Processes for producing ornamental structures by superimposing layers	B44C 3/02
Forming processes for shaped ceramic products	C04B 35/622
Culture of cells	C12N 5/00
Blades and blade-carrying members for non-positive displacement machines	F01D5/00

Making sintered bearings by built-up welding	F16C2220/24
Photosensitive materials for photographic purposes	G03C 1/00
Photographic processes	G03C 5/00
Photomechanical production of textured or patterned surface	G03F 7/00
Electrographic processes using a charge pattern	G03G 13/00
Electric numerical control systems for the surface or curve machining, making 3D objects	G05B 19/4099
Computer-aided design [CAD]	G06F30/00
3D modelling for computer graphics	G06T 17/00
Models for surveying; Models for geography, e.g. relief models	G09B 25/06
Discharge tubes for applying thin layers on objects	H01J 37/00
Apparatus or processes for manufacturing printed circuits using printing techniques to apply the conductive material	H05K 3/12

B22F10/14

Replace: The existing Definition statement text with the following updated text and image.

Definition statement

This place covers:

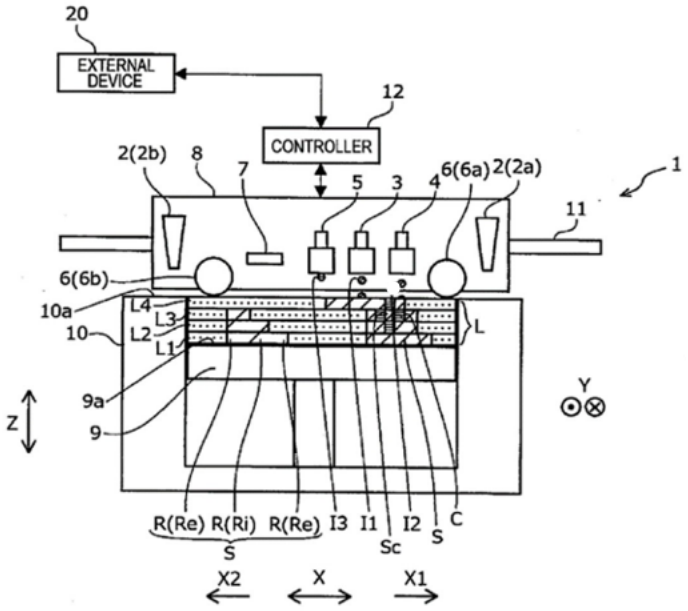
The deposition of a liquid bonding agent onto a thin layer of metallic particles forming a powder bed to join the metallic particles and build up a green body layer by layer.

The bonding agent may include organic and inorganic materials.

The powder bed may be formed from mixtures of metallic particles with (non-metallic) inorganic particles, for example (non-metallic) inorganic particles having a metallic coating or metallic particles having a (non-metallic) inorganic coating.

Illustrative example of subject matter classified in this place:

Binder jetting



B22F10/16

Replace: The existing Definition statement text with the following updated text and images.

Definition statement

This place covers:

The formation layer by layer of a green body by selectively depositing a viscous material comprising activating a binder embedded in a powder bed of metallic particles.

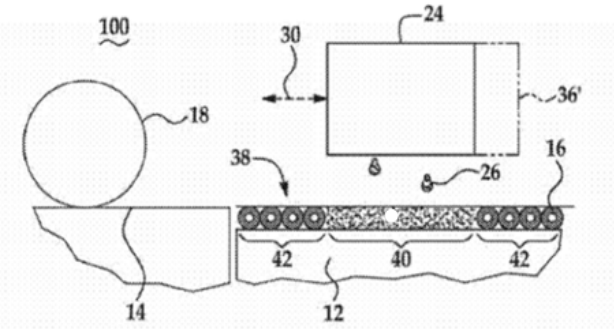
The binder might be activated by a heat source (such as a laser beam, IR-light, etc.) to bond the metallic particles.

The binder may include organic and inorganic materials and may be present in the powder bed as a mixture with the metallic particles or may be present as a coating on the metallic particles.

The powder bed may be formed from mixtures of metallic particles with (non-metallic) inorganic particles, for example (non-metallic) inorganic particles having a metallic coating or metallic particles having a (non-metallic) inorganic coating, with an additional binder embedded in the said powder bed.

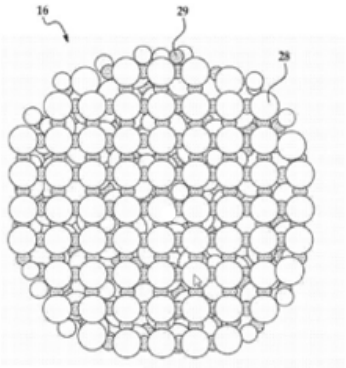
Illustrative example of subject matter classified in this place:

1.a



Binder jetting comprising selectively depositing a patterning fluid (26) onto granules (16) of build material.

