

B21D

WORKING OR PROCESSING OF SHEET METAL OR METAL TUBES, RODS OR PROFILES WITHOUT ESSENTIALLY REMOVING MATERIAL; PUNCHING METAL (working or processing of wire [B21F](#))

Definition statement

This place covers:

Processes and apparatus for the mechanical working of sheet metal or metal tubes, rods or profiles without essentially removing material.

Processes and apparatus for punching, i.e. press-cutting, sheet metal or other metal stock material, as a particular mechanical working which removes material.

It further covers the following parts and devices related to those apparatus:

Tools as parts of those machines;

Feeding, positioning or storing devices combined with, or arranged in, or specially adapted for use in connection with, those apparatus;

Ejecting or stripping-off devices arranged in those machines or tools;

Associations of cutting devices with those apparatus;

Special measures to adapt those apparatus for working metal foils, e.g. gold foils;

Safety devices protecting the machine or the operator, specially adapted for those apparatus.

The mechanical working covers treatments characterised by their function, comprising methods for straightening, restoring form or removing local distortions,

bending or twisting,

corrugating, bending into wave form or forming single grooves,

edge treatments, e.g. for flanging tubes

shaping without cutting by stamping, spinning, deep-drawing or by applying fluid pressure or magnetic forces,

shaping by press cutting, i.e. punching, e.g. for cutting-out or perforating,

stretching sheet metal of limited length,

stabbing, piercing, expanding, hammering, beating, peen forming or other methods,

processes combining those methods.

The processing of sheet metal or metal tubes, rods or profiles covers the application of those mechanical metal-working treatments or methods for the following particular purposes

in order to connect objects or parts,

in order to expand tubes,

in order to alter the diameter of tube ends,

in the manufacture of finished or semi-finished articles, comprising rigid structural elements or units, hollow objects and other particular articles,

for sheathing or stiffening objects.

Relationships with other classification places

Input products

[B21B](#) covers rolling of metal. [B21C](#) covers the manufacture of metal sheets, rods, tubes, profiles or like semi-manufactured products otherwise than by rolling. Operations of the kind involved in the manufacture of metal sheets or metal tubes, rods or profiles are therefore covered by subclasses [B21B](#) and [B21C](#). However, the semi-finished products manufactured by the operations of [B21B](#) (e.g. sheet metal coils, tubes, profiles) or [B21C](#) (e.g. tubes, concrete rods, profiles) may be input products for the metal-working and processing covered by [B21D](#) as for example straightening, bending, corrugating, forming single grooves, flanging or edge treatment, shaping by stamping, spinning or deep-drawing, stretching, press-cutting or perforating.

The mechanical working of wire, which is a further semi-finished product manufactured by the operations of [B21C](#), is covered by the specific subclass [B21F](#).

The mechanical working of metal foils in a manner analogous to the working of paper is covered by [B31F](#), except for the perforating, cutting, or otherwise severing, of metal foils, or thin metal sheets, which is covered by [B26D](#) and [B26F](#). Other special measures in connection with working metal foils, e.g. for adapting apparatus of [B21D](#) therefore, are covered by main group [B21D 33/00](#).

Presses

Presses in general, e.g. characterised by their pressing member or the drive there for, and details thereof, or accessories there for (e.g. the construction of the frame or control arrangements) are covered by [B30B](#). The special adaptation of presses for the purposes of stamping, deep-drawing or punching sheet metal or metal tubes, rods or profiles is covered by [B21D](#), especially by main group [B21D 24/00](#) for special deep-drawing arrangements in, or in connection with, presses.

