

## **7 Manufacture and processing of wire, sheet metal and metal tubes, and the rolling of metal**

### **7 (IPC: B21) Mechanical metal-working without essentially removing material; Punching metal**

#### **Notes:**

1. Combinations of operations covered by different subclasses are dealt with in 49I. Combinations of operations covered by any particular subclass with operations covered by other classes, e.g. with operations involving removal of material, are also dealt with in 49I, except that if the operations covered by the other classes both are subsidiary to and performed in connection with the operations properly covered in a single subclass of 7 the combination is classified in that subclass.

2. Processes of a kind covered by this class but applied to non-metallic materials may be classified here if they are applicable to metal and cannot be classified fully in one other class.

#### **7a Metal rolling**

#### **7a (IPC: B21B) Rolling of metal**

#### **7b Manufacture of sheet metal, wire, and metal bars, metal tubing, fittings, etc. by drawing, extrusion, etc.**

#### **7b (IPC: B21C) Manufacture of metal sheets, wire rods, tubes or profiles, otherwise than by rolling; Auxiliary operations used in connection with metal-working without essentially removing material**

#### **7c Sheet metal and tube working and processing**

#### **7c (IPC: B21D) Working or processing of sheet metal or metal tubes, rods or profiles without essentially removing material; Punching**

#### **7d Wire working and machining**

#### **7d (IPC: B21F) Working or processing of wire**

#### **7e Making of needles and nails**

#### **7e (IPC: B21G) Making needles, pins or nails**

#### **7f Making special articles by rolling, e.g. screws, wheels, rings, disks, drums, balls**

#### **7f (IPC: B21H) Making particular metal objects by rolling**

#### **7g (IPC: B21J) Forging; Hammering; Pressing; Riveting; Forge furnaces**

#### **7h (IPC: B21K) Making forged or pressed products**

#### **7i (IPC: B21L) Making chains**

#### **7a Metal rolling**

7a-1 Metal rolling in general

7a-2 Rolling of bars, strips and round bars in two-high, reversing and three-high rolling mills

7a-3 Rolling of rails, girders, angle irons in two-high reversing and three-high rolling mills

7a-4	Cross rolling of metal, also by means of platens
7a-5/01	Continuous rolling mills for sheet metal, wire and strips
7a-5/02	Entry [feed] braking devices for sheet and strip rolling mills
7a-6	Intermittent metal rolling (pilger-type tube rolling mills 7a-16/01)
7a-7	Rolling of metal, with the exception of sheet metal and wire and rolling covered by 7f, in universal or multiple rolling mills
7a-8	Special metal rolling processes, e.g. from the liquid state
7a-9/01	Rolling of sheet metal
7a-9/02	Special auxiliary devices for sheet, strip and wire rolling mills
7a-10	Devices for doubling and separating metal sheets
7a-11	Rolling of foil
7a-12	Rolling of wire, thin sheets and band iron, coilers and uncoilers without drums (coiling and uncoiling devices with drums 7b-5/01, 7b-5/70)
7a-13	Repeaters
7a-14/01	Tube rolling mills
7a-14/02	Longitudinal tube rolling
7a-14/03	Continuous tube rolling mills
7a-15	Cross and oblique piercing tube rolling
7a-16/01	Intermittent tube rolling, pilger-type rolling mills
7a-16/02	Tube rolling with internal upsetting
7a-17/01	Feeding devices for pilger mills
7a-17/02	Devices for revolving the backup mandrel in pilger mills
7a-17/03	Mandrels, mandrel bar holders and adjusting devices for tube rolling mills
7a-17/04	Special auxiliary devices for tube rolling mills
7a-18	Mills with supported working rolls, roll bearings
7a-19	Roll designs
7a-20	Rolling mill couplings
7a-21	Units for heating and cooling the rolls
7a-22/01	Rolling mill drives
7a-22/02	Drives for friction rolling mills
7a-22/03	Other rolling mill elements
7a-23	Roll setting devices
7a-24/01	Roller tables for rolling mills
7a-24/02	Individual electric drive for table rollers
7a-25	Devices for turning, tilting and rotating the rolled stock
7a-26/01	Cooling beds
7a-26/02	Transfer devices from the roller table to the cooling bed
7a-26/03	Discharging devices for cooling beds
7a-27/01	Other rolling mill accessories
7a-27/02	Entry guides, twist guides, stripping cutters for rolling mills
7a-27/03	Transfer devices for the rolled stock
7a-27/04	Lifting tables, other transfer devices, especially for sheet rolling mills
7a-28	Mechanical treatment of rolled stock, e.g. de-scaling devices
7a-29	Other treatment of rolled articles, e.g. by lubrication

**7a (IPC: B21B) Rolling of metal** (auxiliary operations used in connection with metal-working operations covered in 7, see 7b; bending by rolling 7c; manufacture of particular objects, e.g. screws, wheels, rings, barrels, balls, by rolling 7f; plating 49I-3/06)

**Note:**

**In this subclass, the term "rolling" is understood to refer to operations in which plastic deformations occur.**

**7a-1/00 Metal rolling methods or mills for making semi-finished products of solid or profiled cross-section** (7a-17/00 to 7a-23/00 take precedence; with respect to composition of material to be rolled 7a-3/00; extending closed shapes of metal bands by simultaneous rolling at two or more zones 7a-5/00; metal-rolling stands as units 7a-13/00); **Sequence of operations in milling trains; Layout of rolling-mill plant, e.g. grouping of stands; Succession of passes or of sectional pass alternations**

7a-1/02 . for rolling heavy work, e.g. ingots, slabs, billets, in which the cross-sectional form is unimportant

7a-1/04 . . in a partly or wholly continuous process, i.e. in a mill train designed for the workpiece to enter one pair of rolls before leaving the preceding pair

7a-1/06 . . in a non-continuous process

7a-1/08 . for rolling work of special cross-section, e.g. rails, I-beams, U-irons, angle steel (rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects 7f-8/00)

7a-1/10 . . in a single two-high or universal rolling mill

7a-1/12 . . in a partly or wholly continuous process, i.e. in a mill train designed for the workpiece to enter one pair of rolls before leaving the preceding pair

7a-1/14 . . in a non-continuous process

7a-1/16 . for rolling wire or material of like small cross-section

7a-1/18 . . in a partly or wholly continuous process, i.e. in a mill train designed for the workpiece to enter one pair of rolls before leaving the preceding pair

7a-1/20 . . in a non-continuous process

7a-1/22 . for rolling bands or sheets of indefinite length (7a-1/42 takes precedence)

7a-1/24 . . in a partly or wholly continuous process, i.e. in a mill train designed for the workpiece to enter one pair of rolls before leaving the preceding pair

7a-1/26 . . . by hot-rolling

7a-1/28 . . . by cold-rolling

7a-1/30 . . in a non-continuous process

7a-1/32 . . . in reversing mills, e.g. with intermediate storage reels for accumulating work

7a-1/34 . . . . by hot-rolling

7a-1/36 . . . . by cold-rolling

7a-1/38 . for rolling sheets of limited length, e.g. folded sheets, superimposed sheets

7a-1/40 . for rolling foils which present special problems, e.g. because of thinness

7a-1/42 . for step-by-step or planetary rolling (making tubes by pilgrim-step rolling 7a-21/00)

7a-1/44 . for rolling metal directly from melt (involving special machines 7a-13/22; melting technique 31b, e.g. continuous casting 31b2-11/00)

**7a-3/00 Rolling materials of special alloys so far as the composition of the alloy requires or permits special rolling methods or sequences** (altering special metallurgical properties of alloys, other than structure consolidation or mechanical properties resulting therefrom 18c, 40d)

7a-3/02 . Rolling special iron alloys

**7a-5/00 Extending closed shapes of metal bands by simultaneous rolling at two or more zones** (manufacture of circular shapes, e.g. wheel rims, 7f-1/06)

**7a-9/00 Measures for carrying out rolling operations under special conditions, e.g. in vacuum or inert atmosphere to prevent oxidation of work; Special measures for removing fumes from rolling mills**

<b>7a-11/00</b>	<b>Subsidising the rolling process by subjecting rollers or work to vibrations</b>
<b>7a-13/00</b>	<b>Metal-rolling stands, i.e. an assembly composed of a stand frame, rolls, and accessories</b> (7a-17/00 to 7a-23/00 take precedence; details, component parts, accessories, auxiliary means, procedures in connection with metal rolling, see the relevant groups)
7a-13/02	. with axes of rolls arranged horizontally
7a-13/04	. . Three-high arrangement
7a-13/06	. with axes of rolls arranged vertically
7a-13/08	. with differently-directed roll axes, e.g. for the so-called "universal" rolling process
7a-13/10	. . all axes being arranged in one plane
7a-13/12	. . axes being arranged in different planes
7a-13/14	. having counter-pressure devices acting on rolls to inhibit deflection of same under load (counter-pressure devices as such 7a-29/00)
7a-13/16	. with alternatively operative rolls
7a-13/18	. for step-by-step or planetary rolling (methods 7a-1/42; making tubes by pilgrim-step rolling 7a-21/00)
7a-13/20	. . for planetary rolling
7a-13/22	. for rolling metal directly from melt
<b>7a-15/00</b>	<b>Arrangements for performing additional metal-working operations specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills</b>
7a-15/02	. in which work is subjected to permanent internal twisting, e.g. for producing reinforcement bars for concrete
<b><u>Rolling methods or mills specially designed for making or processing tubes</u></b>	
<b>7a-17/00</b>	<b>Tube-rolling by rollers of which the axes are arranged essentially perpendicular to the axis of the work, e.g. "axial" tube-rolling</b>
7a-17/02	. with mandrel rod
7a-17/04	. . in a continuous process
7a-17/06	. . in a discontinuous process
7a-17/08	. with plug mandrel
7a-17/10	. . in a continuous process
7a-17/12	. . in a discontinuous process
7a-17/14	. without mandrel
<b>7a-19/00</b>	<b>Tube-rolling by rollers arranged outside the work and having their axes not perpendicular to the axis of the work</b> (straightening by rollers 7c)
7a-19/02	. the axes of the rollers being arranged essentially diagonally to the axis of the work, e.g. "cross" tube-rolling
7a-19/04	. . Rolling basic material of solid, i.e. non-hollow, structure; Piercing
7a-19/06	. . Rolling hollow basic material (7a-19/04 takes precedence; separating work from mandrel 7b-45/00)
7a-19/08	. . . Enlarging tube diameter
7a-19/10	. . . Finishing, e.g. smoothing, sizing
7a-19/12	. the axes of the rollers being arranged essentially parallel to the axis of the work
7a-19/14	. . Rolling tubes by means of additional rollers arranged inside the tubes
7a-19/16	. . Rolling tubes without additional rollers arranged inside the tubes
<b>7a-21/00</b>	<b>Pilgrim-step tube-rolling</b>
7a-21/02	. Rollers therefor
7a-21/04	. Pilgrim-step feeding mechanisms (7a-21/06 takes precedence)
7a-21/06	. Devices for revolving work between the steps
<b>7a-23/00</b>	<b>Tube-rolling not restricted to methods mentioned in only one of groups 7a-17/00 to 7a-21/00, e.g. combined processes</b> (7a-25/00 takes precedence)

