SOLDERING OR UNSOLDERING; WELDING; CLADDING OR PLATING BY SOLDERING OR WELDING; CUTTING BY APPLYING HEAT LOCALLY, e.g. FLAME CUTTING; WORKING BY LASER BEAM (making metal-coated products by extruding metal B21C 23/22; building up linings or coverings by casting B22D 19/08; casting by dipping B22D 23/04; manufacture of composite layers by sintering metal powder B22F 7/00; arrangements on machine tools for copying or controlling B23Q; covering metals or covering materials with metals, not otherwise provided for C23C; burners F23D)

NOTES
1. This subclass covers also electric circuits specially adapted for the purposes covered by the title of the subclass.
2. In this subclass, the following term is used with the meaning indicated:
   • “soldering” means uniting metals using solder and applying heat without melting either of the parts to be united

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:
   - B23K 35/04 - B23K 35/20 covered by B23K 35/0205 - B23K 35/0294
   - B23K 35/363 covered by B23K 35/3601 - B23K 35/3618
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.

Soldering, e.g. brazing, or unsoldering (essentially requiring the use of welding machines or welding equipment, see the relevant groups for the welding machines or welding equipment)

1/00 Soldering, e.g. brazing, or unsoldering (B23K 3/00 takes precedence; characterised only by the use of special materials or media B23K 35/00; dip or wave soldering in the manufacture of printed circuits H05K 3/34)

1/002 . [Soldering by means of dipping in a fused salt bath]
1/004 . [Resistance soldering]
1/006 . [Exothermic brazing]
1/008 . [specially adapted for particular articles or work]
1/001 . . [Sealing small holes in metal containers, e.g. tins]
1/0012 . . . [Brazing heat exchangers]
1/0014 . . . [Brazing of honeycomb sandwich structures]
1/0016 . . . [Brazing of electronic components]
1/0018 . . . [Brazing of turbine parts]
1/002 . . Soldering by means of induction heating
1/005 . . Soldering by means of radiant energy
1/0053 . . . [soldering by means of I.R.]
1/0056 . . . [soldering by means of beams, e.g. lasers, E.B.]
1/008 . . Soldering within a furnace (B23K 1/012 takes precedence)
1/012 . . Soldering with the use of hot gas
1/015 . . Vapour-condensation soldering
1/018 . . Unsoldering; Removal of melted solder or other residues
1/06 . . making use of vibrations, e.g. supersonic vibrations
1/08 . . Soldering by means of dipping in molten solder
1/085 . . . [Wave soldering]
1/14 . . . specially adapted for soldering seams (making tubes involving operations other than soldering B21C)
1/16 . . . longitudinal seams, e.g. of shells
1/18 . . . circumferential seams, e.g. of shells
1/19 . . . taking account of the properties of the materials to be soldered
1/20 . . . Preliminary treatment of work or areas to be soldered, e.g. in respect of a galvanic coating (preparation of surfaces in particular ways, see the relevant classes for the treatments or the materials treated, e.g. C04B, C23C)
1/203 . . . [Fluxing, i.e. applying flux onto surfaces]
1/206 . . . [Cleaning]
3/00 Tools, devices, or special appurtenances for soldering, e.g. brazing, or unsoldering, not specially adapted for particular methods (materials used for soldering B23K 35/00)
3/02 . . Soldering irons; Bits
3/021 . . . [Flame-heated soldering irons]
3/022 . . . . [using a gaseous fuel]
3/023 . . . . [using a liquid fuel]
3/024 . . . . [using a solid fuel]
Soldering, e.g. brazing, or unsoldering

- [Bits or tips]
- [Removable soldering bits]
- [Holders for soldering irons]
- [Devices for cleaning soldering iron tips (B23K 3/027 takes precedence)]
- [Solder or residue removing devices]
- Electrically heated
- [with current flow through the workpiece]
- [Quick-heating soldering irons having the tip-material forming part of the electric circuit (B23K 3/0323 takes precedence)]
- [Battery-powered soldering irons]
- [comprising means for controlling or selecting the temperature or power]
- [Constructional features of electric soldering irons]
- [Handles]
- [Heating elements or heating element housings]
- [Couplings between the handle and the heating element housing]
- [Couplings between the heating element housing and the bit or tip]
- [comprising carbon heating elements or electrodes (B23K 3/0384 and B23K 3/0392 take precedence)]
- [the heat being generated by an arc]
- [the heat being generated by contact resistance]
- Heating appliances (soldering lamps or blowpipes - B23D: electric heating in general H05B)
- [Flame-heated appliances]
- Electric
- [using resistance rod or bar, e.g. carbon silica]
- [using Joule effect at the place of contact between a rod and the soldering tip]
- [using induction effects, e.g. Kelvin or skin effects]
- [Soldering pliers]
- [comprising means for controlling or selecting the temperature or power]
- [using resistance wires]
- Solder feeding devices; Solder melting pans
- [Solder feeding devices]
- [forming part of a soldering iron]
- [for shaped solder piece feeding, e.g. preforms, bumps, balls, pellets, droplets]
- [for wire feeding]
- [for viscous material feeding, e.g. solder paste feeding (B23K 3/0623 takes precedence)]
- [Solder baths]
- [with wave generating means, e.g. nozzles, jets, fountains]
- [Oscillating baths]
- [with dipping means]
- [Conveyors therefor]
- [with means for oscillating the workpiece]
- [with intermediary means for bringing solder on workpiece, e.g. rollers]
- Auxiliary devices therefor (cleaning pipes or tubes or systems of pipes or tubes, e.g. before soldering, B08B 9/02)
- Flux dispensers; Apparatus for applying flux
- [Cooling, heat sink or heat shielding means]
- [Soldering or brazing jigs, fixtures or clamping means]

