SECTION B — PERFORMING OPERATIONS; TRANSPORTING

B23 MACHINE TOOLS; METAL-WORKING NOT OTHERWISE PROVIDED FOR

B23K 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)

Note(s)

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.
3. In groups B23K 1/00-B23K 31/00, it is desirable to add the indexing codes of groups B23K 101/00 or B23K 103/00.

Subclass index

SOLDERING.....1/00, 3/00
WELDING
Characterised by the means used to produce heat
by flame.....5/00
by electricity.....9/00, 11/00, 13/00
by means of plasma.....10/00
by nuclear particles.....15/00, 17/00
by alumino-thermic means.....23/00
by laser beam.....26/00
otherwise.....25/00, 28/00
Characterised by the use of impact or pressure.....20/00
Characterised by other features, processes not restricted to one particular group of this subclass.....28/00
CUTTING BY APPLYING HEAT LOCALLY; SEVERING.....7/00, 9/00, 15/00, 26/00, 28/00, 11/00
SCARFING, DESURFACING.....7/00
MATERIALS; AUXILIARY DEVICES.....35/00, 37/00
SPECIAL PROCESSES.....31/00, 33/00

Soldering, e.g. brazing, or unsoldering

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) **[5]**

1/002 • Soldering by means of induction heating **[5]**
1/005 • Soldering by means of radiant energy **[5]**
1/008 • Soldering within a furnace (B23K 1/012 takes precedence) **[5]**
1/012 • Soldering with the use of hot gas **[5]**
1/015 • • Vapour-condensation soldering **[5]**
1/018 • Unsoldering; Removal of melted solder or other residues **[5]**
1/06 • making use of vibrations, e.g. supersonic vibrations
1/08 • Soldering by means of dipping in molten solder
1/14 • specially adapted for soldering seams (making tubes involving operations other than soldering B21C) **[5]**
1/16 • • longitudinal seams, e.g. of shells **[5]**
1/18 • • circumferential seams, e.g. of shells **[5]**
1/19 • taking account of the properties of the materials to be soldered **[3]**
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)

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) **[5]**

3/02 • Soldering irons; Bits
3/03 • • electrically heated **[5]**
3/04 • Heating appliances (soldering lamps or blow-pipes F23D; electric heating in general H05B)
3/047 • • electric **[5]**
3/053 • • • using resistance wires **[5]**

3/06 • Solder feeding devices; Solder melting pans
3/08 • Auxiliary devices therefor (cleaning pipes or tubes or systems of pipes or tubes, e.g. before soldering, B08B 9/02) **[5]**

Flame welding or cutting

5/00 Gas flame welding
5/02 • Seam welding (making tubes involving operations other than welding B21C)
5/04 • • using additional profiled strips or like of welding metal along seam edges
5/06 • • Welding longitudinal seams
5/08 • • Welding circumferential 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 **[3]**
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
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)