<b>7a-25/00</b>	<b>Mandrels for metal tube rolling mills, e.g. mandrels of the types used in the methods covered by group 7a-17/00; Accessories or auxiliary means therefor</b>
7a-25/02	. Guides, supports, or abutments for mandrels, e.g. carriages; Adjusting devices for mandrels
7a-25/04	. Cooling mandrels during operation
7a-25/06	. Interchanging mandrels, with or without cooling
<b>7a-27/00</b>	<b>Shape or construction of rolls (shape of working surfaces required by special processes 7a-1/00); Maintaining, rolls in effective condition</b>
7a-27/02	. Shape or construction of rolls (for rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects 7f-8/02)
7a-27/04	. Devices for reconditioning rolls
7a-27/06	. Lubricating, cooling, or heating rolls
7a-27/08	. . internally
7a-27/10	. . externally
<b>7a-29/00</b>	<b>Counter-pressure devices acting on rolls to inhibit deflection of same under load, e.g. backing rolls</b>
<b>7a-31/00</b>	<b>Rolling stand structures; Mounting, adjusting, or interchanging rolls, roll mountings, or stand frames</b>
7a-31/02	. Rolling stand frames; Roll mountings
7a-31/04	. . with tie rods, e.g. prestressed tie rods
7a-31/06	. . Fastening stands or frames to foundation, e.g. to the sole plate (in general 47a2)
7a-31/08	. Interchanging rolls, roll mountings, or stand frames in rolling stands with alternatively-operative rolls 7a-13/16)
7a-31/10	. . by horizontally displacing
7a-31/12	. . by vertically displacing
7a-31/14	. . by pivotally displacing
7a-31/16	. Adjusting rolls (control devices 7a-37/00)
7a-31/18	. . by moving rolls axially
7a-31/20	. . by moving rolls perpendicularly to roll axis
7a-31/22	. . . mechanically
7a-31/24	. . . . by screws
7a-31/26	. . . . Adjusting eccentrically-mounted roll bearings
7a-31/28	. . . . by toggle-lever mechanisms
7a-31/30	. . . . by wedges or their equivalent
7a-31/32	. . . by liquid pressure
7a-31/34	. Pass indicators, i.e. indicating gap between rolls
<b>7a-33/00</b>	<b>Safety devices preventing fracture of rolls (safety devices in general 47a4); Breaker blocks; Devices for freeing jammed rolls</b>
<b>7a-35/00</b>	<b>Drives for metal-rolling mills</b>
7a-35/02	. for continuously-operating mills (7a-35/10, 7a-35/12 take precedence)
7a-35/04	. . each stand having its own motor or motors
7a-35/06	. for non-continuously-operating mills or for single stands (7a-35/10, 7a-35/12 take precedence)
7a-35/08	. . for reversing rolling mills
7a-35/10	. Driving arrangements for rolls which have only a low-power drive; e.g. for idler rolls; Driving arrangements for rolls which receive power from the shaft of another roll
7a-35/12	. Toothed-wheel gearings specially adapted for metal-rolling mills; Housings or mountings therefor
7a-35/14	. Couplings, driving spindles, or spindle carriers specially adapted for or specially arranged in metal-rolling mills (couplings or shafts in general 47)
<b>7a-37/00</b>	<b>Control or regulating devices for metal-rolling mills as far as specially adapted for such mills</b>
7a-37/02	. responsive to thickness of material

7a-37/04	. responsive to slack or deflection of the material (arrangements for control specially associated with devices for guiding or accumulating easily-flexible work in loops or curves 7a-41/00)
7a-37/06	. responsive to tension of the material (7a-37/04 takes precedence)
7a-37/08	. responsive to rolling pressure, or roll gap responsive
7a-37/10	. responsive to temperature, e.g. of the material
7a-37/12	. for maintaining automatically constant thickness of product, not fully provided for in one of the groups 7a-37/02 to 7a-37/10
7a-37/14	. for automatically varying thickness of product according to a predetermined programme
<b>7a-39/00</b>	<b>Arrangements for moving, supporting, or positioning work, or controlling its movement, combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills</b> (guiding, conveying, or accumulating easily-flexible work in loops or curves 7a-41/00; specially associated with cooling-beds 7a-43/00; conveying or transporting in general 81e)
7a-39/02	. Feeding or supporting work; Braking or tensioning arrangements
7a-39/04	. . Lifting or lowering work for conveying purposes, e.g. tilting tables arranged immediately in front of or behind the pass (turn-over or like manipulating means as such 7a-39/20)
7a-39/06	. . Pushing or forcing work into pass
7a-39/08	. . Braking or tensioning arrangements
7a-39/10	. . Arrangement or installation of feeding rollers in rolling stands
7a-39/12	. . Arrangement or installation of roller tables in relation to a roll stand
7a-39/14	. Guiding, positioning or aligning work (7a-43/12 takes precedence; guides in which work is subjected to permanent internal twisting 7a-15/02)
7a-39/16	. . immediately before entering or after leaving the pass
7a-39/18	. . Switches for directing work in metal-rolling mills or trains
7a-39/20	. Revolving, turning-over, or like manipulation of work (guides in which work is subjected to permanent internal twisting 7a-15/02)
7a-39/22	. . by tipping, e.g. by lifting one side by levers or wedges (7a-39/26, 7a-39/28 take precedence)
7a-39/24	. . by tongs or grippers
7a-39/26	. . by members, e.g. grooved, engaging opposite sides of the work and moved relatively to each other to revolve the work
7a-39/28	. . by means of guide members shaped to revolve the work during its passage
7a-39/30	. . by lodging it in a rotating ring manipulator or ring segment manipulator
7a-39/32	. . Devices specially adapted for turning sheets
7a-39/34	. Arrangements or constructional combinations specifically designed to perform functions covered by more than one of groups 7a-39/02, 7a-39/14, 7a-39/20
<b>7a-41/00</b>	<b>Guiding, conveying, or accumulating easily-flexible work, e.g. wire, sheet metal bands, in loops or curves; Loop lifters</b>
7a-41/02	. Returning work to repeat the pass or passes
7a-41/04	. . above or underneath the rolling stand or rolls
7a-41/06	. in which the direction of movement of the work is turned through approximately 180°
7a-41/08	. without overall change in the general direction of movement of the work
7a-41/10	. . Loop deflectors
7a-41/12	. Arrangements of interest only with respect to provision for indicating or controlling operations
<b>7a-43/00</b>	<b>Cooling beds, whether stationary or moving; Means specially associated with cooling beds, for braking work or for transferring it to or from the bed</b> (conveying means in general 81e)
7a-43/02	. Cooling beds comprising rakes (7a-43/10 takes precedence)
7a-43/04	. Cooling beds comprising rolls or worms
7a-43/06	. Cooling beds comprising carriages (7a-43/08 takes precedence)
7a-43/08	. Cooling beds comprising revolving drums or recycling chains
7a-43/10	. Cooling beds with other work-shifting elements projecting through the bed

7a-43/12	. Devices for positioning workpieces "flushed", i.e. with all their axial ends arranged in line on cooling beds or on co-operating transverse conveyers
<b>7a-45/00</b>	<b>Devices for surface treatment of work, specially combined with or arranged in, or specially adapted for use in connection with, metal-rolling mills</b> (7a-15/00 takes precedence; technical features of scaling-off devices 7b-43/00)
7a-45/02	. for lubricating, cooling, or cleaning
7a-45/04	. for de-scaling
7a-45/06	. . of strip material (7a-45/08 takes precedence)
7a-45/08	. . hydraulically
<b>7a-47/00</b>	<b>Auxiliary arrangements, devices or methods in connection with rolling of multi-layer sheets of metal</b>
7a-47/02	. for folding sheets before rolling
7a-47/04	. for separating layers after rolling

<b>7b</b>	<b>Manufacture of sheet metal, wire, and metal bars, metal tubing, fittings, etc. by drawing, extrusion, etc.</b> (coiling and uncoiling of wire and metal strips metal rolling 7a; working of sheet metal and tubes 7c; of wire 7d; centrifugal and extrusion casting, etc., 31c-18/01, 31c-19/01, 31c-21; perforating 49h-2; bending 49h-12 – 49h-24; annealing furnaces 18c; manufacture of insulating tubes 21c-18; pipes according to their design and material 47f-3)
	Special processes (rolling from the liquid state 7a-8; casting 31c-18 – 31c-21; galvanoplastic processes 48a-8, 48a-9; boring devices 49a), e.g. cutting of billets for the manufacture of
7b-1	sheet metal
7b-2	wire
7b-2/50	metal tubes
7b-3/01	Wire drawing and stretching with drawing drums and drawing machines
7b-3/05	Regulation of drawing drum speeds and automatic stopping of wire drawing machines, etc., (regulating of coiling drum speeds 7b-5/10; drawing drum couplings 7b-3/08; control of the electric motors of wire drawing machines 21c-62/60)
7b-3/08	Drawing drums for wire drawing machines, inclusive of gripping devices and drum couplings (drawing carriages 7b-3/35)
7b-3/30	Drawing and stretching of metal bars and seamless metal tubing on bar and tube drawing benches (drawing benches for bending sheets 7b-8/01; for welding 7b-7/01; for shaping sheets 7c-6)
7b-3/35	Drawing carriages for bar and tube drawing benches, inclusive of gripping devices (gripping devices for wire drawing drums 7b-3/08)
7b-3/50	Drawing, reducing of seamless metal tubes by the internal drawing process
7b-3/70	Drawing, reducing of seamless metal tubes on push benches (piercing the billers 49h-2; drawing presses for the manufacture of sheet metal containers and other sheet metal articles 7c-15, 7c-16)
7b-4/01	Miscellaneous elements of drawing equipment, e.g. devices for counting workpieces
7b-4/02	Pointing drawn stock, forming of drawing tapers (pointing nails 7d-10)
7b-4/03	Devices for introducing the pointed drawn stock into the draw plate (gripping devices 7b-3/08)
7b-4/10	Drawing rings, draw plates, drawing dies (the use of alloys for drawing dies 18d-2/30, 40b-15 – 40b-17; casting of drawing blocks 31c-23/03; grinding 67a-31/10; drilling 80d-9, extrusion press dies 7b-10/80; drawing rings for sheet metal shaping 7c-6)
7b-4/15	Die holders and sockets (mounting of industrial diamonds, in general 49l-6)
7b-4/18	Adjustable drawing passes (for making conical workpieces 7b-18)
7b-4/19	Drawing passes consisting of revolving balls or rolls

- 7b-4/30 Drawing mandrels (welding mandrels 7b-7/01, 7b-7/20; pressing mandrels 7b-10/80, 7b-11/80; rolling mandrels 7a; punching mandrels 49h-2; the use of alloys for mandrels 18d-2/30, 40b-15 – 40b-17)
- 7b-4/40 stripping of drawn tubing from the mandrel (stripping of rolled tubing 7a)
- 7b-4/50 Details in the lubrication and cooling of drawn stock, metallic lubricants (lubrication and cooling of draw plates 7b-4/10, 7b-4/15; of drawing drums 7b-3/08; lubricants made of grease and other substances, in general 23c-1; metal coatings, in general 48a, 48b; for rolling 7a-29; pickling 48a-16, 48d-2)
- 7b-5/01 Coiling of wire and metal strips, e.g. band iron, reels for rolling mills (coiling and uncoiling devices without drum for strip rolling mills 7a-12; coiling devices in wire working machines 7d; furnace coilers 18c-6/70; bundling and binding 81a-13; winding electric coils 21g-1/01; mobile cable reels 21c-19/06; winding devices for hoisting gear 35a – 35c; for wire coating 48b-4; for phonographs 42g-18; winding of threads or yarn, etc., 8f, 25c, 29a-6/13, 76d; 86c-19; of string 34l-33; of hoses 45f-24, 61a-15/03; of paper 55e-7, 70d-11/30, taking up of film 57a-48)
- 7b-5/10 Regulating the speed and automatic stop of the drive in wire coiling, etc., (regulating wire drum speeds 7b-3/05; electric motors control 21c-62/30, 21c-62/60, see also references in 7b-5/01)
- 7b-5/20 Stripping wire coils from coiling drums, etc.
- 7b-5/30 Coiling drums and spools for wire and metal strips (cable drums 21c-19; wire shipping drums 81c-27; coil stripping devices 7b-5/20, see also references in 7b-5/01)
- 7b-5/60 Miscellaneous details in wire and metal strip coiling, e.g. cooling during the coiling process
- 7b-5/70 Uncoiling of wire and metal strips (see also references in 7b-5/01)
- 7b-6/01 Auxiliary processes for the manufacture of wire and metal tubing, e.g. straightening during fabrication (wire straightening in general 7d-1; of rods and tubes 49h-21, 49h-22; surface treatment 18c, 40d)
- 7b-6/20 Washing of wire, etc., (picking 48a-16; 48d-2)
- Manufacture of sheet metal tubing with straight, welded or soldered longitudinal seams
- 7b-7/01 by drawing, hammering, etc., welded (welding furnaces 18c-10; bending sheets, also 7b-8/01; seamless tube drawing 7b-3/30)
- 7b-7/20 Autogenously welded (tube welding machines) or soldered (welding and soldering, in general, 49h-25 – 49h-36; electric tube welding 21h-32/10; bending of sheet metal, also 7b-8/01)
- 7b-8/01 Forming sheet metal into tubing with straight, open longitudinal seams by bending, rolling, drawing, etc. (bending and welding 7b-7/01, 7b-7/20; bending and shaping sheet metal in general, 7c-4 – 7c-6; seamless tube drawing 7b-3/30; manufacture of insulating tubes 21c-18)
- 7b-8/20 Folding of straight longitudinal tube seams (folding sheet metal cans 7c-7; of insulating tubes 21c-18)
- 7b-8/30 Closing straight, longitudinal tube seams with ribs and grooves or retaining pins and the like (riveting devices 49g-16)
- 7b-9/01 Manufacture of sheet metal tubes with spiral seams
- 7b-9/20 Manufacture of flexible sheet metal tubes with spiral seams (with radial ribs 7b-15/10; construction 47f-5, 81e-74; manufacture of flexible shafts from wire 7d-16)
- Extrusion pressing (of valves, etc., 49i-16; homogenising 40d-1/20)
- 7b-10/01 of sheet metal
- 7b-10/10 of wire and metal tubing in general (of casings 7b-11/01)
- 7b-10/20 of wire and metal tubing by the hollow ram process, also called indirect or inverse process
- 7b-10/30 of wire and metal tubing by means of an endless screw etc. (cable casings, 7b-11/20; centrifugal and continuous casting 31c-18 – 31c-21)
- 7b-10/40 of bent metal tubes, odour traps, etc., (bending 49h-17, 49h-18, 49h-24)
- 7b-10/50 of tubes (manufacture from sheet metal 7c-26; structure 81c-15)