**Flame welding or cutting**

5/00 Gas flame welding

5/003. [the welding zone being shielded against the influence of the surrounding atmosphere (selection of media B23K 35/38)]

5/006. [specially adapted for particular articles or work]

5/02. Seam welding (making tubes involving operations other than welding B21C)

5/023. [of horizontal seams in assembling vertical plates a welding unit being adapted to travel along the upper horizontal edge of the plates]

5/026. [of non-horizontal seams in assembling non-horizontal plates]

5/04. [using additional profiled strips or the like of welding metal along seam edges]

5/06. [Welding longitudinal seams]

5/08. [Welding circumferential seams]

5/083. [Welding three-dimensional seams]

5/086. . [helicoidal seams]

5/10. [Welding workpieces essentially comprising layers of different metals, e.g. plated workpieces]

5/12. [taking account of the properties of the material to be welded]

5/14. [of non-ferrous metals (B23K 5/16 takes precedence)]

5/16. [of different metals]

5/18. [for purposes other than joining parts, e.g. built-up welding]

5/20. [making use of vibrations, e.g. supersonic vibrations]

5/213. [Preliminary treatment]

5/22. [Auxiliary equipment, e.g. backings, guides]

5/24. [Arrangements for supporting torches (not restricted to flame welding B23K 37/02)]

7/00 Cutting, scarfing, or desurfacing by applying flames (thermal deburring B23D 79/005)

7/001. [for profiling plate edges or for cutting grooves]

7/002. [Machines, apparatus, or equipment for cutting plane workpieces, e.g. plates]

7/003. [Machines, apparatus, or equipment for cutting long articles, e.g. cast stands, plates, in parts of predetermined length]

7/004. [Seam tracking]

7/005. [Machines, apparatus, or equipment specially adapted for cutting curved workpieces, e.g. tubes]

7/006. [for tubes]

7/007. . [for obtaining tube intersection profiles]

7/008. [Preliminary treatment]

7/06. [Machines, apparatus, or equipment specially designed for scarfing or desurfacing]

7/08. [by applying additional compounds or means favouring the cutting, scarfing, or desurfacing procedure]

7/10. [Auxiliary devices, e.g. for guiding or supporting the torch (guiding means applicable to other metal-working machines B23Q)]

7/102. [for controlling the spacial relationship between the workpieces and the gas torch]

7/105. [specially adapted for particular geometric forms]
**Electric welding or cutting**

9/00  arc welding or cutting (electro-slag welding B23K 2500; welding transformers H01F; welding generators H02K)

9/0008  arc welding without shielding means against the influence of the surrounding atmosphere

9/0017  using more than one electrode

9/0026  specially adapted for particular articles or work

9/0035  of thin articles

9/0043  locally welding a thin plate to a thick piece (spot arc welding B23K 9/007)

9/0052  welding of pipe panels

9/0061  underarc arc welding

9/0077  spot arc welding

9/0139  arc cutting, gouging, scarfing or desurfacing

9/0135  arc saw cutting

9/0023  [inserts]

9/0025  of horizontal seams in assembling vertical plates, a welding unit being adapted to travel along the upper horizontal edge of the plates

9/0099  of non-horizontal seams in assembling non-horizontal plates

9/0213  narrow gap welding

9/0024  of rectilinear seams

9/0253  of the longitudinal seam of tubes

9/0256  of welding ribs on plates

9/0289  of curved planar seams

9/0282  of welding tube sections

9/0284  with an electrode working inside the tube

9/0206  with an electrode moving around the fixed tube during the welding operation

9/0288  of welding tubes to tube plates

9/0326  for three-dimensional seams

9/0325  helicoideal seams

9/0355  with backing means disposed under the seam

9/0352  the backing means being movable during the welding operation

9/0354  the backing means being expandable

9/0356  the backing means being a tape or strip

9/0358  the backing means being a ring or sleeve

9/038  using moulding means (not restricted to arc welding B23K 37/06)

9/04  welding for other purposes than joining, e.g. built-up welding

9/0417  built-up welding on planar surfaces

9/044  built-up welding on three-dimensional surfaces

9/046  on surfaces of revolution

9/048  on cylindrical surfaces

9/06  arrangements or circuits for starting the arc, e.g. by generating ignition voltage, or for stabilising the arc