1.b



Granules (16) of the build material comprising metal particles (28) bound by a polymeric binder (29).

B22F10/18

Replace: The existing Definition statement text with the following updated text and image.

Definition statement

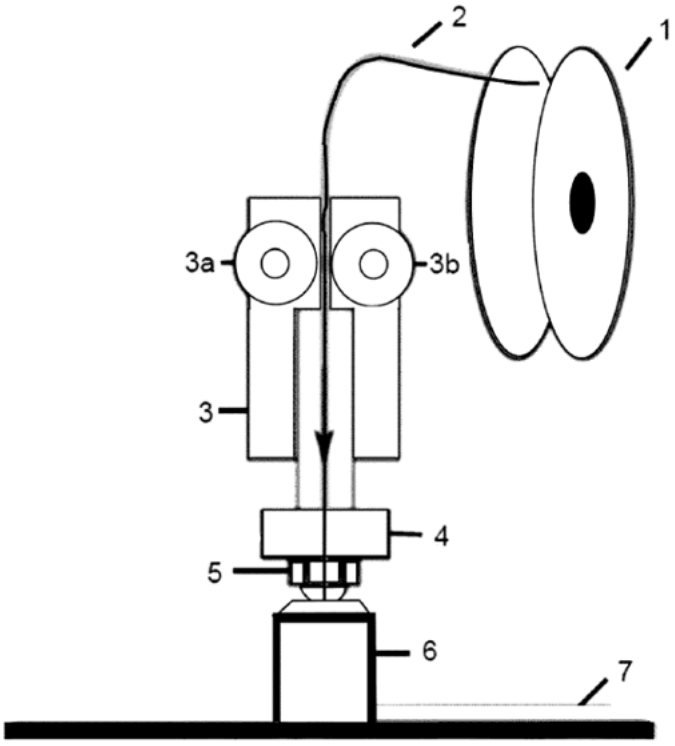
This place covers:

The formation layer by layer of a green body by selectively depositing beads of a viscous material composed of a mixture of metal particles embedded in a binder, the mixture having the form of a filament. The binder may include organic and inorganic materials.

For example, the filament material might be extruded by a nozzle in beads.

Illustrative example of subject matter classified in this place:

Fused filament fabrication



B22F10/30

Replace: The existing Relationships text with the following updated text.

Relationships with other classification places

Group B29C 64/393 concerns processes for additive manufacturing of plastics.

Group B22F10/85 concerns data acquisition or data processing for controlling or regulating additive manufacturing processes.

B22F10/34

Replace: The existing Definition statement text with the following updated text and images.

Definition statement

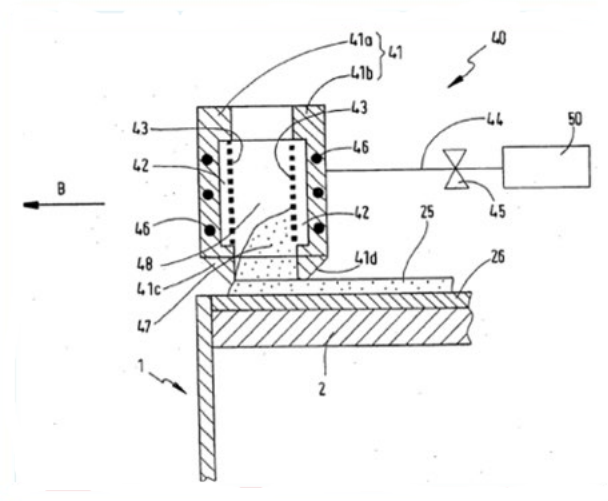
This place covers:

Control of the powder characteristics before or during the additive manufacture. The powder characteristics are controlled or selected in a particular way.

Process control with respect to properties of powders before they are fed to the powder bed, such as control during mixing of powders, or while drying or protecting powders from oxidation.

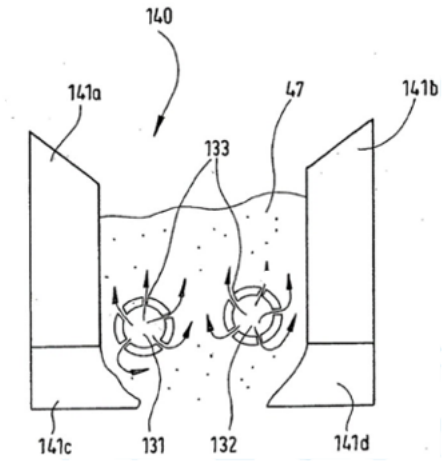
Illustrative examples of subject matter classified in this place:

1.