- 7b-10/70 Trimming and removing of discards after extrusion pressing, etc.
- 7b-10/80 Components of metal extrusion presses, e.g. lifters, dies, mandrels (for lead cable presses, etc. 7b-11/80; drawing dies 7b-4/10; drawing mandrels 7b-4/30; piercing mandrels 49h-2; use of alloys in the manufacture of pressing tools 18d-2/30, 40b-15 – 40b-17)
- Extrusion pressing of metal casings for cables, wires and tubes (cable drying and impregnating devices 21c-7/06; special devices in presses for the manufacture of electric conductors 21c-7/07; sheathing by drawing, etc., 7b-12)
- 7b-11/01 with intermittent presses, especially lead cable presses
- 7b-11/20 with continuous presses, especially lead cable presses (pressing by means of endless screws, also 7b-10/30)
- 7b-11/60 Extruding of wires or tubes with metal sheaths by the simultaneous forcing of different metals, extrusion pressing of metal tubes filled with a solidifying substance, etc.
- 7b-11/80 Components of lead cable presses, etc., e.g. lifters, dies, mandrels (for extrusion pressing in general, 7b-10/80)
- 7b-12 Sheathing of wire and tubes with metal by drawing, etc., fitting metal liners into tubes, etc. (extruding sheaths 7b-11/01, 7b-11/60; manufacture of solder wire 7b-14/60; dipping into molten coating metal, metalising, etc. 48b, doubling, rolling on or welding of a metal layer 49l-5; double-walled tubing according to design and material 47f-3/02; wear resistant 5d-14, 5d-15; 81e-73, 81e-74; acid resistant 12f-3)
- 7b-13 Manufacture of metal tubing by opening double-walled rolled flat bars
- Manufacture of special wires, metal tubes, etc.**
- 7b-14/01 Manufacture of special wires, shaped wires, etc. (conical 7b-18; extrusion 7b-10/10)
- 7b-14/50 Manufacture of special wire from high melting metals, e.g. tungsten (manufacture of wire for incandescent lamps 21f-32; refining, making single crystals 40d)
- 7b-14/60 Manufacture of soldering and welding wire (construction and materials 7d-6, 49h-26)
- 7b-15/01 Manufacture of corrugated tubing for fire tube boilers, etc. (construction 13a-2 – 13a-5; corrugating sheet metal in general 7c-2, 7c-3)
- 7b-15/10 Manufacture of flexible metal tubes with radial ribs (with spiral seam 7b-9/20; design 47f-5, 81e-74)
- 7b-15/20 Manufacture of metal tubes with longitudinal grooves or ribs, grooving of metal poles, etc. (manufacture of metal poles, also 7b-18, 7b-21; structure 37b-3/01)
- 7b-15/30 Manufacture of corrugated sectional chambers for water tube boilers, etc. (design 13a-6 – 13a-21)
- Manufacture of ribbed tubing (structure 17f, 36c, 46c4, 47f-3/03)
- 7b-16/01 with radial ribs
- 7b-16/20 with helical ribs
- 7b-16/40 with longitudinal ribs
- 7b-17 Making elbows and bent tubing of sheet metal, e.g. curved stove pipes (design 36a-14/11, 47f-3/51)
- 7b-18 Manufacture of conical wires and metal tubing (manufacture of conical textile bobbins 7c-47; manufacture of poles, also 7b-15/20, 7b-21; poles according to design 37b-3/01; golf club handles according to design 77a-21/11)
- 7b-19 Manufacture of pipe connections, L-, T- and cross-shaped pipe sections, fittings (design 47f-3/51, 47f-3/52)
- 7b-20 Manufacture of return bend elements, U-pieces for superheater tubes, etc. (design 13d, 36c, 36e)
- 7b-21 Manufacture of miscellaneous special metal tubing, tubing with varying cross section, wire wound tubing, etc. (upsetting of tube ends 49h-1; expanding of tube ends, etc. 7c-21; compound stepped pole according to design 37b-3/01; making of poles also 7b-15/20, 7b-18)

**7b (IPC: B21C) Manufacture of metal sheets, wire, rods, tubes or profiles, otherwise than by rolling; Auxiliary operations used in connection with metal-working without essentially removing material**

**Metal drawing** (continuous casting 31b2-11/00; plating 49I-3/00)

**7b-1/00 Manufacture of metal sheets, metal wire, metal rods, metal tubes by drawing**

- 7b-1/02 . Drawing metal wire or like flexible metallic material by drawing machines or apparatus in which the drawing action is effected by drums
- 7b-1/04 . . with two or more dies operating in series
- 7b-1/06 . . . in which the material slips on the drums
- 7b-1/08 . . . in which the material does not slip on the drums
- 7b-1/10 . . . . with accumulation of material between consecutively-arranged dies
- 7b-1/12 . . Regulating or controlling speed of drawing drums, e.g. to influence tension; Drives; Stop or relief mechanisms (couplings for drums 7b-1/14; design or construction of electrical equipment, see the relevant classes)
- 7b-1/14 . . Drums, e.g. capstans (capstans or winches in general 35c); Connection of grippers thereto; Grippers specially adapted for drawing machines or apparatus of the drum type; Couplings specially adapted for these drums
- 7b-1/16 . Metal drawing by machines or apparatus in which the drawing action is effected by other means than drums, e.g. by a longitudinally-moved carriage pulling or pushing the work or stock for making metal sheets, bars, or tubes
- 7b-1/18 . . from stock of limited length (7b-1/22 takes precedence)
- 7b-1/20 . . from stock of essentially unlimited length (7b-1/22 takes precedence)
- 7b-1/22 . . specially adapted for making tubular articles (bending sheet metal into tubular form by drawing 7c-5/10)
- 7b-1/24 . . . by means of mandrels (mandrels 7b-3/16)
- 7b-1/26 . . . . Push-bench drawing
- 7b-1/27 . . Carriages; Drives
- 7b-1/28 . . . Carriages; Connections of grippers thereto; Grippers (for drawing machines of the drum type 7b-1/14)
- 7b-1/30 . . . Drives, e.g. carriage-traversing mechanisms; Driving elements, e.g. drawing chains; Controlling the drive
- 7b-1/32 . . Feeding or discharging the material or mandrels
- 7b-1/34 . . Guiding or supporting the material or mandrels

**7b-3/00 Profiling tools for metal drawing; Combinations of dies and mandrels**

- 7b-3/02 . Dies; Selection of material therefor; Cleaning thereof
- 7b-3/04 . . with non-adjustable section (7b-3/08 takes precedence)
- 7b-3/06 . . with adjustable section (7b-3/08 takes precedence)
- 7b-3/08 . . with section defined by rollers, balls, or the like
- 7b-3/10 . . with hydraulic forces acting immediately on work
- 7b-3/12 . . Die holders; Rotating dies
- 7b-3/14 . . . Die holders combined with devices for guiding the drawing material or combined with devices for cooling, heating, or lubricating
- 7b-3/16 . Mandrels (separating mandrels from work 7b-45/00); Mounting or adjusting same
- 7b-3/18 . Making tools by operations not covered by a single other subclass; Repairing

**7b-5/00 Pointing; Push-pointing**

**7b-9/00 Cooling, heating or lubricating drawing material** (7b-3/14 takes precedence)

- 7b-9/02 . Selection of compositions therefor

**7b-19/00 Devices for straightening wire or like work combined with or specially adapted for use in connection with drawing or winding machines or apparatus**

**Metal extruding (continuous casting 31b2-11/00)**

- 7b-23/00 Extruding metal; Impact extrusion**
- 7b-23/01 . starting from material of particular form or shape, e.g. mechanically pre-treated (7b-23/22 takes precedence; heat treatment or combinations thereof with mechanical treatments, see appropriate classes)
  - 7b-23/02 . Making uncoated products
  - 7b-23/03 . . by both direct and backward extrusion
  - 7b-23/04 . . by direct extrusion
  - 7b-23/06 . . . Making sheets
  - 7b-23/08 . . . Making wire, bars, tubes
  - 7b-23/10 . . . . Making finned tubes
  - 7b-23/12 . . . . Extruding bent tubes or rods
  - 7b-23/14 . . . Making other products
  - 7b-23/16 . . . . Making turbo blades or propellers
  - 7b-23/18 . . . . by impact extrusion
  - 7b-23/20 . . by backward extrusion
  - 7b-23/21 . Presses specially adapted for extruding metal (extrusion presses in general 58a-11/22)
  - 7b-23/22 . Making metal-coated products; Making products from two or more metals
  - 7b-23/24 . . Covering indefinite lengths of metal or non-metal material with a metal coating
  - 7b-23/26 . . . Applying metal coats to cables, e.g. to insulated electric cables
  - 7b-23/28 . . . . on intermittently-operating extrusion presses
  - 7b-23/30 . . . . on continuously-operating extrusion presses
  - 7b-23/32 . Lubrication of metal being extruded or of dies, etc., e.g. physical state of lubricant, location where lubricant is applied (chemical composition, see appropriate classes)
- 7b-25/00 Profiling tools for metal extruding**
- 7b-25/02 . Dies
  - 7b-25/04 . Mandrels
  - 7b-25/06 . Press heads, dies, or mandrels for coating work
  - 7b-25/08 . Dies or mandrels with section variable during extruding, e.g. for making tapered work; Controlling variation
  - 7b-25/10 . Making tools by operations not covered by a single other subclass
- 7b-27/00 Containers for metal to be extruded (7b-29/02 takes precedence)**
- 7b-27/02 . for making coated work
  - 7b-27/04 . Venting metal-container chamber
- 7b-29/00 Cooling or heating work or parts of the extrusion press**
- 7b-29/02 . of containers for metal to be extruded
  - 7b-29/04 . of press heads, dies, or mandrels
- 7b-31/00 Control devices, e.g. for regulating the pressing speed or temperature of metal (7b-25/08 takes precedence); Measuring devices, e.g. for temperature of metal, combined with or specially adapted for use in connection with extrusion presses**
- 7b-33/00 Feeding extrusion presses with metal to be extruded**
- 7b-33/02 . the metal being in liquid form
- 7b-35/00 Removing work or waste from extruding presses; Drawing-off extruded work (in connection with the extruding of bent tubes or rods 7b-23/12); Cleaning dies, ducts or mandrels**
- 7b-35/02 . Removing or drawing-off work
  - 7b-35/03 . . Straightening the work
  - 7b-35/04 . Cutting-off or removing waste
  - 7b-35/06 . Cleaning dies, ducts or mandrels
- 7b-37/00 Manufacture of metal sheets, bars, wire, tubes or like semi-manufactured products, not otherwise provided for (by drawing or extruding, in the relevant groups; by rolling 7a; by working or processing ready-manufactured sheet metal, profiles, tubes, or wire 7c or 7d; by casting 31b; by**

	material-removing machine tools 49; plating 49I-3/00; by grinding or polishing 67; by electroforming 48a-7/00); <b>Manufacture of tubes of special shape</b>
7b-37/02	. of sheets
7b-37/04	. of bars or wire
7b-37/06	. of tubes or metal hoses; Combined procedures for making tubes (bending sheets for making tubes 7c-5/00; seaming by folding 7c-39/02)
7b-37/08	. . Making tubes with welded or soldered seams (involving only a soldering or welding operation 49h)
7b-37/083	. . . Supply, or operations combined with supply, of strip material
7b-37/087	. . . using rods or strips of soldering material
7b-37/09	. . . of coated strip material
7b-37/10	. . Making tubes with riveted seams
7b-37/12	. . Making tubes or metal hoses with helically arranged seams
7b-37/14	. . Making tubes from doubled flat material
7b-37/15	. . Making tubes of special shape; Making tube fittings
7b-37/16	. . . Making tubes with varying diameter in longitudinal direction
7b-37/18	. . . . conical tubes
7b-37/20	. . . Making helical or similar guides in or on tubes without removing material, e.g. by drawing same over mandrels, by pushing same through dies
7b-37/22	. . . Making finned or ribbed tubes by fixing strip or like material to tubes (making heat exchangers 7c-53/02)
7b-37/24	. . . . annularly-ribbed tubes
7b-37/26	. . . . helically-ribbed tubes
7b-37/28	. . . Making tube fittings for connecting pipes, e.g. U-pieces
7b-37/29	. . . . Making branched pieces, e.g. T-pieces
7b-37/30	. . Finishing tubes, e.g. sizing, burnishing (finishing operations per se, see the relevant classes)