Electric welding or cutting

9/00 Arc welding or cutting (electro-slag welding B23K 25/00; welding transformers H01F; welding generators H02K)
9/007 • Spot arc welding **[5]**
9/013 • Arc cutting, gouging, scarfing or desurfacing **[5]**
9/02 • Seam welding; Backing means; Inserts
9/022 • • Welding by making use of electrode vibrations **[5]**
9/025 • • for rectilinear seams **[5]**
9/028 • • for curved planar seams **[5]**
9/032 • • for three-dimensional seams **[5]**
9/035 • • with backing means disposed under the seam **[5]**
9/038 • • using moulding means (not restricted to arc welding B23K 37/06) **[5]**
9/04 • Welding for other purposes than joining, e.g. built-up welding
9/06 • Arrangements or circuits for starting the arc, e.g. by generating ignition voltage, or for stabilising the arc **[5]**
9/067 • • Starting the arc **[5]**
9/073 • • Stabilising the arc **[5]**
9/08 • Arrangements or circuits for magnetic control of the arc
9/09 • Arrangements or circuits for arc welding with pulsed current or voltage **[3]**
9/095 • Monitoring or automatic control of welding parameters **[5]**
9/10 • Other electric circuits therefor; Protective circuits; Remote controls
9/12 • Automatic feeding or moving of electrodes or work for spot or seam welding or cutting
9/127 • • Means for tracking lines during arc welding or cutting (copying in general B23Q 35/00) **[5]**
9/133 • • Means for feeding electrodes, e.g. drums, rolls, motors **[5]**
9/14 • making use of insulated electrodes
9/16 • making use of shielding gas
9/167 • • and of a non-consumable electrode **[5]**
9/173 • • and of consumable electrode **[5]**
9/18 • Submerged-arc welding
9/20 • Stud welding
9/22 • Percussion welding
9/23 • taking account of the properties of the materials to be welded **[3]**
9/235 • Preliminary treatment **[3]**
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)
9/29 • • • Supporting devices adapted for making use of shielding means **[5]**
9/30 • • • Vibrating holders for electrodes (B23K 9/022 takes precedence) **[5]**
9/32 • Accessories (earthing connections H01R)

10/00 Welding or cutting by means of a plasma [5]
10/02 • Plasma welding **[5]**

11/00 Resistance welding; Severing by resistance heating
11/02 • Pressure butt welding
11/04 • Flash butt welding
11/06 • using roller electrodes
11/08 • Seam welding not restricted to one of the preceding subgroups
11/087 • • for rectilinear seams **[5]**
11/093 • • for curved planar seams **[5]**
11/10 • Spot welding; Stitch welding
11/11 • • Spot welding **[5]**
11/12 • • making use of vibrations
11/14 • Projection welding
11/16 • taking account of the properties of the material to be welded
11/18 • • of non-ferrous metals (B23K 11/20 takes precedence)
11/20 • • of different metals
11/22 • Severing by resistance heating
11/24 • Electric supply or control circuits therefor
11/25 • • Monitoring devices **[5]**
11/26 • • Storage discharge welding
11/28 • Portable welding equipment
11/30 • Features relating to electrodes (form or composition of electrodes B23K 35/00)
11/31 • • Electrode holders (not restricted to resistance welding or severing by resistance heating B23K 37/02) **[5]**
11/34 • Preliminary treatment **[3]**
11/36 • Auxiliary equipment (B23K 11/31 takes precedence) **[3, 5]**

13/00 Welding by high-frequency current heating [5]

13/01 • by induction heating **[5]**
13/02 • • Seam welding
13/04 • by conduction heating **[5]**
13/06 • characterised by the shielding of the welding zone against influence of the surrounding atmosphere (selection of media B23K 35/38) **[5]**
13/08 • Electric supply or control circuits therefor **[5]**

Other welding or cutting; Working by laser beam [3]

15/00 Electron-beam welding or cutting (electron- or ion-beam tubes H01J 37/00)
15/02 • Control circuits therefor **[5]**
15/04 • for welding annular seams **[5]**
15/06 • within a vacuum chamber (B23K 15/04 takes precedence) **[5]**
15/08 • Removing material, e.g. by cutting, by hole drilling **[5]**
15/10 • Non-vacuum electron beam-welding or cutting **[5]**

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 [3]
20/02 • by means of a press **[3]**
20/04 • by means of a rolling mill **[3]**
20/06 • by means of high energy impulses, e.g. magnetic energy **[3]**
20/08 • • Explosive welding **[3]**
20/10 • making use of vibrations, e.g. ultrasonic welding **[3]**
20/12 • the heat being generated by friction; Friction welding **[3]**
20/14 • Preventing or minimising gas access, or using protective gases or vacuum during welding (formed by material interposed between workpieces B23K 20/18) **[3]**
20/16 • with interposition of special material to facilitate connection of the parts, e.g. material for absorbing or producing gas **[3]**
20/18 • Zonal welding by interposing weld-preventing substances between zones not to be welded **[3]**
20/20 • Special methods allowing subsequent separation, e.g. of metals of high quality from scrap material **[3]**
20/22 • taking account of the properties of the materials to be welded **[3]**
20/227 • • with ferrous layer **[5]**
20/233 • • without ferrous layer **[5]**
20/24 • Preliminary treatment **[3]**
20/26 • Auxiliary equipment **[3]**