References

Limiting references

This place does not cover:

Working or processing of wire, e.g. for making wire fabrics	B21F
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Making nails, pins or the like by cutting from strips or sheet material	B21G 3/26
Making chains or chain parts	B21L

Informative references

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

Rolling of metal in general	B21B
Manufacture of metal sheets, rods, tubes, profiles or like semi-manufactured products otherwise than by rolling; Auxiliary operations used in connection with metal-working operations without essentially removing material	B21C

Forging; Hammering; Pressing; Riveting	B21J
Making forged or pressed products	B21K
Working metal by removing material there from	B23B
Shearing or similar cutting of metal, e.g. tubes or profiles	B23D
Other working of metal; Combined Operations; Universal machine tools	B23P
Features of cutting or severing devices or machines in general	B26
Presses in general, e.g. safety devices there for	B30B
Safety devices in general	F16P

Glossary of terms

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

Profile	a load supporting metal bar with a particular cross section different from those of tubes or rods, e.g. an I-beam
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B21D 1/00

Straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom ([B21D 3/00](#) takes precedence); Stretching sheet metal combined with rolling (working sheet metal of limited length by stretching [B21D 25/00](#); by localised hammering [B21D 31/06](#))

Definition statement

This place covers:

All aspects related to straightening, restoring form or removing local distortions of sheet metal or specific articles made therefrom (e.g. straightening uncoiled bands or strips, removing bumps in sheet metal structures like cars, airplanes, etc ... , straightening structures, e.g. crashed vehicle bodies).

References

Limiting references

This place does not cover:

Working sheet metal of limited length by stretching	B21D 25/00
Working sheet metal of limited length by localised hammering	B21D 31/06
Flattening hollow objects for transport and reforming	B21D 51/14

Informative references

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

Servicing, repairing vehicles	B60S 5/00
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B21D 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 [E21B](#); {straightening rails or rail joints [E01B 31/08](#)})

Definition statement

This place covers:

All aspects related to straightening or restoring form of metal rods, metal tubes, metal profiles and specific articles made therefrom, whether or not in combination with sheet metal parts (e.g. crankshafts).

References

Limiting references

This place does not cover:

Straightening by twisting only	B21D 11/14
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Straightening rails or rail joints	E01B 31/08
Straightening of well casings in situ	E21B

Informative references

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

Repairing methods or devices of turbine blades	F01D 5/005
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B21D 5/00

Bending sheet metal along straight lines, e.g. to form simple curves ([B21D 11/06](#) - [B21D 11/18](#) take precedence; corrugating sheet metal [B21D 13/00](#); as edge treatment [B21D 19/00](#))

Definition statement

This place covers:

Methods and devices for bending sheet metal along straight lines

References

Limiting references

This place does not cover:

Corrugating sheet metal	B21D 13/00
Bending sheet metal as edge treatment	B21D 19/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Manufacture of tubes or metal hoses by bending sheet metal	B21C 37/06
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Informative references

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

Bending of plastics	B29C 53/00
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B21D 7/00

Bending rods, profiles, or tubes ([B21D 11/02](#) - [B21D 11/18](#) take precedence; using mandrels or the like [B21D 9/00](#))

Definition statement

This place covers:

Methods and devices for bending metal rods, profile or tubes

References**Limiting references**

This place does not cover:

Bending tubes using mandrels or the like	B21D 9/00
Corrugating tubes by bending	B21D 15/00
Bending tubes or profiles as edge treatment	B21D 19/00

Informative references

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

Working and processing of wire	B21F
Bending of plastics	B29C 53/00

B21D 9/00

Bending tubes using mandrels or the like ([B21D 11/02](#) - [B21D 11/18](#) take precedence)

Definition statement

This place covers:

Methods and devices for bending tubes using mandrels or the like.

The group also covers the bending mandrels as such.

Mandrels are used to keep the cross sectional shape of the tube in the bending area (i.e. to avoid unwanted deformations).