**7b-43/00 Devices for cleaning metal products combined with or specially adapted for use with machines or apparatus provided for in this subclass**

7b-43/02	. combined with or specially adapted for use in connection with drawing or winding machines or apparatus
7b-43/04	. . Devices for de-scaling wire or like flexible work

**Auxiliary operations used in connection with metal working without essentially removing material**

**7b-45/00 Separating mandrels from work or vice versa**

**7b-47/00 Winding-up, coiling or winding-off metal wire, metal band or other flexible metal material characterised by features relevant to metal processing only** (coiling wire into particular forms 7d-3/00; winding or unwinding in general, regulating or controlling winding speed controlling of tension of material, drives 47k; hot coilers in connection with heat-treatment apparatus 18c-9/68)

7b-47/02	. Winding-up or coiling
7b-47/04	. . on or in reels or drums, without using a moving guide (reels or drums 7b-47/28)
7b-47/06	. . . with loaded rollers, bolts, or equivalent means holding the material on the reel or drum
7b-47/08	. . without making use of a reel or drum, the first turn being formed by a stationary guide
7b-47/10	. . by means of a moving guide
7b-47/12	. . . the guide moving parallel to the axis of the coil (7b-47/14 takes precedence)
7b-47/14	. . . by means of a rotating guide, e.g. laying the material around a stationary reel or drum
7b-47/16	. Unwinding or uncoiling
7b-47/18	. . from reels or drums
7b-47/20	. . . the unreeled material moving transversely to the tangent line of the drum, e.g. axially, radially
7b-47/22	. . Unwinding coils without reels or drums

7b-47/24	. Transferring coils to or from winding apparatus or to or from operative position therein; Preventing uncoiling during transfer
7b-47/26	. Special arrangements with regard to simultaneous or subsequent treatment of the material
7b-47/28	. Drums or other coil-holders (gripping means 7b-47/32)
7b-47/30	. . expansible or contractible
7b-47/32	. Tongs or gripping means specially adapted for reeling operations
7b-47/34	. Feeding or guiding devices not specially adapted to a particular type of apparatus
<b>7b-49/00</b>	<b>Devices for temporarily accumulating material (in general 47k)</b>
<b>7b-51/00</b>	<b>Measuring, gauging, indicating, counting, or marking devices specially adapted for use in the production or manipulation of material in accordance with subclasses 7a to 7d</b>

**7c Sheet metal and tube working and processing, e.g. expanding and cutting devices for tubing (manufacture of corrugated tubing, fittings, etc. 7b-15 – 7b-21; sheet metal shears 49c; soldering 49h)**

**Straightening, bending, rounding, angular bending, folding and seaming of sheet metal, flanging of sheet metal and tubing**

7c-1	Straightening and smoothing of sheet metal, straightening and stretching machines
7c-2	Corrugating of sheet metal, manufacture of corrugated sheets by pressing
7c-3	Corrugating of sheet metal, manufacture of corrugated sheets by means other than pressing
7c-4/02	Bending of sheet metal by means other than rolling (of tubes 49h-17)
7c-4/03	Angular bending of sheet metal, angular bending machines, combined angular bending, rounding and beading machines
7c-4/04	Flanging of sheet metal and tubular bodies, flanging machines
7c-4/05	Folding and seaming of sheet metal, seaming and folding machines (manufacture of tubing from sheet metal 7b-8, 7b-9)
7c-4/06	Beading and knurling of metal and of tubular bodies, beading and knurling machines
7c-5	Rounding and beading of sheet metal, roll bending, rounding and bulbing machines (for the manufacture of tubes 7b-8/01) edge and wire inserting machines
7c-6	Shaping of sheet metal strips by means of draw plates and drawing rolls (7b-8/01)

**Seaming of sheet metal cans**

7c-7	Longitudinal seaming of preserve cans of sheet metal, making can bodies (soldering longitudinal seams 49h-32/01)
7c-8	Transverse seaming of sheet metal cans by means of rollers, preserve can closing machines with seaming rollers (7c-25; cans and their closures 64a-56 – 64a-64; devices for closing cans under vacuum 64b-22; soldering transverse seams 49h-32/02)
7c-9	Transverse can seaming by means of dies, preserve can closing machines with seaming dies

**Blanking, spinning and embossing of sheet metal and tubes, pressing, drawing and raising sheet metal**

7c-10	Blanking sheet metal and tubing in general (49c-17, 49c-18)
7c-11	Manufacture of finely perforated sheeting or tubing by means of punches, perforating and screen or sieve making machines (perforating devices for printing machines 15e-2; perforating paper, paperboard, etc. 54d-3)
7c-12	Spinning and embossing sheet metal or tubing, spinning lathes (manufacture of corrugated tubing 7b-15/01)
7c-13	Pressing sheet metal or tubing by means of rigid dies, sheet presses (presses in general 58a, 58b; pressing of water tanks 7b-15/30)
7c-14	Pressing sheet metal or tubing by means of water, sand, plastic materials, etc., Huber-type pressing devices (manufacture of corrugated tubes 7b-15/01)

- 7c-15 Drawing hollow objects from sheet metal or tubing, drawing presses with the exception of 7c-13, 7c-16
- 7c-16 Hydraulic drawing presses for sheet metal (hydraulic presses in general 58a; for tube manufacture 7b-3/20, 7b-3/70)
- 7c-17 Safety devices exclusively for the presses of groups 7c-13 to 7c-16 (58b16)
- 7c-18 Components of presses and dies: feeding, holding and stripping devices, punches and dies, couplings, etc. (15e-5 – 15e-11, 49c-30, 58b-17)

### **Special tube fabrication**

- 7c-19 Tube cutters, hand-operated tube cutters (cutting-off lathes, also using cutting-off rollers, metal saws 49c-20, 49c-21)
- 7c-20 Tools for rolling-on, flanging and rolling-in of tube ends (13f-1), fitting guide rings to projectiles
- 7c-21 Machining of tube ends for pipe couplings (pipe couplings 47f, upsetting of tube ends 49h-1)
- 7c-22 Joining sheet metal by means other than seaming (7c-4/05), welding (21h-29 – 21h-32; 49h-25 – 49h-35) and riveting (49g-13 – 49g-17)
- 7c-23 Sheet machining processes in covering and reinforcing articles with sheet metal

### **Special devices and processes for sheet metal and tube machining**

- 7c-24 Making hollow articles of sheet metal in general, e.g. cans, heating elements, tubs and troughs, metal drums, and components
- 7c-25/01 Making can- closing and opening devices (7c-8, 7c-9; cans and their closure 64a-56 – 64a-64; capping and wiring machines for bottles 64b-23, 64b-24)
- 7c-25/02 Machines for applying sealing substances and for pressing seal rings onto sheet metal lids
- 7c-26 Making tubes, sleeves, hollow rivets and capsules of sheet metal, unless classified in 7c-28 (pressing of tubes 7b-10/50; making zinc vessels for galvanic cells 21b; tubes 81c-15)
- 7c-27 Making bottle caps of sheet metal
- 7c-28 Manufacture of cartridge cases (construction 72d-2, 72d-3) and cartridge holders (pressing of cartridge bases 49i-16)
- 7c-29 Manufacture of buttons (of wire 7d-14) and studs of sheet metal
- 7c-30 Manufacture of metal screens and laths, also lattice components of sheet metal (screens 37d-36)
- 7c-31 Manufacture of metallic music-sheets, music sheet stamping machines (51e-4, 51e-5)
- 7c-32/01 Manufacture of rings, disks and hoops of sheet metal, unless classified in 7c-33, 7c-38
- 7c-32/02 Manufacture of wheels, rollers or belt pulleys from sheet metal or tubing (vehicle wheels 63d)
- 7c-33 Manufacture of wheel fellys and rims from sheet metal and tubing (design 63d)
- 7c-34 Manufacture of staples, staple strips and belt couplings from sheet metal (combined manufacturing and stapling machines for the cardboard industry 54a-8 – 54a-11)
- 7c-35 Manufacture of sheet metal fitting and caps
- 7c-36 Manufacture of hinges, door fittings and strips from sheet metal
- 7c-37 Manufacture of keys and lock components from sheet metal (by forging 49i; construction 68a-83)
- 7c-38 Manufacturing finger rings of sheet metal and tubing
- 7c-39 Manufacturing jewellery of sheet metal and tubing
- 7c-40 Manufacturing writing and drawing implements, e.g. pens, drawing pens, compasses from sheet metal and tubing
- 7c-41 Manufacture of knives, forks, spoons, shovels, hoes, rakes and spades from sheet metal (by rolling 7f-3; hoes, etc., for soil cultivation 45a; rakes and forks for agriculture 45c)
- 7c-42 Manufacturing scythes and sickles from sheet metal (rolling 7f-5; construction 45c-3/10)

7c-43	Making bicycle and automobile parts from sheet metal and tubing, with the exception of wheels, felloes and rims(7c-32/02; construction 63c-37, 63c-38, 63c-43, 63c-47)
7c-44	Making window and door frames, mirror frames, etc., of sheet metal (construction 37d)
7c-45/01	Making buckles, hooks, eyelets and corset fasteners from sheet metal (design of closure components 71b)
7c-45/02	Making zippers (zipper and stop structures 3c)
7c-46	Making metal tips on laces and strings
7c-47	Miscellaneous sheet metal article production

**7c (IPC: B21D) Working and processing of sheet metal and metal tubes, rods or profiles without essentially removing material; Punching** (operations of the kind involved in the manufacture of such products per se 7a, 7b; working or processing of wire 7d; cutting or severing devices or machines in general 49)

**Straightening; Bending; Corrugating; Flanging**

**7c-1/00** **Straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom** (7c-3/00 takes precedence); **Stretching sheet metal** (stretch-forming 7c-11/02; by localised hammering 7c-31/06)

- 7c-1/02 . by rollers (7c-1/04, 7c-1/06 take precedence)
- 7c-1/04 . Stretching
- 7c-1/05 . . combined with rolling
- 7c-1/06 . Removing local distortions
- 7c-1/08 . . of hollow bodies made from sheet metal (of substantially open bodies 7c-1/10)
- 7c-1/10 . . of specific articles made from sheet metal, e.g. mudguards
- 7c-1/12 . Straightening vehicle body parts or bodies (7c-1/14 takes precedence)
- 7c-1/14 . Straightening frame structures

**7c-3/00** **Straightening or restoring form of metal rods, metal tubes, metal profiles, or specific articles made therefrom, whether or not in combination with sheet metal parts** (straightening of well casings in situ 5a)

- 7c-3/02 . by rollers
- 7c-3/04 . . arranged on stationary axes skew to the path of the work
- 7c-3/06 . . arranged inclined to a revolving flier rolling frame
- 7c-3/08 . . which move in an orbit without rotating round the work
- 7c-3/10 . between rams and anvils or abutments
- 7c-3/12 . by stretching with or without twisting (by twisting only 7c-11/14)
- 7c-3/14 . Recontouring
- 7c-3/16 . of specific articles made from metal rods, tubes, or profiles, e.g. crankshafts, by specially-adapted methods or means

**7c-5/00** **Bending sheet metal along straight lines, e.g. to form simple curves** (7c-11/02 to 7c-11/18 take precedence; as edge treatment 7c-19/00)

- 7c-5/01 . between rams and anvils or abutments
- 7c-5/02 . on press brakes without making use of clamping means
- 7c-5/04 . on brakes making use of clamping means on one side of the work
- 7c-5/06 . by drawing procedure making use of dies or forming-rollers, e.g. making profiles
- 7c-5/08 . . making use of forming-rollers (7c-5/12 takes precedence)
- 7c-5/10 . . for making tubes
- 7c-5/12 . . . making use of forming-rollers
- 7c-5/14 . by passing between rollers (7c-5/06 takes precedence)
- 7c-5/16 . Folding; Pleating

**7c-7/00** **Bending rods, profiles, or tubes** (7c-11/02 to 7c-11/18 take precedence; using mandrels or the like 7c-9/00)

- 7c-7/02 . over a stationary forming member; Bending by use of a swinging forming-member or abutment
- 7c-7/023 . . over a stationary forming member