9/0677  starting the arc

9/0671  by means of brief contacts between the electrodes

9/0672  without direct contact between electrodes

9/0673  ionisation of the arc gap by means of a tension with a step front (pulses or high frequency tensions)

9/0675  ionisation of the arc gap by means of radiation or particle bombardment

9/0676  ionisation of the arc gap by means of heating

9/0677  ionisation of the arc gap by means of a contact piece disposed between the electrodes

9/0678  ionisation of the arc gap by means of an auxiliary arc

9/073  stabilising the arc

9/0731  stabilising of the arc tension

9/0732  stabilising of the arc current

9/0734  stabilising of the arc power

9/0735  stabilising of the arc length

9/0736  stabilising of the arc position

9/0738  stabilising of the arc by automatic re-ignition means

9/08  arrangements or circuits for magnetic control of the arc (stabilising of the arc position by magnetic means B23K 9/0737)

9/09  arrangements or circuits for arc welding with pulsed current or voltage

9/0901  characterised by the circuits

9/0902  characterised by the shape of the pulses produced

9/0903  the frequency of the pulses produced being modulatable

9/0905  monitoring or automatic control of welding parameters

9/0953  using computing means

9/0956  using sensing means, e.g. optical

9/10  other electric circuits therefor; protective circuits; remote controls

9/1006  power supply

9/1012  characterised by parts of the process

9/1018  improvements of the cos (phi) of arc welding installations

9/1025  means for suppressing or reducing DC components in AC arc welding installations

9/1031  reduction of the arc voltage beneath the arc striking value, e.g. to zero voltage, during non-welding periods

9/1037  means preventing crater forming at the extremity of the seam

9/1043  characterised by the electric circuit (B23K 9/1012 takes precedence)

9/105  by using discharge tubes or mechanical contactors (B23K 9/1068 takes precedence)

9/1056  by using digital means (B23K 9/1068 takes precedence)

9/106  with computing means

9/1068  electric circuits for the supply of power to two or more arcs from a single source

9/1075  parallel power supply, i.e. multiple power supplies or multiple inverters supplying a single arc or welding current

9/1081  arc welding by means of accumulated energy

9/1087  arc welding using remote control

9/1093  consumable electrode or filler wire preheat circuits

9/12  automatic feeding or moving of electrodes or work for spot or seam welding or cutting

9/121  devices for the automatic supply of at least two electrodes one after the other
Electric welding or cutting

9/122 . . . [Devices for guiding electrodes, e.g. guide tubes]
9/123 . . . [Serving also as contacting devices supplying welding current to an electrode]
9/124 . . . [Circuits or methods for feeding welding wire]
9/125 . . . [Feeding of electrodes (for stabilising arc B23K 9/073)]
9/126 . . . [Controlling the spatial relationship between the work and the gas torch (between wire tip and piece B23K 9/073)]
9/127 . . . [Means for tracking lines during arc welding or cutting (copying in general B23Q 35/00)]
9/1272 . . . [Geometry oriented, e.g. beam optical trading]
9/1274 . . . [Using non-contact, optical means, e.g. laser means]
9/1276 . . . [Using non-contact, electric or magnetic means, e.g. inductive means]
9/1278 . . . [Using mechanical means]
9/133 . . . [Means for feeding electrodes, e.g. drums, rolls, motors]
9/1333 . . . [Dereeling means]
9/1336 . . . [Driving means]
9/14 . . . [making use of insulated electrodes]
9/142 . . . [Drag welding, the arc length being determined by an insulated layer between the welding electrode and the welding spot or seam]
9/145 . . . [the insulated welding electrode being laid along the seam]
9/147 . . . [the insulated welding electrode resting with one extremity on the workpiece]
9/16 . . . [making use of shielding gas (selection of media B23K 35/38)]
9/162 . . . [making use of a stationary fluid]
9/164 . . . [making use of a moving fluid]
9/167 . . . [and of a non-consumable electrode]
9/1675 . . . [making use of several electrodes]
9/173 . . . [and of a consumable electrode]
9/1735 . . . [making use of several electrodes]
9/18 . . . Submerged-arc welding
9/182 . . . [making use of a non-consumable electrode]
9/184 . . . [making use of several electrodes]
9/186 . . . [making use of a consumable electrodes]
9/188 . . . [making use of several electrodes]
9/20 . . . Stud welding
9/201 . . . [of the extremity of a small piece on a great or large basis]
9/202 . . . [by means of portable equipment, e.g. stud welding gun]
9/203 . . . [of cooling fins]
9/205 . . . [Means for determining, controlling or regulating the arc interval]
9/206 . . . [with automatic stud supply]
9/207 . . . [Features related to studs (welding studs per se B23K 35/0288)]
9/208 . . . [Ferrules, e.g. for confining molten material]
9/22 . . . Percussion welding
9/23 . . . [taking account of the properties of the materials to be welded]
9/232 . . . [of different metals]
9/235 . . . Preliminary treatment
9/24 . . . Features related to electrodes (form or composition of electrodes B23K 35/00)
9/26 . . . Accessories for electrodes, e.g. ignition tips
9/28 . . . [Supporting devices for electrodes (not restricted to arc welding or cutting B23K 37/02)]
9/282 . . . [Electrode holders not supplying shielding means to the electrode]
9/285 . . . [Cooled electrode holders]
9/287 . . . [Supporting devices for electrode holders (not restricted to arc welding B23K 37/02)]
9/29 . . . [Supporting devices adapted for making use of shielding means]
9/291 . . . [the shielding means being a gas]
9/293 . . . [using consumable electrode-rod]
9/295 . . . [using consumable electrode-wire]
9/296 . . . [using non-consumable electrodes]
9/298 . . . [the shielding means being a powder]
9/30 . . . Vibrating holders for electrodes (B23K 9/022 takes precedence)
9/32 . . . [Accessories (earthing connections H01R)]
9/321 . . . [Protecting means (protecting means in general F16P 1/06)]
9/322 . . . [Head protecting means (masks, shields or hoods for welders A61F 9/06)]
9/323 . . . [Combined coupling means, e.g. gas, electricity, water or the like (electrical only H01R)]
9/324 . . . [Devices for supplying or evacuating a shielding or a welding powder, e.g. a magnetic powder]
9/325 . . . [Devices for supplying or evacuating shielding gas]
9/326 . . . [Purge gas rings, i.e. devices for supplying or evacuating shielding gas inside of hollow or tubular articles, e.g. pipes, vessels]
9/327 . . . [Means for transporting supplies (carriages in general B23K 37/02)]
9/328 . . . [Cleaning of weld torches, i.e. removing weld-splatter, Preventing weld-splatter, e.g. applying anti-adhesives]