Control of fluidization of powder material (47) comprised in an application device (40) through a fluidization device integrated into the longitudinal walls (41a and 41b) of the application device (40).

2.



Control of fluidization of powder material (47) comprised in an application device (140) through a fluidization device (131 and 132) integrated within said application device (140).

Insert: The following new Special rules section.

Special rules of classification

In this group, C-Sets (#B22Fc) are used. The detailed information about the C-Sets construction and the associated syntax rules are found in the “Special rules of classification” in B22F.

For example, where a particular aspect mentioned in B22F1/00 is controlled, a C-Set should be included of the form (B22F2999/00, B22F10/34, B22F1/00 and subgroups).

B22F10/37

Replace: The existing Definition statement text with the following updated text and images.

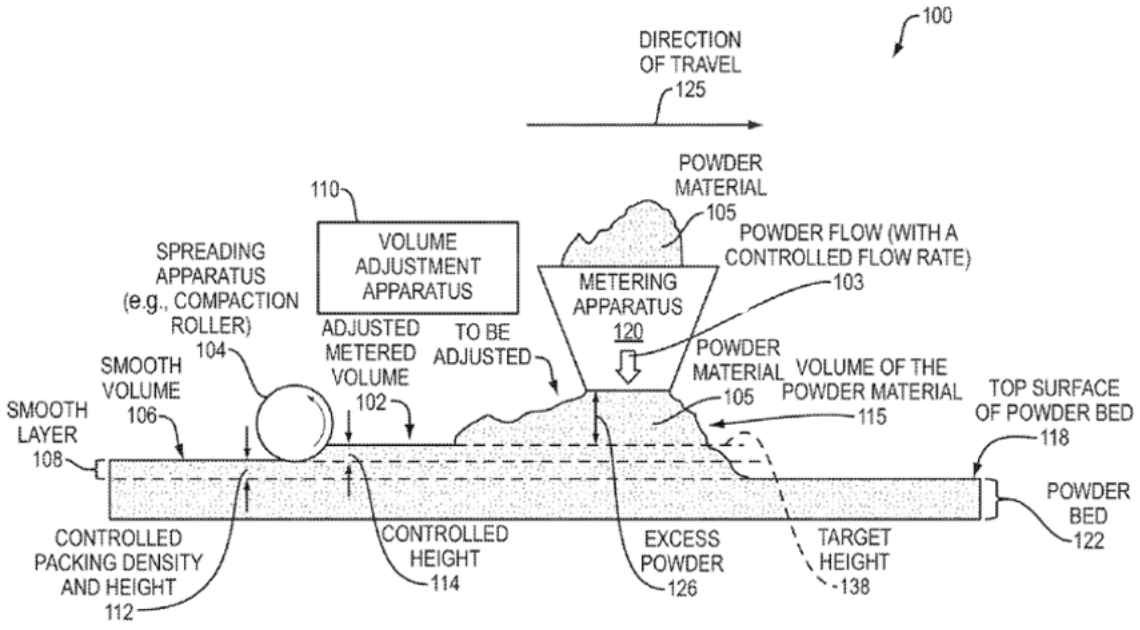
Definition statement

This place covers:

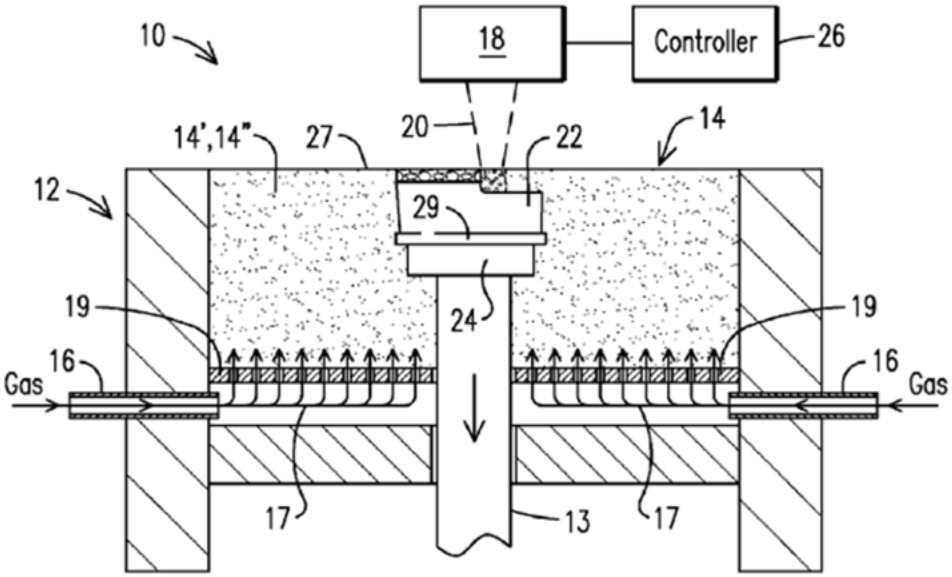
Powder bed aspects, e.g. smoothness of the bed, its density or the presence of defects, e.g. spatters.