7c-7/024	. . by a swinging forming member
7c-7/025	. . . and pulling or pushing the ends of the work
7c-7/028	. . . and altering the profile at the same time, e.g. forming bumpers
7c-7/03	. . Apparatus with means to keep the profile in shape
7c-7/04	. over a movably-arranged forming member (7c-7/02 takes precedence)
7c-7/06	. in press brakes or between rams and anvils or abutments; Pliers with forming dies
7c-7/08	. by passing between rollers or through a curved die
7c-7/10	. by abutting members and flexible bending means, e.g. with chains, ropes
7c-7/12	. with programme control
7c-7/14	. combined with measuring of bends or lengths
7c-7/16	. Auxiliary equipment, e.g. for heating or cooling of bends
<b>7c-9/00</b>	<b>Bending tubes using mandrels or the like (7c-11/02 to 7c-11/18 take precedence)</b>
7c-9/002	. using filling material, e.g. sand
7c-9/004	. with a non-flexible mandrel
7c-9/01	. the mandrel being flexible and engaging the entire tube length
7c-9/03	. . and built-up from loose elements, e.g. series of balls
7c-9/05	. co-operating with forming-members
7c-9/07	. . with one or more swinging forming members engaging tube ends only
7c-9/08	. in press brakes or between rams and anvils or abutments; Pliers with forming dies
7c-9/10	. by passing between rollers
7c-9/12	. by pushing over a curved mandrel; by pushing through a curved die
7c-9/14	. Wrinkle-bending, i.e. bending by corrugating
7c-9/16	. Auxiliary equipment, e.g. machines for filling tubes with sand
7c-9/18	. . for heating or cooling of bends
<b>7c-11/00</b>	<b>Bending not restricted to materials mentioned in only one of groups 7c-5/00, 7c-7/00, 7c-9/00; Bending not provided for in groups 7c-5/00 to 7c-9/00 (corrugating or bending into wave form 7c-13/00, 7c-15/00; flanging 7c-19/00)</b>
7c-11/02	. by stretching or pulling over a die (deep-drawing 7c-22/20)
7c-11/04	. Clamping arrangements
7c-11/06	. Bending into helical or spiral form; Forming a succession of return bends, e.g. serpentine form (making helically seamed tubing 7b-37/12)
7c-11/07	. . Making serpentine-shaped articles by bending essentially in one plane
7c-11/08	. by altering the thickness of part of the cross-section of the work (7c-11/06 takes precedence)
7c-11/10	. Bending specially adapted to produce specific articles, e.g. leaf springs
7c-11/12	. . the articles being reinforcements for concrete
7c-11/14	. by twisting
7c-11/15	. . reinforcing rods for concrete
7c-11/16	. . crankshafts
7c-11/18	. Jogging
7c-11/20	. Bending sheet metal, not otherwise provided for
7c-11/22	. Auxiliary equipment, e.g. positioning devices
<b>7c-13/00</b>	<b>Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form (tubes 7c-15/00)</b>
7c-13/02	. by pressing
7c-13/04	. by rolling
7c-13/06	. by drawing
7c-13/08	. by combined methods
7c-13/10	. into a peculiar profiling shape
<b>7c-15/00</b>	<b>Corrugating tubes (wrinkle-bending 7c-9/14); Bending tubes into wave form</b>
7c-15/02	. longitudinally
7c-15/03	. . by applying fluid pressure
7c-15/04	. transversely, e.g. helically
7c-15/06	. . annularly



7c-15/10	. . by applying fluid pressure
7c-15/12	. Bending tubes into wave form
<b>7c-17/00</b>	<b>Forming single grooves in sheet metal or tubular or hollow articles</b>
7c-17/02	. by pressing (grooving or notching of bolts, studs, or the like 7h-1/54)
7c-17/04	. by rolling
7c-17/06	. Forming helical grooves by pressing or rolling
<b>7c-19/00</b>	<b>Flanging or other edge treatment, e.g. of tubes</b> (connecting by making use of folds 7c-39/00; flaring out tube ends 7c-41/02)
7c-19/02	. by continuously-acting tools moving along the edge (edge-curling 7c-19/12)
7c-19/04	. . shaped as rollers
7c-19/06	. . . working inwardly
7c-19/08	. by single or successive action of pressing tools, e.g. vice jaws
7c-19/10	. . working inwardly
7c-19/12	. Edge-curling
7c-19/14	. . Reinforcing edges, e.g. armouring same
7c-19/16	. Reverse flanging of tube ends
<b>7c-21/00</b>	<b>Combined processes according to methods covered by groups 7c-1/00 to 7c-19/00</b>
<b><u>Stamping; Spinning; Deep-drawing; Punching</u></b>	
<b>7c-22/00</b>	<b>Shaping without cutting, by stamping, spinning, or deep-drawing</b> (otherwise than using rigid devices or tools or yieldable or resilient pads 7c-26/00)
7c-22/02	. Stamping using rigid devices or tools
7c-22/04	. . for dimpling (combined with perforating 7c-28/24)
7c-22/06	. . having relatively-movable die parts
7c-22/08	. . with die parts on rotating carriers
7c-22/10	. Stamping using yieldable or resilient pads
7c-22/12	. . using enclosed flexible chambers
7c-22/14	. Spinning
7c-22/16	. . over shaping mandrels or formers
7c-22/18	. . using tools guided to produce the required profile
7c-22/20	. Deep-drawing (special deep-drawing arrangements in, or in connection with, presses 7c-24/00)
7c-22/22	. . with devices for holding the edge of the blanks (7c-22/24 to 7c-22/30 take precedence; shaping over a die without external former 7c-11/02)
7c-22/24	. . involving two drawing operations having effects in opposite directions with respect to the blank
7c-22/26	. . for making peculiarly, e.g. irregularly, shaped articles
7c-22/28	. . of cylindrical articles using consecutive dies
7c-22/29	. . Stretch forming
7c-22/30	. . to finish articles formed by deep-drawing
<b>7c-24/00</b>	<b>Special deep-drawing arrangements in, or in connection with, presses</b>
7c-24/02	. Die-cushions
7c-24/04	. Blank holders; Mounting means therefor
7c-24/06	. . Mechanically spring-loaded blank holders
7c-24/08	. . Pneumatically or hydraulically loaded blank holders
7c-24/10	. Devices controlling or operating blank holders independently, or in conjunction with dies
7c-24/12	. . mechanically
7c-24/14	. . pneumatically or hydraulically
7c-24/16	. Additional equipment in association with the tools, e.g. for shearing, for trimming
<b>7c-26/00</b>	<b>Shaping without cutting otherwise than using rigid devices or tools or yieldable or resilient pads namely, applying direct pressure or magnetic forces</b>
7c-26/02	. by applying direct pressure

7c-26/04	. . low pressure, e.g. fluid pressure
7c-26/06	. . by shock waves
7c-26/08	. . . generated by explosives, e.g. chemical explosives
7c-26/10	. . . generated by evaporation, e.g. of wire, of liquids
7c-26/12	. . . . initiated by spark discharge
7c-26/14	. applying magnetic forces
<b>7c-28/00</b>	<b>Shaping by press-cutting; Perforating</b>
7c-28/02	. Punching blanks or articles with or without obtaining scrap (cutting nails or pins from strips or sheet material 7e-3/26); Notching
7c-28/04	. . Centering the work; Positioning the tools
7c-28/06	. . Making more than one part out of the same blank; Scrapless working
7c-28/08	. . . Zig-zag sequence working
7c-28/10	. . Incompletely punching in such a manner that the parts are still coherent with the work
7c-28/12	. . Punching using rotatable carriers
7c-28/14	. . Dies (ejecting or stripping-off devices arranged in punching machines or tools 7c-45/00)
7c-28/16	. . Shoulder or burr prevention
7c-28/18	. . Yieldable, e.g. rubber, punching pads
7c-28/20	. . Applications of drives
7c-28/22	. . Notching the peripheries of circular blanks, e.g. laminations for dynamo-electric machines
7c-28/24	. Perforating, i.e. punching holes
7c-28/26	. . in sheets or flat parts
7c-28/28	. . in tubes or other hollow bodies
7c-28/30	. . in annular parts, e.g. rims
7c-28/32	. . in other articles of special shape
7c-28/34	. . Perforating tools; Die holders
7c-28/36	. . using rotatable work or tool holders
<b>7c-31/00</b>	<b>Other methods for working sheet metal, metal tubes, metal profiles</b> (deforming one surface of tubes helically by rolling 7f-3/00; upsetting 7g-5/08; working metal by removing material therefrom 49; embossing 75a-2, 75b-19)
7c-31/02	. Stabbing or piercing, e.g. for making sieves (dimpling 7c-22/04; perforating by punching 7c-28/24)
7c-31/03	. . Expanding of holes
7c-31/04	. Expanding other than provided for in groups 7c-1/00 to 7c-28/00, e.g. for making open mesh (enlarging tube ends 7c-41/02; in making statical constructions 7c-47/00)
7c-31/06	. Deforming sheet metal, tubes or profiles by sequential impacts, e.g. hammering, beating (forging hammers 7g-7/00)
<b>7c-33/00</b>	<b>Special measures in connection with working metal foils, e.g. gold foil</b>
<b>7c-35/00</b>	<b>Combined processes according to methods covered by groups 7c-1/00 to 7c-31/00</b> (7c-21/00 takes precedence)
<b>7c-37/00</b>	<b>Tools as parts of machines dealt with in this subclass</b> (forms or constructions of tools uniquely adapted for particular operations in the relevant groups for the operations)
7c-37/02	. Die constructions enabling assembly of the die parts in different ways (7c-37/06 takes precedence)
7c-37/04	. Movable or exchangeable mountings for tools
7c-37/06	. . Pivotaly-arranged tools, e.g. disengageable (die sets with dies pivoted to one another 7c-37/12)
7c-37/08	. Dies with different parts for several steps in a process
7c-37/10	. Die sets; Pillar guides
7c-37/12	. . Particular guiding equipment, e.g. pliers; Special arrangements for interconnection or co-operation of dies
7c-37/14	. Peculiar arrangements for handling and holding in place complete dies
7c-37/16	. Heating or cooling

7c-37/15	. for rods, profiles or tubes
7c-37/18	. Lubricating
7c-37/20	. Making tools by operations not covered a single other subclass
<b>7c-39/00</b>	<b>Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating</b> (riveting 7g; uniting components by forging or pressing to form integral members 7h-25/00; welding 49h; press-fitting, force-fitting, or shrinking in general 49l-11/00, 49l-19/00; by adhesives 47a1-11/00); <b>Tube expanders</b>
7c-39/02	. of sheet metal by folding, e.g. connecting edges of a sheet to form a cylinder
7c-39/03	. of sheet metal otherwise than by folding
7c-39/04	. of tubes with tubes; of tubes with rods
7c-39/06	. of tubes in openings, e.g. rolling-in
7c-39/08	. . Tube expanders
7c-39/10	. . . with rollers for expanding only
7c-39/12	. . . with rollers for expanding and flanging
7c-39/14	. . . with balls
7c-39/16	. . . with torque limiting devices
7c-39/18	. . . Rollers of special shape
7c-39/20	. . . with mandrels or expanding mandrels
<b>7c-41/00</b>	<b>Application of procedures in order to alter the diameter of tube ends</b> (7c-39/00 takes precedence)
7c-41/02	. Enlarging
7c-41/04	. Reducing; Closing
<b>7c-43/00</b>	<b>Feeding, aligning or storing devices combined with, or arranged in, or specially adapted for use in connection with, apparatus for working and processing sheet metal, metal tubes, metal profiles or metal blanks; Associations therewith of cutting devices</b> (cutting devices associated with the tool, see the relevant group for the tool)
7c-43/02	. Advancing work in relation to the stroke of the die or tool
7c-43/04	. . by means in mechanical engagement with the work
7c-43/05	. . . specially adapted for multi-stage presses
7c-43/06	. . . by positive or negative engaging parts co-operating with corresponding parts of the sheet or the like to be processed, e.g. carrier bolts or grooved section in the carriers
7c-43/08	. . . by rollers
7c-43/10	. . . by grippers
7c-43/12	. . . by chains or belts
7c-43/14	. . . by turning devices, e.g. turn-tables
7c-43/16	. . by gravity, e.g. chutes
7c-43/18	. . by means in pneumatic or magnetic engagement with the work
7c-43/20	. Storage arrangements; Piling or unpling (in general 81e)
7c-43/22	. . Devices for piling sheets
7c-43/24	. . Devices for removing sheets from a stack
7c-43/26	. Stops
7c-43/28	. Associations of cutting devices therewith
7c-43/30	. for rods, profiles or tubes
<b>7c-45/00</b>	<b>Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass</b>
<b><u>Processing sheet metal or metal tubes, or processing metal profiles according to any of the preceding groups, in the manufacture of finished or semi-finished articles</u></b>	
<b>7c-47/00</b>	<b>Making statical construction e.g. honeycomb structures</b>
7c-47/02	. Making beams or pillars by expanding
7c-47/04	. Making composite sheet metal profiles
7c-47/06	. Making perforated sheet, e.g. expanded metal
7c-47/08	. . by making parallel slits and stretching
7c-47/10	. . by making angled slits and stretching