10/00 Welding or cutting by means of a plasma
10/003 . . . [Scarifying, desurfacing or deburring (by applying flames B23K 7/06)]
10/006 . . . [Control circuits therefor (circuits for plasma torches H05H 1/36)]
10/02 . . . [Plasma welding]
10/022 . . . [Spot welding]
10/025 . . . [by making use of electrode vibrations]
10/027 . . . [Welding for purposes other than joining, e.g. build-up welding]

11/00 Resistance welding; Severing by resistance heating
11/0006 . . . [the welding zone being shielded against the influence of the surrounding atmosphere (selection of media B23K 35/38)]
11/0013 . . . [welding for reasons other than joining, e.g. build up welding]
11/002 . . . [specially adapted for particular articles or work]
11/0026 . . . [Welding of thin articles]
11/003 . . . [Welding locally a thin plate to a large piece]
11/004 . . . [Welding of a small piece to a great or broad piece]
11/0046 . . . [the extremity of a small piece being welded to a base, e.g. cooling studs or fins to tubes or plates]
11/0053 . . . [Stud welding, i.e. resistive (with an arc B23K 9/20)]
11/006 . . . [Welding a tip to a base, e.g. pen point nibs]
Electric welding or cutting

11/0066 . . . {Riveting}
11/0073 . . . {Butt welding of long articles advanced axially}
11/008 . . . {Manufacturing of metallic grids or mats by spot welding}
11/0086 . . . {Grids or mats used in concrete structures
  (B23K 11/11 takes precedence)}
11/0093 . . . {Welding of honeycomb sandwich structures
  (brazing of honeycomb sandwich structure
  B23K 1/0014)}
11/02 . Pressure butt welding
11/04 . Flash butt welding
11/043 . . . {characterised by the electric circuits used therewith}
11/046 . . . {Apparatus therefor}
11/06 . using roller electrodes
11/061 . . . {for welding rectilinear seams}
11/062 . . . {for welding longitudinal seams of tubes}
11/063 . . . . {Lap welding}
11/065 . . . {for welding curved planar seams}
11/066 . . . . {of tube sections}
11/067 . . . . {for welding three-dimensional seams}
11/068 . . . . . {of helicoidal seams}
11/08 . Seam welding not restricted to one of the preceding subgroups
11/082 . . . . . {of three-dimensional seams}
11/084 . . . . . . {of helicoidal seams}
11/087 . . . . . for rectilinear seams
11/0873 . . . . . {of the longitudinal seam of tubes}
11/0876 . . . . {Lap welding}
11/093 . . . . . for curved planar seams
11/0935 . . . . . {of tube sections}
11/10 . Spot welding; Stitch welding
11/105 . . . {Stitch welding}
11/11 . Spot welding
11/115 . . . . . {by means of two electrodes placed opposite
  one another on both sides of the welded parts}
11/12 . . . making use of vibrations
11/14 . Projection welding
11/16 . taking account of the properties of the material to be welded
11/163 . . . . . {Welding of coated materials}
11/166 . . . . . . {of galvanized or tinned materials}
11/18 . . . . of non-ferrous metals (B23K 11/20 takes precedence)
11/185 . . . . . {of aluminium or aluminium alloys}
11/20 . . . . of different metals
11/22 . Severing by resistance heating
11/24 . Electric supply or control circuits therefor
11/241 . . . . {Electric supplies (B23K 11/248 takes precedence)}
11/243 . . . . {Multiple welding installations fed by one
  source}
11/245 . . . . . {using a stepping counter in synchronism with
  the welding pulses (electromagnetic counters
  G06M)}
11/246 . . . . {for flash welding}
11/248 . . . {Electric supplies using discharge tubes}
11/25 . . . Monitoring devices
11/251 . . . . {using analog means}
11/252 . . . . . {using digital means}
11/253 . . . . . {the measured parameter being a
  displacement or a position}
Other welding or cutting: Working by laser beam