References

Limiting references

This place does not cover:

Corrugating tubes by bending	B21D 15/00
Bending tubes as edge treatment	B21D 19/00

B21D 11/00

Bending not restricted to forms of material mentioned in only one of groups [B21D 5/00](#), [B21D 7/00](#), [B21D 9/00](#); Bending not provided for in groups [B21D 5/00](#) - [B21D 9/00](#) (corrugating or bending into wave form [B21D 13/00](#), [B21D 15/00](#); flanging [B21D 19/00](#)); Twisting

Definition statement

This place covers:

Methods and devices for bending not restricted to either sheet metal, tubes, rods or profiles. This covers:

Bending by stretching or pulling over a die

Bending into special geometrical forms, e.g: helical, spiral, serpentine

Bending by altering the thickness of part of the cross-section of the work

Bending specially adapted to produce specific articles, e.g. leaf springs, reinforcements for concrete

Twisting

Joggling

Special bending methods and devices not covered by other subgroups in [B21D](#)

Auxiliary bending equipment, e.g. positioning devices, heating devices

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Making leaf springs by bending	B21D 53/886
Processes for producing ornamental structures by bending	B44C 3/087

References out of a residual place

Examples of places in relation to which this place is residual:

Bending sheet metal along straight lines	B21D 5/00
Bending rods, profiles, or tubes	B21D 7/00
Bending tubes using mandrels or the like	B21D 9/00
Corrugating or bending into wave form	B21D 13/00 , B21D 15/00
Flanging	B21D 19/00

Working sheet metal of limited length by stretching	B21D 25/00
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B21D 13/00

Corrugating sheet metal, rods or profiles; Bending sheet metal, rods or profiles into wave form (tubes [B21D 15/00](#))

Definition statement

This place covers:

Methods and devices for corrugating or bending into wave form of sheet metal, rods or profiles.
Corrugating here also means forming embossments/dimples all over the surface of a metal sheet.

References

Limiting references

This place does not cover:

Corrugating tubes by bending	B21D 15/00
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Machines or apparatus for embossing decorations or marks in sheet metal	B44B 5/00
Pressing or stamping ornamental designs on surfaces of sheet metal	B44C 1/24

B21D 15/00

Corrugating tubes (wrinkle-bending using mandrels or the like [B21D 9/14](#))

Definition statement

This place covers:

Methods and devices for corrugating or bending into wave form of tubes.

References

Limiting references

This place does not cover:

Wrinkle-bending using mandrels or the like	B21D 9/14
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Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Corrugating tubes annularly with thinning	B21C 37/205
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B21D 17/00**Forming single grooves in sheet metal or tubular or hollow articles****Definition statement**

This place covers:

Forming grooves by deformation of the sheet only, without variation of the thickness (i.e. the grooves are not obtained by crushing the metal).

References**Informative references**

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

Grooving or notching of bolts, studs or the like	B21K 1/54
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B21D 19/00**Flanging or other edge treatment, e.g. of tubes (connecting by making use of folds [B21D 39/00](#); flaring-out tube ends [B21D 41/02](#))****Definition statement**

This place covers:

Methods and devices for applying flanges on edges or holes of metal sheets or tubes.

Edge treatments like edge deburring or smoothing by sheet metal working techniques without removing material

References**Limiting references**

This place does not cover:

Connecting by making use of folds	B21D 39/00
Flaring-out tube ends	B21D 41/02

Informative references

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

Chamfering or deburring the ends of tubes	B23B 5/16
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B21D 21/00**Combined processes according to methods covered by groups [B21D 1/00](#) - [B21D 19/00](#)****Definition statement**

This place covers:

Processes combining two or more metal working methods from the following list:

Strai ghtening,

Definition statement

bending,

corrugating,

forming single grooves,

flanging or other edge treatment.

B21D 22/00

Shaping without cutting, by stamping, spinning, or deep-drawing (otherwise than using rigid devices or tools or yieldable or resilient pads [B21D 26/00](#))

Definition statement

This place covers:

All kinds of methods and devices for shaping sheet metal or tubes by

Stamping using rigid devices or tools: the sheet stock is shaped between a punch and a die.

Stamping using yieldable or resilient pads: the shaping member is yieldable or resilient and is forced against the sheet stock; there may be a die against which the sheet stock is pressed, but not necessarily.

Spinning: spinning is used to make axis-symmetric parts by relative rotation of a piece of sheet stock and rollers or rigid tools. The rollers or rigid tools are pressed against the stock, stretching it, until the stock takes the required shape. The stock may be pressed against a mandrel but not necessarily.