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)

26/00 Working by laser beam, e.g. welding, cutting or boring [2, 3, 2014.01]

Note(s) [2014.01]

1. This main group 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 main group 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.*

*26/02 • Positioning or observing the workpiece, e.g. with respect to the point of impact; Aligning, aiming or focusing the laser beam **[3, 2014.01]***
26/03 • • Observing, e.g. monitoring, the workpiece **[7]**
*26/035 • • Aligning the laser beam (automatically B23K 26/042) **[2014.01]***
*26/04 • • Automatically aligning, aiming or focusing the laser beam, e.g. using the back-scattered light **[3, 2014.01]***
*26/042 • • • Automatically aligning the laser beam **[2014.01]***
*26/044 • • • • Seam tracking **[2014.01]***
*26/046 • • • Automatically focusing the laser beam **[2014.01]***
*26/06 • • Shaping the laser beam, e.g. by masks or multi-focusing **[3, 2014.01]***
*26/062 • • • by direct control of the laser beam **[2014.01]***
*26/0622 • • • • by shaping pulses **[2014.01]***
*26/064 • • • by means of optical elements, e.g. lenses, mirrors or prisms **[2014.01]***
*26/066 • • • • by using masks **[2014.01]***
26/067 • • • Dividing the beam into multiple beams, e.g. multi-focusing **[7]**
26/073 • • • Shaping the laser spot **[7]**
*26/08 • Devices involving relative movement between laser beam and workpiece **[3, 2014.01]***
*26/082 • • Scanning systems, i.e. devices involving movement of the laser beam relative to the laser head **[2014.01]***
26/10 • • using a fixed support **[3]**
*26/12 • in a special environment or atmosphere, e.g. in an enclosure **[3, 2014.01]***
*26/122 • • in a liquid, e.g. underwater **[2014.01]***
*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) **[3, 2014.01]***
*26/142 • • for the removal of by-products **[2014.01]***
*26/144 • • the fluid stream containing particles, e.g. powder **[2014.01]***
*26/146 • • the fluid stream containing a liquid **[2014.01]***
26/16 • Removal of by-products, e.g. particles or vapours produced during treatment of a workpiece (by a fluid stream B23K 26/142) **[3]**
26/18 • using absorbing layers on the workpiece, e.g. for marking or protecting purposes **[3]**
*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) **[7, 2014.01]***
*26/21 • • by welding **[2014.01]***
*26/211 • • • with interposition of special material to facilitate connection of the parts **[2014.01]***
26/22 • • • Spot welding **[7]**
*26/24 • • • Seam welding **[7, 2014.01]***