15/00 Electron-beam welding or cutting (electron- or ion-beam tubes (H01J 37/00))
15/0006 specially adapted for particular articles
15/0013 Positioning or observing workpieces, e.g. with respect to the impact; Aligning, aiming or focusing electronbeams
15/002 Devices involving relative movement between electronbeam and workpiece
15/0026 Auxiliary equipment
15/0033 Preliminary treatment
15/004 Tandem beams or torches, i.e. working simultaneously with several beams or torches
15/0046 (Welding)
15/0053 Seam welding
15/006 [of rectilinear seams]
15/0066 [with backing means disposed under the seams]
15/0073 [with interposition of particular material to facilitate connecting the parts, e.g. using a filler]
15/008 Spot welding
15/0086 [welding for purposes other than joining, e.g. built-up welding]
15/0093 [characterised by the properties of the materials to be welded]
15/02 Control circuits therefor
15/04 for welding annular seams
15/06 within a vacuum chamber (B23K 15/04 takes precedence)
15/08 Removing material, e.g. by cutting, by hole drilling
15/085 (Boring)
15/10 (Boring)

17/00 Use of the energy of nuclear particles in welding or related techniques

20/00 Non-electric welding by applying impact or other pressure, with or without the application of heat, e.g. cladding or plating
20/001 by extrusion or drawing
20/002 (specially adapted for particular articles or work (B23K 20/129 takes precedence))
20/004 Wire welding
20/005 Capillary welding
20/007 Ball bonding
20/008 [pressure combined with radiant energy]
20/02, by means of a press (B23K 20/001, B23K 20/004 take precedence)
20/021 Isostatic pressure welding
20/023 Thermo-compression bonding
20/025 Bonding tips therefor
20/026 with diffusion of soldering material
20/028 Butt welding
20/04 by means of a rolling mill
20/06 by means of high energy impulses, e.g. magnetic energy
20/08 Explosive welding
20/085 for tubes, e.g. plugging
20/10 making use of vibrations, e.g. ultrasonic welding
20/103 using a roller
20/106 (Features related to sonotrodes)

20/12 the heat being generated by friction; Friction welding
20/1205 (using translation movement)
20/121 Control circuits therefor
20/1215 (for other purposes than joining, e.g. built-up welding)
20/122 (using a non-consumable tool, e.g. friction stir welding)
20/1225 (Particular aspects of welding with a non-consumable tool)
20/123 Controlling or monitoring the welding process
20/1235 (with temperature control during joining)
20/124 (at the beginning or at the end of a weld)
20/1245 (characterised by the apparatus)
20/125 Rotary tool drive mechanism
20/1255 Tools therefor, e.g. characterised by the shape of the probe
20/126 (Workpiece support, i.e. backing or clamping)
20/1265 (Non-butt welded joints, e.g. overlap-joints, T-joints or spot welds)
20/127 (friction stir welding involving a mechanical connection (forged connections B21K 25/005; riveted connections B21J 15/027))
20/1275 (involving metallurgical change)
20/128 making use of additional material
20/1285 Portable friction welding machines
20/129 (specially adapted for particular articles or workpieces)
20/1295 (Welding studs)
20/14 Preventing or minimising gas access, or using protective gases or vacuum during welding (formed by material interposed between workpieces B23K 20/18)
20/16 with interposition of special material to facilitate connection of the parts, e.g. material for absorbing or producing gas
20/165 (involving an exothermic reaction of the interposed material)
20/18 Zonal welding by interposing weld-preventing substances between zones not to be welded
20/20 Special methods allowing subsequent separation, e.g. of metals of high quality from scrap material
20/22 taking account of the properties of the materials to be welded
20/227 with ferrous layer
20/2275 (the other layer being aluminium)
20/233 without ferrous layer
20/2333 (one layer being aluminium, magnesium or beryllium)
20/2336 (both layers being aluminium)
20/24 Preliminary treatment
20/26 Auxiliary equipment

23/00 Alumino-thermic welding

25/00 Slag welding, i.e., using a heated layer or mass of powder, slag, or the like in contact with the material to be joined (B23K 23/00 takes precedence; submerged-arc welding B23K 9/18)
25/005 (Welding for purposes other than joining, e.g. built-up welding)
Other welding or cutting: Working by laser beam

26/00 Working by laser beam, e.g. welding, cutting or boring

NOTES

1. This subclass covers:
   - laser working for making a weakened layer, with or without removing material;
   - laser shock processing;
   - apparatus for laser surface treatment;
   - laser ablation.