Illustrative examples of subject matter classified in this place:

1. Control of powder bed aspect, packing density and height



2. Control of the fluidisation of the powder contained in the powder bed



Insert: The following new Special rules section.

Special rules of classification

Classification in group B22F 10/37 is made if the powder bed is seen as a distinct aspect or entity.

B22F12/86

Replace: The existing Definition statement text with the following updated text and images.

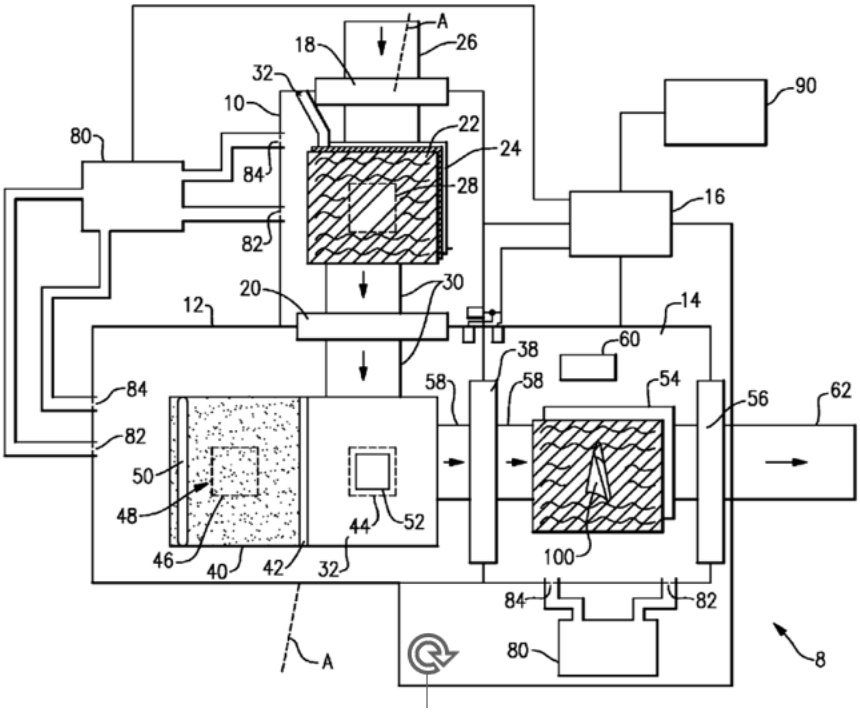
Definition statement

This place covers:

Modular set-up of workstations connected to each other by, e.g. robots or continuous transport means, but clustered.

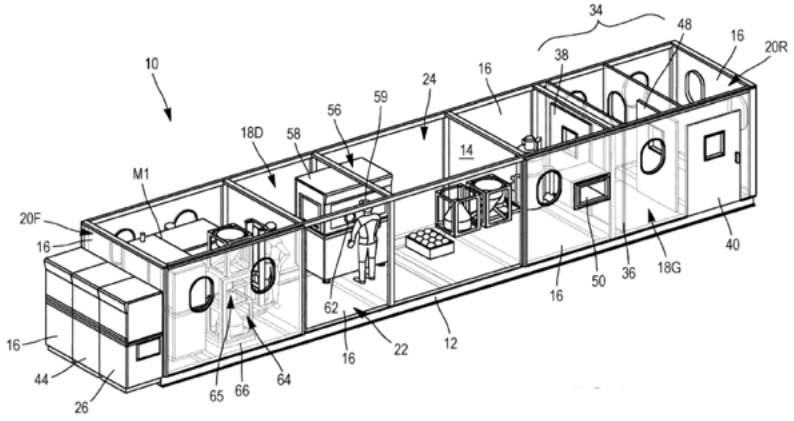
Illustrative examples of subject matter classified in this place:

1.



System (8) where a component (100) is formed in the chamber (12) and undergoes post-processing in the chamber (14). It is transferred between the chambers (10, 12, 14) by means of belt or conveyor (30, 58, 62).

2.



Mobile AM installation (10) with an AM machine (M1) and auxiliary functions.