26/242 • • • • *Fillet welding, i.e. involving a weld of substantially triangular cross section joining two parts* ***[2014.01]***
26/244 • • • • *Overlap seam welding* ***[2014.01]***
26/26 • • • • *of rectilinear seams* ***[7, 2014.01]***
26/262 • • • • • *of longitudinal seams of tubes* ***[2014.01]***
26/28 • • • • *of curved planar seams* ***[7, 2014.01]***
26/282 • • • • • *of tube sections* ***[2014.01]***
26/30 • • • • *of three-dimensional seams* ***[7, 2014.01]***
26/302 • • • • • *of helicoidal seams* ***[2014.01]***
26/32 • • *taking account of the properties of the material involved* ***[7, 2014.01]***
26/322 • • • *involving coated metal parts (using absorbing layers on the workpiece B23K 26/18)* ***[2014.01]***
26/323 • • • *involving parts made of dissimilar metallic material* ***[2014.01]***
26/324 • • • *involving non-metallic parts* ***[2014.01]***
26/34 • *Laser welding for purposes other than joining* ***[7, 2014.01]***
26/342 • • *Build-up welding* ***[2014.01]***
26/346 • *in combination with welding or cutting covered by groups B23K 5/00-B23K 25/00, e.g. in combination with resistance welding* ***[2014.01]***
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)* ***[2014.01]***
26/351 • *for trimming or tuning of electrical components* ***[2014.01]***
26/352 • *for surface treatment* ***[2014.01]***
26/354 • • *by melting* ***[2014.01]***
26/356 • • *by shock processing* ***[2014.01]***
26/359 • • *by providing a line or line pattern, e.g. a dotted break initiation line* ***[2014.01]***
26/36 • *Removing material (B23K 26/55, B23K 26/57 take precedence)* ***[7, 2014.01]***
26/361 • • *for deburring or mechanical trimming (B23K 26/351 takes precedence)* ***[2014.01]***
26/362 • • *Laser etching* ***[2014.01]***
26/364 • • • *for making a groove or trench, e.g. for scribing a break initiation groove* ***[2014.01]***
26/38 • • *by boring or cutting* ***[7, 2014.01]***
26/382 • • • *by boring* ***[2014.01]***
26/384 • • • • *of specially shaped holes* ***[2014.01]***
26/386 • • • • *of blind holes* ***[2014.01]***
26/388 • • • • *Trepanning, i.e. boring by moving the beam spot about an axis* ***[2014.01]***
26/40 • • *taking account of the properties of the material involved* ***[7, 2014.01]***
26/402 • • • *involving non-metallic material, e.g. isolators* ***[2014.01]***
26/50 • *Working by transmitting the laser beam through or within the workpiece* ***[2014.01]***
26/53 • • *for modifying or reforming the material inside the workpiece, e.g. for producing break initiation cracks* ***[2014.01]***
26/55 • • *for creating voids inside the workpiece, e.g. for forming flow passages or flow patterns* ***[2014.01]***
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* ***[2014.01]***
26/60 • *Preliminary treatment* ***[2014.01]***
26/70 • *Auxiliary operations or equipment* ***[2014.01]***

28/00 **Welding or cutting not covered by groups B23K 5/00-B23K 26/00** (joining workpieces by electrolysis C25D 2/00; electrolytic removal of materials C25F) **[2]**
28/02 • *Combined welding or cutting procedures or apparatus* ***[2, 2014.01]***

31/00 **Processes relevant to this subclass, specially adapted for particular articles or purposes, but not covered by any single one of main groups B23K 1/00-B23K 28/00** (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)
31/10 • relating to cutting or desurfacing
31/12 • relating to investigating the properties, e.g. the weldability, of materials **[5]**

33/00 **Specially-profiled edge portions of workpieces for making soldering or welding connections; Filling the seams formed thereby**

35/00 **Rods, electrodes, materials, or media, for use in soldering, welding, or cutting**
35/02 • characterised by mechanical features, e.g. shape
35/04 • • specially designed for use as electrodes (ignition tips for arc welding or cutting B23K 9/26)
35/06 • • • of non-circular cross-section; with special arrangement, e.g. internal
35/08 • • • • multi-cored; multiple
35/10 • • • • with more than one layer of coating or sheathing material
35/12 • • not specially designed for use as electrodes
35/14 • • • for soldering
35/16 • • • of non-circular cross-section; with special arrangement, e.g. internal (B23K 35/14 takes precedence)
35/18 • • • • multi-cored; multiple
35/20 • • • • with more than one layer of coating or sheathing material
35/22 • characterised by the composition or nature of the material
35/24 • • Selection of soldering or welding materials proper (B23K 35/34 takes precedence)
35/26 • • • with the principal constituent melting at less than 400°C
35/28 • • • with the principal constituent melting at less than 950°C
35/30 • • • with the principal constituent melting at less than 1550°C
35/32 • • • with the principal constituent melting at more than 1550°C
35/34 • • comprising compounds which yield metals when heated
35/36 • • Selection of non-metallic compositions, e.g. coatings, fluxes (B23K 35/34 takes precedence); Selection of soldering or welding materials, conjoint with selection of non-metallic compositions, both selections being of interest (selection of soldering or welding materials proper B23K 35/24) **[2]**
35/362 • • • Selection of compositions of fluxes (B23K 35/365, B23K 35/368 take precedence) **[2]**
35/363 • • • • for soldering or brazing **[4]**