<b>7c-49/00</b>	<b>Sheathing or stiffening objects</b> (by winding wire or tape thereon 25c-1/01 – 25c-1/10; specially adapted for manufacturing conductors or cables 21c-7)
<b>7c-51/00</b>	<b>Making hollow objects</b> (from thick-walled or non-uniform tubes 7h-21/00)
7c-51/02	. not characterised by the particular use (cans or tins 7c-51/26)
7c-51/04	. . built-up objects, e.g. objects with rigidly-attached bottom or cover
7c-51/06	. . folded objects
7c-51/08	. . ball-shaped objects
7c-51/10	. . conically or cylindrically shaped objects
7c-51/12	. . objects with corrugated walls
7c-51/14	. . Flattening hollow objects for transport or storage; Re-forming same (making tubes from doubled flat material 7b-37/14)
7c-51/16	. characterised by the particular structure or use
7c-51/18	. . vessels, e.g. tubs, vats, tanks, sinks, or the like
7c-51/20	. . . barrels
7c-51/22	. . . pots, e.g. for cooking
7c-51/24	. . high-pressure containers, e.g. boilers, bottles
7c-51/26	. . cans or tins; Closing same in a permanent manner (closing outlets 7c-51/38)
7c-51/28	. . . Folding the longitudinal seam
7c-51/30	. . . Folding the circumferential seam
7c-51/32	. . . . by rolling
7c-51/34	. . . . by pressing
7c-51/36	. . collapsible or like thin-walled tubes, e.g. for toothpaste
7c-51/38	. . Making inlet or outlet arrangements of cans, tins, baths, bottles, or other vessels
7c-51/40	. . . Making outlet openings, e.g. bung holes
7c-51/42	. . . . Making or attaching spouts
7c-51/44	. . . Making closures, e.g. caps (folded of thin metal foils in the way of making paper caps 54a3-5/00; making closures in conjunction with applying same 64a, 81a)
7c-51/46	. . . . Placing sealings or sealing material
7c-51/48	. . . . Making crown caps
7c-51/50	. . . . Making screw caps
7c-51/52	. . boxes, cigarette cases, or the like
7c-51/54	. . cartridge cases, e.g. for ammunition, for letter carriers in pneumatic-tube plants
<b>7c-53/00</b>	<b>Making other particular articles</b> (making chains or chain parts 7i)
7c-53/02	. heat exchangers, e.g. radiators, condensers (by inflating sheets or strips secured together locally, e.g. along lines defining passages 7c-26/02; making finned or ribbed tubes by fixing strip material or like to tubes 7b-37/22)
7c-53/04	. . of sheet metal
7c-53/06	. . of metal tubes
7c-53/08	. . of both metal tubes and sheet metal (connecting tubes in openings 7c-39/06)
7c-53/10	. parts of bearings; sleeves; valve seats or the like
7c-53/12	. . cages for bearings
7c-53/14	. belts, e.g. machine-gun belts
7c-53/16	. rings, e.g. barrel hoops
7c-53/18	. . of hollow or C-shaped cross-section, e.g. for curtains, for eyelets
7c-53/20	. . washers, e.g. for sealing
7c-53/22	. . . with means for preventing rotation
7c-53/24	. nuts or like thread-engaging members
7c-53/26	. wheels or the like
7c-53/28	. . gear wheels
7c-53/30	. . wheel rims
7c-53/32	. . wheel covers
7c-53/34	. . brake drums
7c-53/36	. clips, clamps, or like fastening or attaching devices, e.g. for electric installation
7c-53/38	. locksmith's goods, e.g. handles
7c-53/40	. . hinges, e.g. door hinge plates
7c-53/42	. . keys
7c-53/44	. fancy goods, e.g. jewellery products (making wire fabrics 7d)
7c-53/46	. haberdashery, e.g. buckles, combs; pronged fasteners, e.g. staples
7c-53/48	. . buttons, e.g. press-buttons, snap fasteners

7c-53/50	. . metal slide-fastener parts
7c-53/52	. . . fastener elements; Attaching such elements so far as this procedure is combined with the process for making the elements
7c-53/54	. . . slides
7c-53/56	. . . stops
7c-53/58	. end-pieces for laces or ropes
7c-53/60	. cutlery wares; garden tools or the like
7c-53/62	. . spoons; table forks
7c-53/64	. . knives; scissors; cutting blades (7c-53/72 takes precedence; handle portions 7c-53/70)
7c-53/66	. . spades; shovels (handle portions 7c-53/70)
7c-53/68	. . rakes, garden forks, or the like (handle portions 7c-53/70)
7c-53/70	. . handle portions (7c-53/72 takes precedence)
7c-53/72	. . sickles; scythes
7c-53/74	. frames for openings, e.g. for windows, doors, handbags
7c-53/76	. writing or drawing instruments, e.g. writing pens, erasing pens
7c-53/78	. propeller blades; turbine blades
7c-53/80	. dustproof covers; safety covers
7c-53/82	. perforated music sheets; pattern sheets, e.g. for control purposes, stencils
7c-53/84	. other parts for engines, e.g. connecting-rods
7c-53/86	. other parts for bicycles or motorcycles
7c-53/88	. other parts for vehicles, e.g. cowlings, mudguards
7c-53/90	. . axle-housings
7c-53/92	. other parts for aircraft
<b>7c-55/00</b>	<b>Safety devices protecting the machine or the operator, specially adapted for apparatus or machines dealt with in this subclass</b> (for presses in general 58a; safety devices in general 47a4)

## **7d Wire working and machining**

### **Wire working in general**

- 7d-1 Wire bending (49h-12 – 49h-24), straightening, making crimped wire and wire eyelets
- 7d-2 Coiling wire, making spiral and helical wire (49h-20), springs from wire and strips (7d-7; coiling of wire 7b-5/01)
- 7d-3 Making wire connections and connecting wire to sheet metal
- 7d-4 Making barbed wire
- 7d-5 Upsetting, stretching, cutting, splitting and feeding wire (7e-10, 7e-18), special wire treatment, also reinforcing articles with wire

### **Machining of wire into special articles**

- 7d-6 Manufacture of wire screens, plaster supports, decorative weaves (design thereof 33b-5); decorative chains, soldering of decorative weaves and chains (mattresses 34g-17; railing and fences 37d-36; wire weaving 86f)
- 7d-7 Making springs, spring winding and setting machines (springs for upholstered furniture 34g-18)
- 7d-8 Making and repairing weaving wire heddles and beams (structure thereof 86c-7, 86g-2)
- 7d-9 Making wire carding combs, card settings machines (card 76b-15)
- 7d-10 Making wire bows and ties for bottle closures
- 7d-11 Making wire bicycle spokes
- 7d-12 Making wire umbrella frames
- 7d-13 Making wire tips for strings and laces
- 7d-14 Making buckles, lacing hooks, corset fasteners, hooks, snap hooks, eyelets, buttons; snap fastener springs, spring inserting devices (perforating punch and eyelet setting machines and tools for general use 71c-60; garment hooks and eyelets 3c-1; corset fasteners 3c-6; making sheet metal buttons 7c-29; of horn, celluloid and the like buttons 39a; buttons, general, 44a-1 – 44a-14)
- 7d-15 Making metal strips and wire corset stays (their construction 3a-16, 3c-6, 3f-16)

7d-16 Making miscellaneous wire articles

<b>7d</b>	<b>(IPC: B21F) Working and processing of wire</b> (reducing diameter by rolling 7a; by drawing, auxiliary operations used in connection with metal-working without essentially removing material 7b)
<b>7d-1/00</b>	<b>Bending wire other than coiling; Straightening wire</b>
7d-1/02	. Straightening
7d-1/04	. Undulating
7d-1/06	. Bending wire-eyes
<b>7d-3/00</b>	<b>Coiling wire into particular forms</b>
7d-3/02	. helically
7d-3/027	. . with extended ends formed in a special shape, e.g. for clothes-pegs
7d-3/04	. . externally on a mandrel or the like
7d-3/06	. . internally on a hollow form
7d-3/08	. to flat spiral
7d-3/10	. to spirals other than flat, e.g. conical
7d-3/12	. of interconnected helical springs
<b>7d-5/00</b>	<b>Upsetting wire</b> (in the manufacture of nails or pins 7e-3/12)
<b>7d-7/00</b>	<b>Twisting wire; Twisting wire together</b> (for connections of limited size 7d-15/04)
<b>7d-9/00</b>	<b>Straining wire</b> (straining prestressing wires for concrete 37e-21/12; connections or attachments adapted for straining 47d-11/00)
7d-9/02	. by tools adapted also for making connections
<b>7d-11/00</b>	<b>Cutting wire</b> (hand cutting tools 69)
<b>7d-13/00</b>	<b>Splitting wire</b>
<b>7d-15/00</b>	<b>Connecting wire to wire or other metallic material or objects; Connecting parts by means of wire</b> (tools for both straining and connecting 7d-9/00; jacketing or reinforcing 7d-17/00; manufacture of wire network 7d-27/00; in making bands 7d-43/00)
7d-15/02	. wire with wire
7d-15/04	. . without additional connecting elements or material, e.g. by twisting
7d-15/06	. . with additional connecting elements or material
7d-15/08	. . . making use of soldering or welding
7d-15/10	. wire with sheet metal
<b>7d-17/00</b>	<b>Jacketing or reinforcing articles with wire</b> (by winding 25c-1/01 – 25c-1/10; by braiding 25b)
<b>7d-19/00</b>	<b>Metallic coating of wire</b> (by extruding 7b-23/24; by welding technique 49h; electroplating 48a; by other non-mechanical means 48)
<b>7d-21/00</b>	<b>Working or processing wire not otherwise provided for</b>
<b>7d-23/00</b>	<b>Feeding wire in wire-working machines or apparatus</b> (applicable also to feeding rods or strips 7c-43/00)
<b><u>Wire working characterised by the particular articles produced</u></b>	
<b>7d-25/00</b>	<b>Making barbed wire</b>
<b>7d-27/00</b>	<b>Making wire network; Wire nettings</b> (meshed-ring network 7d-31/00; in making bands 7d-43/00; using looms 86f)
7d-27/02	. without additional connecting elements or material at crossings, e.g. connected by knitting
7d-27/04	. . Manufacturing on machines with rotating blades or formers
7d-27/06	. . Manufacturing on twister-gear machines
7d-27/08	. with additional connecting elements or material at crossings

7d-27/10	. . with soldered or welded crossings
7d-27/12	. Making special types or portions of network by methods or means specially adapted therefor
7d-27/14	. . Specially bending or deforming free wire ends
7d-27/16	. . for spring mattresses
7d-27/18	. . of meshed work for filters or sieves
7d-27/20	. . of plaster-carrying network
7d-27/22	. . of network for wire-reinforced glass or the like
<b>7d-29/00</b>	<b>Making other fencing or like material made partly of wire</b>
7d-29/02	. comprising bars or the like connected by wires
<b>7d-31/00</b>	<b>Making meshed-ring network from wire</b>
<b>7d-33/00</b>	<b>Tools or devices specially designed for handling or processing wire fabrics or the like</b>
7d-33/02	. Mounting of wire network on frames
7d-33/04	. Connecting ends of helical springs for mattresses
<b>7d-35/00</b>	<b>Making springs from wire</b> (by coiling wire 7d-3/00; making resilient rings 7d-37/02)
7d-35/02	. Bending or deforming ends of coil springs to special shape
7d-35/04	. Making flat springs, e.g. sinus springs
<b>7d-37/00</b>	<b>Manufacture of rings from wire</b> (in chain making 7i; making of tyre beads 39a6-17/32)
7d-37/02	. or resilient rings, e.g. key-rings
7d-37/04	. of washers (7d-37/02 takes precedence)
<b>7d-39/00</b>	<b>Making wheel spokes from wire</b>
<b>7d-41/00</b>	<b>Making umbrella frames or members from wire</b>
<b>7d-43/00</b>	<b>Making bands, e.g. bracelets, or wire</b> (making chains 7i; using looms 86f)
<b>7d-45/00</b>	<b>Wire-working in the manufacture of other particular articles</b> (of pins, needles, nails, hairpins 7e; of chains 7i)
7d-45/02	. of clothes hangers
7d-45/04	. of elements, e.g. levers or links, for bottle stoppers
7d-45/06	. of flexible shafts or hollow conduits, e.g. for Bowden mechanisms
7d-45/08	. of loom heddles
7d-45/10	. of cards for fabric-napping machines
7d-45/12	. of fishing hooks
7d-45/14	. of end-pieces for laces or ropes
7d-45/16	. of devices for fastening or securing purposes
7d-45/18	. . of slide fastener elements
7d-45/20	. . of spring hooks; of spring safety hooks
7d-45/22	. . of paper fasteners or clips (staples 7d-45/24)
7d-45/24	. . of staples; of belt-fastening elements
7d-45/26	. . of buttons
7d-45/28	. . . of "patent-fastener" or press-button type