2. This subclass does not cover:
   - laser assisted deposition which is covered by subclass C23C;
   - laser sintering which is covered by group B22F 3/105 for metallic powder, by group B29C 67/04 for plastics, by group C03B 19/06 for glass or by group C04B 35/64 for ceramics;
   - laser assisted chemical etching which is covered by group C23F 1/00.

26/0006 [taking account of the properties of the material involved (B23K 26/32, B23K 26/40 take precedence)]

26/009 [using a non-absorbing, e.g. transparent, reflective or refractive, layer on the workpiece (using a mask on the workpiece B23K 26/066)]

26/0093 [combined with mechanical machining or metal-working covered by other subclasses than B23K (combined welding or cutting procedures or apparatus B23K 28/02)]

26/0096 [Portable laser equipment, e.g. hand-held laser apparatus (surgical laser instruments A61B 18/20, Dental Lasers A61C 1/0046, Hand-held laser dental apparatus for curing resins A61C 19/004)]

26/002 [Positioning or observing the workpiece, e.g. with respect to the point of impact; Aligning, aiming or focusing the laser beam]

26/03 [Observing, e.g. monitoring, the workpiece]

26/032 [using optical means]

26/034 [Observing the temperature of the workpiece]

26/0342 [Observing magnetic fields related to the workpiece]

26/0344 [Observing the speed of the workpiece]

26/035 [Aligning the laser beam (automatically B23K 26/042)]

26/037 [by pressing on the workpiece, e.g. pressing roller foot]

26/04 [Automatically aligning, aiming or focusing the laser beam, e.g. using the back-scattered light]

26/042 [Automatically aligning the laser beam]

26/043 [along the beam path, i.e. alignment of laser beam axis relative to laser beam apparatus]

26/044 [Seam tracking]

26/046 [Automatically focusing the laser beam]

26/048 [by controlling the distance between laser head and workpiece]

26/06 [Shaping the laser beam, e.g. by masks or multifocting]

26/0604 [by a combination of beams]

26/0608 [in the same heat affected zone HAZ (B23K 26/0613, B23K 26/0619 take precedence)]

26/0613 [having a common axis (B23K 26/0619 takes precedence)]

26/0617 [and with spots spaced along the common axis]

26/0619 [with spots located on opposed surfaces of the workpiece]

26/062 [by direct control of the laser beam]

26/0622 [by shaping pulses]

26/0624 [using ultrashort pulses, i.e. pulses of 1ns or less]

26/0626 [Energy control of the laser beam (B23K 26/0622 takes precedence)]

26/064 [by means of optical elements, e.g. lenses, mirrors or prisms]

26/0643 [comprising mirrors]

26/0648 [comprising lenses]

26/0652 [comprising prisms]

26/066 [by using masks]

26/0661 [disposed on the workpiece]

26/0665 [by beam condensation on the workpiece, e.g. for focusing]

26/067 [Dividing the beam into multiple beams, e.g. multifocusing]

26/0673 [into independently operating sub-beams, e.g. beam multiplexing to provide laser beams for several stations]

26/0676 [into dependently operating sub-beams, e.g. an array of spots with fixed spatial relationship or for performing simultaneously identical operations]

26/073 [Shaping the laser spot]

26/0732 [into a rectangular shape]

26/0734 [into an annular shape]

26/0736 [into an oval shape, e.g. elliptic shape]

26/0738 [into a linear shape]

26/08 [Devices involving relative movement between laser beam and workpiece]

26/082 [Scanning systems, i.e. devices involving movement of the laser beam relative to the laser head]

26/0821 [using multifaceted mirrors, e.g. polygonal mirror]

26/0823 [Devices involving rotation of the workpiece]

26/083 [Devices involving movement of the workpiece in at least one axial direction]

26/0838 [by using an endless conveyor belt]

26/0846 [for moving elongated workpieces longitudinally, e.g. wire or strip material]

26/0853 [Devices involving movement of the workpiece in at least in two axial directions, e.g. in a plane]

26/0861 [in at least in three axial directions]

26/0869 [Devices involving movement of the laser head in at least one axial direction]

26/0876 [in at least two axial directions]

26/0884 [in at least in three axial directions, e.g. manipulators, robots]

26/0892 [Controlling the laser beam travel length]

26/10 [using a fixed support, i.e. involving moving the laser beam]

26/103 [the laser beam rotating around the fixed workpiece (B23K 26/28 takes precedence)]

26/106 [inside the workpiece]

26/12 [in a special atmosphere, e.g. in an enclosure]

26/122 [in a liquid, e.g. underwater]
Other welding or cutting: Working by laser beam