35/365 • • • Selection of non-metallic compositions of coating materials either alone or conjoint with selection of soldering or welding materials **[2]**
35/368 • • • Selection of non-metallic compositions of core materials either alone or conjoint with selection of soldering or welding materials **[2]**
35/38 • • Selection of media, e.g. special atmospheres for surrounding the working area
35/40 • Making wire or rods for soldering or welding (processes involving a single technical art, see the relevant subclasses, e.g. B05D, B21C)

37/00 Auxiliary devices or processes, not specially adapted to a procedure covered by only one of the other main groups of this subclass (eye-shields for welders worn on the operator's body or carried in the hand A61F 9/00; applicable to metal-working machines other than soldering, welding, or flame-cutting machines B23Q; other protective shields F16P 1/06)
37/02 • Carriages for supporting the welding or cutting element
37/04 • for holding or positioning work
37/047 • • moving work to adjust its position between soldering, welding or cutting steps (B23K 37/053 takes precedence) **[5]**
37/053 • • aligning cylindrical work; Clamping devices therefor **[5]**
37/06 • for positioning the molten material, e.g. confining it to a desired area
37/08 • for flash removal **[5]**

Indexing scheme associated with groups B23K 1/00-B23K 31/00, relating to articles made by soldering, welding or cutting or to materials to be soldered, welded or cut. [5]

101/00 Articles made by soldering, welding or cutting [5]
101/02 • Honeycomb structures **[5]**
101/04 • Tubular or hollow articles **[5]**
101/06 • • Tubes **[5]**
101/08 • • • finned or ribbed **[5]**
101/10 • • Pipe-lines **[5]**
101/12 • • Vessels **[5]**
101/14 • • Heat exchangers **[5]**
101/16 • Bands or sheets of indefinite length **[5]**
101/18 • Sheet panels **[5]**
101/20 • Tools **[5]**
101/22 • Nets, wire fabrics or the like **[5]**
101/24 • Frameworks **[5]**
101/26 • Railway- or like rails **[5]**
101/28 • Beams **[5]**
101/30 • Chains, hoops or rings **[5]**
101/32 • Wires **[5]**
101/34 • Coated articles **[5]**
101/36 • Electric or electronic devices **[5]**
101/38 • • Conductors **[5]**
101/40 • • Semiconductor devices **[5]**
101/42 • • Printed circuits **[5]**

103/00 Materials to be soldered, welded or cut [5]
103/02 • Iron or ferrous alloys **[5]**
103/04 • • Steel alloys **[5]**
103/06 • • Cast-iron alloys **[5]**
103/08 • Non-ferrous metals or alloys **[5]**
103/10 • • Aluminium or alloys thereof **[5]**
103/12 • • Copper or alloys thereof **[5]**
103/14 • • Titanium or alloys thereof **[5]**
103/16 • Composite materials **[5]**
103/18 • Dissimilar materials **[5]**
103/20 • • Ferrous alloys and aluminium or alloys thereof **[5]**
103/22 • • Ferrous alloys and copper or alloys thereof **[5]**
103/24 • • Ferrous alloys and titanium or alloys thereof **[5]**