**7e Making of needles and nails, e.g. by pressing, rolling and blanking** (broaches, hairpins, hat-pins, pins, safety pins 44a-21 – 44a-26; sewing needles and needles for sewing machines, 52a-40; needles for knitting and hosiery machines 25a-19; nails as machine components 47a-4)

**Making needles**

7e-1	Making of pins and safety pins, except 7e-5, 7e-6
7e-2	Making of sewing, darning, packing needles and awls, needle blanking and perforating machines, except 7e-5, 7e-6
7e-3	Making of machine needles, needles for sewing and knitting machines, except 7e-5, 7e-6

- 7e-4 Making of special needles, knitting needles, crochet needles, hairpins, hatpins and the like, except 7e-5, 7e-6
- 7e-5 Scouring, bur removing, polishing, grinding and sorting of needles (grinding machines for needles 67a-22)
- 7e-6 Miscellaneous special methods for needle machining, e.g. straightening

**Making of common nails**

- 7e-7 Making of wire nails, pins, and tacks, except 7e-8, 7e-9, 7e-10
- 7e-8 Making of wire nails in pairs or in multiple groups
- 7e-9 Making of nails in the form of connected wires
- 7e-10 Components of wire nail making machines, e.g. feeding, cutting, pressing and pointing devices
- 7e-11 Making of cut nails and cut nail blanks, including details, except 7e-14
- 7e-12 Rolling of nails, except 7e-17
- 7e-13 Pressing of nails, except 7e-15

**Making special nails, horseshoe nails, etc.**

- 7e-14 Making horseshoe nail blanks by cutting
- 7e-15 Making horseshoe nails by pressing
- 7e-16 Making horseshoe nails by forging, hammer and forging roll machines
- 7e-17 Making horseshoe nails by rolling
- 7e-18 Components of horseshoe nail machines, e.g., feeding, turning, cutting, pressing and pointing devices
- 7e-19 Making hooks, clamps, bench and window irons and rail spikes (hooks for curtain rods 34e-3; hooks for hoisting chains, etc. 47d-16; clamps 68b-29)
- 7e-20 Making special nails of sheet metal and wire, capped nails, thumb tacks, upholstery nails, etc. slit rivets (49i-6)

**7e (IPC: B21G) Making needles, pins, or nails****7e-1/00 Making needles used for performing operations (U-shaped hairpins 7e-7/04)**

- 7e-1/02 . of needles with eyes, e.g. sewing-needles, sewing-awls
- 7e-1/04 . . of needles specially adapted for use in machines or tools
- 7e-1/06 . of needles with hook or barb, e.g. crochet hooks
- 7e-1/08 . of hollow needles or needles with hollow end, e.g. hypodermic needles, larding-needles (7e-1/10 takes precedence)
- 7e-1/10 . equipped with locking means for the material to be drawn through, e.g. for repairing tubeless tyres
- 7e-1/12 . Securing, cleaning-off burrs, reconditioning, polishing, grinding (takes precedence over 7e-1/02 to 7e-1/10)

**7e-3/00 Making pins or nails (of pins with individual caps 7e-5/00; of U-like shape 7e-7/00; of split-pins 7e-7/08)**

- 7e-3/02 . of pins of the kind used in the tailoring trade or the household
- 7e-3/04 . . with locking or shielding device for the pin point, e.g. safety-pins
- 7e-3/06 . of nails with shoulders
- 7e-3/08 . of nails with head and two or more shanks or split shanks
- 7e-3/10 . of undulated nails or pins
- 7e-3/12 . Upsetting; Forming heads
- 7e-3/14 . Reducing diameter of parts otherwise than by rolling
- 7e-3/16 . Pointing with or without cutting
- 7e-3/18 . by operations not restricted to one of the groups 7e-3/12 to 7e-3/16 (7e-3/06 to 7e-3/10 take precedence)
- 7e-3/20 . . from wire of indefinite length (by rolling 7e-3/30)
- 7e-3/22 . . . in pairs arranged head to head
- 7e-3/24 . . . by simultaneously forming the head of one nail and the adjacent point of another
- 7e-3/26 . . by cutting from strip or sheet material
- 7e-3/28 . . by forging or pressing



7e-3/30	. . by rolling
7e-3/32	. Feeding material to be worked to nail or pin making machines
<b>7e-5/00</b>	<b>Making pins or nails with attached caps or with coated heads</b>
7e-5/02	. of drawing-pins or pins of drawing-pin type
<b>7e-7/00</b>	<b>Making pins of U-like shape or split-pins</b> (of paper fasteners or staples 7c-53/46, 7d-45/16)
7e-7/02	. of U-like shape
7e-7/04	. . of hairpins
7e-7/06	. . . of undulated hairpins
7e-7/08	. of split-pins, e.g. cotter-pins

## **7f Making special articles by rolling, e.g. screws, wheels, rings, disks, drums, balls**

1	Rolling of wheels, rings, hoops, disks, wheel and wheel rim rolling mills
2	Rolling of barrel-shaped convex rings
3	Rolling of shovels, spades, hoes, ploughshares
4	Rolling of forks and rakes
5	Rolling of knives, sickles and scythes (production from sheet metal 7c-41, 7c-42; special shapes 45c-3)
6	Rolling of balls
7	Rolling of horseshoes and horseshoe blanks (manufacture by forging and pressing - 49i-1)
8	Rolling spiral and helical metal strips, e.g. worms and twist drills from flat bars (making of drills by forging and pressing 49i-10)
9	Rolling of screw threads
10	Rolling of various articles, e.g. grate bars (structure 24f), bed plates, fishplates, rail chairs and ties for railway superstructures

## **7f (IPC: B21H) Making particular metal objects by rolling, e.g. screws, wheels, rings, barrels, balls** (essentially from sheet metal 7c)

### **Note:**

**This subclass includes only rolling operations which are specially adapted for use in the manufacture of particular objects and which, so far as the invention is concerned, are not combined with any different metal-working operation unless the latter is a subsidiary operation performed in the same machine.**

<b>7f-1/00</b>	<b>Making articles shaped as bodies of revolution</b> (rolling tubes 7a-17/00 to 7a-25/00)
7f-1/02	. discs; disc wheels
7f-1/04	. . with rim, e.g. railway wheels
7f-1/06	. rings of restricted axial length (extending closed shapes of metal bands by simultaneous rolling at two or more zones 7a-5/00)
7f-1/08	. . railway wheel rims
7f-1/10	. . rims for pneumatic tyres
7f-1/12	. . rings for ball or roller bearings
7f-1/14	. balls, rollers, cone rollers, or like bodies
7f-1/16	. . for bearings
7f-1/18	. cylinders, e.g. rolled transversely
7f-1/20	. . rolled longitudinally
<b>7f-3/00</b>	<b>Making helical bodies or bodies having parts of helical shape</b> (helical gears 7f-5/00; forming tubes or tube walls into helical shape 7c-11/06, 7c-15/04)
7f-3/02	. external screw-threads
7f-3/04	. . Making by means of profiled rolls

7f-3/06	. . Making by means of profiled members other than rolls, e.g. jaws, moved longitudinally or curvilinearly with respect to each other
7f-3/08	. internal screw-threads
7f-3/10	. twist-drills; screw-taps
7f-3/12	. articles with helicoidal surface (bending strip or the like helically 7c-11/06)
<b>7f-5/00</b>	<b>Making gear wheels</b>
7f-5/02	. with cylindrical outline
7f-5/04	. bevel gears
<b>7f-7/00</b>	<b>Making articles not provided for in the preceding groups, e.g. agricultural tools, dinner forks, knives, spoons (nails, pins 7e-3/30)</b>
7f-7/02	. spades; shovels
7f-7/04	. hoes
7f-7/06	. ploughshares; axes
7f-7/08	. forks; rakes
7f-7/10	. knives; sickles; scythes
7f-7/12	. horse-shoes; articles of like shape, e.g. wear-resisting attachments for shoes
7f-7/14	. knurled articles
7f-7/16	. turbine blades; compressor blades; propeller blades
7f-7/18	. grooved pins; Rolling grooves, e.g. oil grooves, in articles
<b>7f-8/00</b>	<b>Rolling metal of indefinite length in repetitive shapes specially designed for the manufacture of particular objects</b>
7f-8/02	. Rolls of special shape
<b>7f-9/00</b>	<b>Feeding arrangements for rolling machines or apparatus manufacturing articles dealt with in this subclass</b>
7f-9/02	. for screw-rolling machines
<b>7g</b>	<b>(IPC: B21J) Forging; Hammering; Pressing; Riveting; Forge furnaces (making particular products by forging or pressing 7h; plating or pressure finishing or surfaces 49I-3/00; general features of presses, presses for consolidating scrap 58a; furnaces in general 31)</b>
<b>7g-1/00</b>	<b>Preparing metal stock</b>
7g-1/02	. Preliminary treatment of metal stock without particular shaping, e.g. salvaging segregated zones, forging or pressing in the rough (modifying the physical properties by deformation 18c-7/00, 40d-1/00)
7g-1/04	. Shaping in the rough solely by forging or pressing
7g-1/06	. Heating or cooling methods or arrangements specially adapted for performing forging or pressing operations
<b>7g-3/00</b>	<b>Lubricating during forging or pressing (lubricating in general 47e)</b>
<b>7g-5/00</b>	<b>Methods for forging, hammering, or pressing (for working sheet metal or metal tubes, rods, or profiles 7c; for working wire 7d); Special equipment or accessories therefor</b>
7g-5/02	. Die forging; Trimming by making use of special dies
7g-5/04	. by directly applied fluid pressure or explosive action
7g-5/06	. for performing particular operations
7g-5/08	. . Upsetting
7g-5/10	. . Piercing billets (in combination with extrusion 7b-23/00)
7g-5/12	. . Forming profiles on internal or external surfaces (making screw-thread by forging, pressing, or hammering 7h)
<b>7g-7/00</b>	<b>Hammers; Forging machines with hammers or die jaws acting by impact (hand hammers 87b-1; electrical features 21d)</b>
7g-7/02	. Special design or construction
7g-7/04	. . Power hammers
7g-7/06	. . Drop hammers
7g-7/08	. . . with rigidly-guided hammer

7g-7/10	. . with both drive and hammer connected to a fulcrumed lever, e.g. tail hammers
7g-7/12	. . . the lever being a spring, i.e. spring hammers
7g-7/14	. . Forging machines working with several hammers
7g-7/16	. . . in rotary arrangements
7g-7/18	. . Forging machines working with die jaws, e.g. pivoted, movable laterally of the forging or pressing direction, e.g. for swaging
7g-7/20	. Drives for hammers; Transmission means therefor
7g-7/22	. . for power hammers
7g-7/24	. . . operated by steam, air, or other gaseous pressure
7g-7/26	. . . . operated by internal combustion
7g-7/28	. . . operated by hydraulic or liquid pressure
7g-7/30	. . . operated by electro-magnets
7g-7/32	. . . operated by rotary drive, e.g. by electric motor
7g-7/34	. . . operating both the hammer and the anvil, so-called counter-tup
7g-7/36	. . for drop hammers
7g-7/38	. . . driven by steam, air, or other gaseous pressure
7g-7/40	. . . driven by hydraulic or liquid pressure
7g-7/42	. . . operated by rotary drive, e.g. electric motors
7g-7/44	. . . . equipped with belts, ropes, cables, chains
7g-7/46	. . Control uniquely specially adapted to forging hammers, not restricted to one of the preceding subgroups
<b>7g-9/00</b>	<b>Forging presses</b>
7g-9/02	. Special design or construction
7g-9/04	. . Piercing presses
7g-9/06	. . Sawing presses; Upsetting presses
7g-9/08	. . . equipped with devices for heating the workpiece (electric heating elements 21h)
7g-9/10	. Drives for forging presses
7g-9/12	. . operated by hydraulic or liquid pressure
7g-9/14	. . . in conjunction with electric power
7g-9/16	. . . in conjunction with steam or gas power
7g-9/18	. . operated by making use of gearing mechanisms, e.g. levers, spindles, crankshafts, eccentrics, toggle-levers, rack bars
7g-9/20	. . Control devices specially adapted to forging presses not restricted to one of the preceding subgroups
<b>7g-11/00</b>	<b>Forging hammers combined with forging presses; Forging machines with provision for hammering and pressing</b>
<b>7g-13/00</b>	<b>Details of machines for forging, pressing, or hammering</b>
7g-13/02	. Dies; mountings
7g-13/04	. Frames; Guides
7g-13/06	. Hammer tups; Anvils; Anvil blocks
7g-13/08	. Accessories for handling work or tools
7g-13/10	. . Manipulators (in general 87a)
7g-13/12	. . . Turning means
7g-13/14	. . Ejecting devices
<b>7g-15/00</b>	<b>Riveting</b>
7g-15/02	. Riveting procedures
7g-15/04	. . Riveting hollow rivets mechanically
7g-15/06	. . Riveting hollow rivets by means of hydraulic, liquid, or gas pressure
7g-15/08	. . Riveting by applying heat to the end parts of the rivets to enable heads to be formed
7g-15/10	. Riveting machines (electric heating elements 21h)
7g-15/12	. . with tools or tool parts having a movement additional to the feed movement, e.g. spinning
7g-15/14	. . uniquely adapted for riveting specific articles, e.g. brake lining machines
7g-15/16	. . Drives for riveting machines; Transmission means therefor
7g-15/18	. . . operated by air pressure or other gas pressure
7g-15/20	. . . operated by hydraulic or liquid pressure
7g-15/22	. . . operated by both hydraulic or liquid pressure and gas pressure