Other welding or cutting: Working by laser beam

26/124 . . . [in vacuum]
26/123 . . . [in an atmosphere of particular gases]
26/125 . . . [of mixed gases]
26/126 . . . [in an atmosphere of gases chemically reacting with the workpiece]
26/127 . . . [in an enclosure]
26/128 . . . [Laser beam path enclosures]
26/14 . . . using a fluid stream, e.g. a jet of gas, in conjunction with the laser beam; Nozzles therefor (B23K 26/12 takes precedence)
26/142 . . . for the removal of by-products
26/1423 . . . [the flow carrying an electric current]
26/1435 . . . [involving specially adapted flow control means]
26/1436 . . . [for pressure control]
26/1437 . . . [for flow rate control]
26/1438 . . . [for directional control]
26/144 . . . the fluid stream containing particles, e.g. powder
26/146 . . . the fluid stream containing a liquid
26/1462 . . . [Nozzles; Features related to nozzles]
26/1464 . . . [Supply to, or discharge from, nozzles of media, e.g. gas, powder, wire]
26/147 . . . [Features outside the nozzle for feeding the fluid stream towards the workpiece]
26/1476 . . . [Features inside the nozzle for feeding the fluid stream through the nozzle]
26/1482 . . . [Detachable nozzles, e.g. exchangeable or provided with breakaway lines]
26/1488 . . . [Means for protecting nozzles, e.g. the tip surface (by breakaway lines B23K 26/1482)]
26/1494 . . . [Maintenance of nozzles]
26/16 . . . Removal of by-products, e.g. particles or vapours produced during treatment of a workpiece (by a fluid stream B23K 26/142)
26/18 . . . using absorbing layers on the workpiece, e.g. for marking or protecting purposes
26/20 . . . Bonding (soldering by means of radiant energy B23K 1/005; joining of preformed plastics parts by heating using laser beam B29C 65/16)
26/206 . . . [Laser sealing]
26/21 . . . by welding
26/211 . . . with interposition of special material to facilitate connection of the parts
26/22 . . . Spot welding
26/24 . . . Seam welding
26/242 . . . Fillet welding, i.e. involving a weld of substantially triangular cross section joining two parts
26/244 . . . Overlap seam welding
26/26 . . . [rectilinear seams]
26/262 . . . [longitudinal seams of tubes]
26/28 . . . [of curved planar seams]
26/282 . . . [of tube sections]
26/30 . . . [of three-dimensional seams]
26/302 . . . [of helicoidal seams]
26/32 . . . taking account of the properties of the material involved
26/322 . . . involving coated metal parts (using absorbing layers on the workpiece B23K 26/18)
26/323 . . . involving parts made of dissimilar metallic material
26/324 . . . involving non-metallic parts
26/34 . . . Laser welding for purposes other than joining
26/342 . . . Build-up welding
26/346 . . . in combination with welding or cutting covered by groups B23K 5/00 - B23K 25/00, e.g. in combination with resistance welding
26/348 . . . in combination with arc heating, e.g. TIG [tungsten inert gas], MIG [metal inert gas] or plasma welding (laser beam for starting a welding or cutting arc B23K 9/067)
26/351 . . . for trimming or tuning of electrical components
26/352 . . . for surface treatment
26/354 . . . by melting
26/355 . . . [Texturing]
26/356 . . . by shock processing
26/3568 . . . [Modifying rugosity]
26/3576 . . . [Diminishing rugosity; e.g. grinding; Polishing; Smoothing]
26/3584 . . . [Increasing rugosity, e.g. roughening]
26/359 . . . by providing a line or line pattern, e.g. a dotted break initiation line
26/36 . . . Removing material (B23K 26/55, B23K 26/57 take precedence)
26/361 . . . for deburring or mechanical trimming (B23K 26/351 takes precedence)
26/362 . . . Laser etching
26/364 . . . for making a groove or trench, e.g. for scribing a break initiation groove
26/38 . . . by boring or cutting
26/382 . . . by boring
26/384 . . . . . of specially shaped holes
26/386 . . . . . of blind holes
26/388 . . . . . Trepanning, i.e. boring by moving the beam spot about an axis
26/389 . . . . . {of fluid openings, e.g. nozzles, jets (laser machining of inkjet nozzles B41J 2/1634)}
26/40 . . . taking account of the properties of the material involved
26/402 . . . involving non-metallic material, e.g. isolators
26/50 . . . Working by transmitting the laser beam through or within the workpiece
26/53 . . . for modifying or reforming the material inside the workpiece, e.g. for producing break initiation cracks
26/55 . . . for creating voids inside the workpiece, e.g. for forming flow passages or flow patterns
26/57 . . . the laser beam entering a face of the workpiece from which it is transmitted through the workpiece material to work on a different workpiece face, e.g. for effecting removal, fusion splicing, modifying or reforming
26/60 . . . Preliminary treatment
26/70 . . . Auxiliary operations or equipment
26/702 . . . [Auxiliary equipment]
26/703 . . . [Cooling arrangements (by using a fluid stream B23K 26/14)]
26/704 . . . [Beam dispersers, e.g. beam wells]
26/705 . . . [Beam measuring device]
26/706 . . . [Protective screens]
26/707 . . . [for monitoring laser beam transmission optics]
28/00 . . . Welding or cutting not covered by any of the preceding groups, e.g. electrolytic welding
28/003 . . . [Welding in a furnace]
Other welding or cutting: Working by laser beam, other welding or cutting; Working by laser beam

31/00 Processes relevant to this subclass, specially adapted for particular articles or purposes, but not covered by only one of the preceding main groups (making tubes or profiled bars involving operations other than soldering or welding B21C 37/04, B21C 37/08)

31/02 . . . relating to soldering or welding (dip or wave soldering in the manufacture of printed circuits H05K 3/34)

31/02 . . . (Making profiled bars with soldered or welded seams)

31/025 . . . (Connecting cutting edges or the like to tools; Attaching reinforcements to workpieces, e.g. wear-resisting zones to tableware)

31/027 . . . (Making tubes with soldering or welding)

31/10 . . . relating to cutting or desurfacing

31/12 . . . relating to investigating the properties, e.g. the weldability, of materials

31/125 . . . (Weld quality monitoring)

33/00 Specially-profiled edge portions of workpieces for making soldering or welding connections; Filling the seams formed thereby (B23K 11/14 takes precedence)

33/002 . . . (Crimping or bending the workpieces at the joining area)

33/004 . . . (Filling of continuous seams)

33/006 . . . (for cylindrical workpieces)

33/008 . . . (for automotive applications)

35/00 Rods, electrodes, materials, or media, for use in soldering, welding, or cutting

35/002 . . . (at least one of the workpieces being of light metal)

35/004 . . . (at least one of the workpieces being of a metal of the iron group)

35/005 . . . (at least one of the workpieces being of a refractory metal)

35/007 . . . (at least one of the workpieces being of copper or another noble metal)

2035/008 . . . . . . (at least one of the workpieces being of silicium)

35/02 . . . . . . characterised by mechanical features, e.g. shape

35/0205 . . . . . . {Non-consumable electrodes; C-electrodes}

35/0211 . . . . . . {for use in cutting (B23K 35/0205 takes precedence)}

35/0216 . . . . . . {Rods, electrodes, wires}

35/022 . . . . . . (for use in soldering, brazing (B23K 35/0205 takes precedence)}

35/0227 . . . . . . {Rods, wires (B23K 35/0244 takes precedence)}

35/023 . . . . . . {Sheets, foils (B23K 35/0244 takes precedence)}

35/0238 . . . . . . {layered}

35/0244 . . . . . . {Powders, particles or spheres; Preforms made therefrom}
Articles made by soldering, welding or cutting

2101/00 Articles made by soldering, welding or cutting

2101/01 [Turbinies]
2101/02 [Drill-bits]
2101/03 [Pistons]
2101/05 [Camshafts]
2101/06 [Vehicles]
2101/07 [Marks, e.g. trade marks]
2101/08 [Gears]
2101/02 [Honeycomb structures]
2101/04 [Tubular or hollow articles]
2101/05 [Hollow panels]
2101/06 [Tubes]
2101/08 [finned or ribbed]
2101/10 [Pipe-lines]
2101/12 [Vessels]
2101/125 [Cans]
2101/14 [Heat exchangers]
2101/16 [Bands or sheets of indefinite length]
2101/18 [Sheet panels]
2101/185 [Tailored blanks]
2101/20 [Tools]
2101/22 [Nets, wire fabrics or the like]
2101/24 [Frameworks]
2101/26 [Railway- or like rails]
Other welding or cutting: Working by laser beam

B23K

2101/28 . Beams
2101/30 . Chains, hoops or rings
2101/32 . Wires
2101/34 . Coated articles { e.g. plated or painted; Surface treated articles }
2101/35 . . {Surface treated articles}
2101/36 . Electric or electronic devices
2101/38 . . Conductors
2101/40 . . Semiconductor devices
2101/42 . . Printed circuits

2103/00 Materials to be soldered, welded or cut
2103/02 . Iron or ferrous alloys
2103/04 . Steel or steel alloys
2103/05 . . {Stainless steel}
2103/06 . . Cast-iron alloys
2103/08 . Non-ferrous metals or alloys
2103/10 . . Aluminium or alloys thereof
2103/12 . . Copper or alloys thereof
2103/14 . . Titanium or alloys thereof
2103/15 . . {Magnesium or alloys thereof}
2103/16 . Composite materials { e.g. fibre reinforced }
2103/166 . . {Multilayered materials}
2103/172 . . . {wherein at least one of the layers is non-metallic}
2103/18 . Dissimilar materials
2103/20 . . Ferrous alloys and aluminium or alloys thereof
2103/22 . . Ferrous alloys and copper or alloys thereof
2103/24 . . Ferrous alloys and titanium or alloys thereof
2103/26 . . {Alloys of Nickel and Cobalt and Chromium}
2103/30 . . {Organic material}
2103/32 . . {Material from living organisms, e.g. skins}
2103/34 . . . {Leather}
2103/36 . . . {Wood or similar materials}
2103/38 . . . {Fabrics, fibrous materials}
2103/40 . . . {Paper}
2103/42 . . . {Plastics (B23K 2103/16 takes precedence)}
2103/50 . . {Inorganic material, e.g. metals, not provided for in B23K 2103/02 – B23K 2103/26}
2103/52 . . . {Ceramics}
2103/54 . . . {Glass}
2103/56 . . . {semiconducting (semiconducting devices B23K 2101/40)}