7g-15/24	. . . operated by electro-magnets
7g-15/26	. . . operated by rotary drive, e.g. by electric motor
7g-15/28	. . Control devices specially adapted to riveting machines not restricted to one of the preceding subgroups
7g-15/30	. . Particular items, e.g. supports; Suspension equipment uniquely adapted for portable riveters
7g-15/32	. . . Devices for inserting or holding rivets in position with or without feeding arrangements
7g-15/34	. . . . for installing tubular rivets
7g-15/36	. . Rivet sets, i.e. tools for forming heads; Mandrels for expanding parts of hollow rivets
7g-15/38	. Accessories for use in connection with riveting, e.g. pliers for upsetting; Hand tools for riveting
7g-15/40	. . for forming rivet heads
7g-15/42	. . Special clamping devices for workpieces to be riveted together, e.g. operating through the rivet holes
7g-15/44	. . Rivet hole positioners
7g-15/46	. . Positioners for rivets for making tube joints
7g-15/48	. . Devices for caulking rivets
7g-15/50	. . Removing or cutting devices for rivets
<b>7g-17/00</b>	<b>Forge furnaces</b> (furnaces for heat treatment 18c-9/00; furnaces in general 31)
7g-17/02	. electrically heated (electric heating elements 21h)
<b>7g-19/00</b>	<b>Blacksmiths' requisites not otherwise provided for</b>
7g-19/02	. Hearths; Air supply arrangements specially adapted therefor
7g-19/04	. Anvils; Associated items
<b>7h</b>	<b>(IPC: B21K) Making forged and pressed products, e.g. horse-shoes, rivets, bolts, wheels</b> (processing wire 7d; making pins, needles or nails 7e; forging machines, pressing machines, hammering machines, in general 7g; making chains 7i; plating 49I-3/00)

**Note:**

**This subclass includes only forging, pressing, or hammering operations which are specially adapted for use in the manufacture of particular objects and which, so far as the invention is concerned, are not combined with any different metal-working operation unless the latter is a subsidiary operation performed in the same machine.**

**Making particular articles by forging, pressing, or hammering; Equipment therefor**

<b>7h-1/00</b>	<b>Making machine elements</b>
7h-1/02	. balls, rolls, or rollers, e.g. for bearings
7h-1/04	. ball-races
7h-1/06	. axles or shafts
7h-1/08	. . crankshafts
7h-1/10	. . of cylindrical form
7h-1/12	. . of specially-shaped cross-section
7h-1/14	. fittings
7h-1/16	. . parts of pipe or hose couplings
7h-1/18	. pistons or plungers
7h-1/20	. valve parts
7h-1/22	. . poppet valves, e.g. for internal-combustion engines
7h-1/24	. . valve bodies; valve seats
7h-1/26	. housings or supporting parts, e.g. axle housings, engine mountings
7h-1/28	. wheels; discs
7h-1/30	. . with gear-teeth
7h-1/32	. . discs, e.g. disc wheels
7h-1/34	. . wheels with spokes

- 7h-1/36 . . with blades
- 7h-1/38 . . rims; tyres
- 7h-1/40 . . hubs
- 7h-1/42 . . pulleys, e.g. cable pulleys
- 7h-1/44 . bolts, studs, or the like (making screw-thread 7h-1/56; making U-bolts 7h-1/74)
- 7h-1/46 . . with heads
- 7h-1/48 . . . Machines working with hammers, e.g. beating in a radial direction, for forming heads
- 7h-1/50 . . . Trimming or shearing formed heads, e.g. working with dies
- 7h-1/52 . . double-ended, e.g. with heads on both ends (forming heads 7h-1/46)
- 7h-1/54 . . with grooves or notches
- 7h-1/56 . Making screw-thread (by rolling 7f-3/02)
- 7h-1/58 . rivets
- 7h-1/60 . . hollow or semi-hollow rivets
- 7h-1/62 . . special rivets, e.g. with electrical contacts
- 7h-1/64 . nuts (making screw-thread 7h-1/56)
- 7h-1/66 . . from strip bars
- 7h-1/68 . . from round or profiled bars
- 7h-1/70 . . of special shape, e.g. self-locking nuts, wing nuts
- 7h-1/72 . hooks, e.g. crane hooks, railway track spikes (making nails in general 7e)
- 7h-1/74 . forked members or members with two or more limbs, e.g. U-bolts, anchors
- 7h-1/76 . elements not mentioned in one of the preceding groups

### **7h-3/00 Making engine or like machine parts not covered by subgroups of 7h-1/00; Making propellers or the like**

- 7h-3/02 . cylinder heads
- 7h-3/04 . blades, e.g. for turbines; Upsetting of blade roots

### **7h-5/00 Making tools or tool parts, e.g. pliers**

- 7h-5/02 . drilling-tools or other tools for making or working on holes
- 7h-5/04 . . twisting-tools, e.g. drills, reamers
- 7h-5/06 . . Dressing, e.g. sharpening rock drills
- 7h-5/08 . . drifting tools
- 7h-5/10 . . Forming drill-bit shanks
- 7h-5/12 . other cutting tools (cutlery wares 7h-11/00)
- 7h-5/14 . hand hammers
- 7h-5/16 . tools for turning nuts
- 7h-5/18 . handles or parts therefor
- 7h-5/20 . Making working faces of dies, either recessed or outstanding

### **7h-7/00 Making railway appurtenances**

- 7h-7/02 . parts for permanent way (spikes 7h-1/72)
- 7h-7/04 . . switch tongues
- 7h-7/06 . . sleepers
- 7h-7/08 . . base plates for rails, e.g. chairs
- 7h-7/10 . . rail joints
- 7h-7/12 . parts for locomotives or vehicles, e.g. frames, underframes
- 7h-7/14 . . brake rigging

### **7h-9/00 Reconditioning railroad accessories, e.g. rails**

### **7h-11/00 Making cutlery wares; Making garden tools or the like**

- 7h-11/02 . knives
- 7h-11/04 . spoons; table forks
- 7h-11/06 . scissors
- 7h-11/08 . sickles; scythes
- 7h-11/10 . axes; picks
- 7h-11/12 . spades; shovels
- 7h-11/14 . rakes; garden forks

### **7h-13/00 Making locksmiths' goods, e.g. handles for cases**

- 7h-13/02 . hinges

<b>7h-15/00</b>	<b>Making blacksmiths' goods</b>
7h-15/02	. horse-shoes; appurtenances therefor
7h-15/04	. . caulks
7h-15/06	. metal attachments for footwear, e.g. wear-resisting plates
<b>7h-17/00</b>	<b>Making sport articles, e.g. skates</b>
<b>7h-19/00</b>	<b>Making articles for agricultural machinery</b>
7h-19/02	. plough blades; ploughshares
<b>7h-21/00</b>	<b>Making hollow articles not covered by a single preceding subgroup</b> (essentially from sheet-metal or uniform thin-walled tubes 7c, e.g. 7c-41/00, 7c-51/00)
7h-21/02	. Producing blanks in the shape of discs or cups as semi-finished articles for making hollow articles, e.g. to be deep-drawn or extruded
7h-21/04	. Shaping thin-walled hollow articles, e.g. cartridges
7h-21/06	. Shaping thick-walled hollow articles, e.g. projectiles
7h-21/08	. Shaping hollow articles with different cross-section in longitudinal direction, e.g. nozzles, spark-plugs
7h-21/10	. . cone-shaped or bell-shaped articles, e.g. insulator caps
7h-21/12	. Shaping end portions of hollow articles
7h-21/14	. . closed or substantially-closed ends, e.g. cartridge bottoms
7h-21/16	. Remodelling hollow bodies with respect to the shape of the cross-section (remodelling end portions only 7h-21/12)
<b>7h-23/00</b>	<b>Making other articles</b>
7h-23/02	. members of endless tracks, e.g. track guides, shoes (making from sheet-metal 7c)
7h-23/04	. flanged articles (7f-1/28 takes precedence; flanging tubes 7c)
<b>7h-25/00</b>	<b>Uniting components to form integral members, e.g. turbine wheels and shafts, caulks with inserts, with or without shaping of the components</b> (uniting by interference-fitting or press-fitting 49l-11/02, 49l-19/02)
<b><u>Accessories; Auxiliary devices</u></b>	
<b>7h-27/00</b>	<b>Handling devices, e.g. for feeding, aligning, discharging; Cutting-off means; Arrangement thereof</b>
7h-27/02	. Feeding devices for rods, wire, or strips
7h-27/04	. . allowing successive working steps
7h-27/06	. Cutting-off means; Arrangement thereof
<b>7h-29/00</b>	<b>Arrangements for heating or cooling during processing</b> (for preparing metal stock to be forged or pressed 7g-1/06; heating equipment per se, see the appropriate subclasses, e.g. 21h)
<b>7h-31/00</b>	<b>Control devices specially adapted for positioning tool carriers</b>
<b>7i</b>	<b>(IPC: B21L) Making chains</b>
<b>7i-1/00</b>	<b>Making chains or chain links by bending workpieces of rod, wire, or strip to form links of oval or other simple shape</b> (7h-3/00, 7h-7/00 take precedence)
7i-1/02	. by bending the ends of the workpieces to abut
7i-1/04	. by bending and interconnecting the ends of the workpieces with or without separate jointing members
<b>7i-3/00</b>	<b>Making chains or chain links by bending the chain links or link parts and subsequently welding or soldering the abutting ends</b> (7h-7/00 takes precedence)
7i-3/02	. Machines or devices for welding chain links
7i-3/04	. . by making use of forge or pressure welding

<b>7i-5/00</b>	<b>Making chains or chain links by working the starting material in such a way that integral, i.e. jointless, chain links are formed</b>
7i-5/02	. in such a way that interconnected links are formed
<b>7i-7/00</b>	<b>Making chains or chain links by cutting single loops or loop-parts from coils, assembling the cut parts and subsequently subjecting same to twisting with or without welding</b>
<b>7i-9/00</b>	<b>Making chains or chain links, the links being composed of two or more different parts, e.g. drive chains (7h-1/04, 7h-7/00, 7h-11/14, 7h-13/00 take precedence)</b>
7i-9/02	. of roller-chain or other plate-link type
7i-9/04	. . Punching or bending the different parts of the chain links
7i-9/06	. . Sorting, feeding, assembling, riveting, or finishing parts of chains
7i-9/08	. . Combining the chain links with auxiliary parts, e.g. welding-on wear-resistant parts
<b>7i-11/00</b>	<b>Making chains or chain links of special shape</b>
7i-11/02	. each link being formed of a single member of which both ends are bent or shaped to engage the middle portion of the next link
7i-11/04	. . the ends being pierced or punched to form eyes
7i-11/06	. . . the workpiece being of thin strip metal
7i-11/08	. . the ends being interengaged with other parts of the same link
7i-11/10	. the chain links having opposed correspondingly shaped cylindrical and hook-like parts of which one part forms a hinge-like support for the adjacent link (7h-11/02 takes precedence)
7i-11/12	. forming bead chains
7i-11/14	. making chain links with inserted or integrally-formed studs
<b>7i-13/00</b>	<b>Making terminal or intermediate chain links of special shape; Making couplings for chains, e.g. swivels, shackles</b>
<b>7i-15/00</b>	<b>Finishing or dressing chains or chain links, e.g. removing burr material, calibrating (7i-9/06 takes precedence)</b>
7i-15/02	. Twisting already closed links
<b>7i-17/00</b>	<b>Making chains or chain links not covered by one of the preceding main groups (by casting 31b2-25/02)</b>
<b>7i-19/00</b>	<b>Appurtenances for chain-making not restricted to any particular process</b>
<b>7i-21/00</b>	<b>Tools or implements for repairing chains using metal-working operations, e.g. for detaching deformed chain links</b>