Deep drawing: deep drawing is, as for stamping, a process of forming sheet metal through a forming die with a punch. In deep-drawing, the material undergoes high plastic deformations: deep drawing is often used to produce metal objects that are more than half their diameters in height; if the height is less than half their diameter we talk about drawing (which is also covered by this subclass). Often but not always, the blank is held by a blank-holder to control the flow of material and to prevent the formation of wrinkles.

References**Limiting references**

This place does not cover:

Special deep-drawing arrangements in, or in connection with, presses	B21D 24/00
Marking devices by stamping	B21C 51/005

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Pressing or stamping ornamental designs on surfaces of sheet metal	B44C 1/24
Processes for producing ornamental structures by stamping sheet metal	B44C 3/085

Informative references

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

Bending by stretching or pulling over a die	B21D 11/02
Shaping sheet metal over a die without external former	B21D 25/02

Shaping without cutting otherwise than using rigid devices or tools or yieldable or resilient pads	B21D 26/00
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B21D 24/00

Special deep-drawing arrangements in, or in connection with, presses

Definition statement

This place covers:

General aspects of the deep-drawing apparatus as such.

Special deep-drawing arrangements in presses as for example feeding, centering of the blanks, guiding the tools.

Multi-stage deep-drawing presses.

The special devices for holding the metal sheet during deep-drawing (blank-holders and die cushions) as well as the devices for controlling or operating them during deep-drawing.

Blank holders: mechanisms which hold the borders of the blanks in order to control the flow of material during the drawing operation and to prevent wrinkles.

Cushioning arrangements: they are utilized for absorbing the force from the upper die so that the blank holder is moved downwardly, together with the punch, in a controlled manner.

Additional equipment in association with the deep-drawing tools e.g. for shearing, for trimming.

References

Informative references

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

Trimming deep-drawn products	B23D 31/001
Presses, drive of the presses in general, details of the presses (frame, table, ...)	B30B
Gas springs in general	F16F 9/00
Numerical control of the blank holders	G05B 19/00

B21D 25/00

Working sheet metal of limited length by stretching, e.g. for straightening

Definition statement

This place covers:

Methods and devices for working sheet metal of limited length by stretching, e.g. for straightening, by pulling over a die. It also covers the clamping arrangements needed to apply the stretching force to the sheet metal.

B21D 26/00

Shaping without cutting otherwise than using rigid devices or tools or yieldable or resilient pads, i.e. applying fluid pressure or magnetic forces (stamping using resilient pads [B21D 22/10](#))

Definition statement

This place covers:

Methods and devices for shaping sheet metal by the effect of non rigid means which are fluids or

magnetic forces including shaping by a kinetic energy of a fluid or field and explosive shaping

References

Limiting references

This place does not cover:

Stamping using yieldable or resilient pads	B21D 22/10
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B21D 26/02

by applying fluid pressure

Definition statement

This place covers:

Devices and methods for deforming sheet metal blanks in the form of sheets or thin plates, of tubes with or without bottom, or of profiles, by applying fluid pressure.

References

Informative references

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

Making other parts for vehicles, e.g. cowlings, mudguards	B21D 53/88
Treating or finishing surfaces by applying fluid pressure (Autofrettage)	B23P 9/00
Modifying the physical properties of iron or steel by deformation	C21D 7/00
Modifying the physical properties of ferrous metals or ferrous alloys by deformation combined with, or followed by heat treatment	C21D 8/00

Glossary of terms

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

Fluid	Comprises gas, liquids, fluent particulate materials (e.g. sand) and materials which easily show plastic flow (e.g. soft metals such as lead)
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B21D 26/021**Deforming sheet bodies****Definition statement**

This place covers:

Devices and methods for deforming sheet metal in the form of flat sheets or thin plates, whether layered or not, by applying fluid pressure.

Special rules of classification

When the invention is characterised by the shape of the bodies to be deformed in combination with a particular material feature of the bodies to be deformed, the invention shall also be classified in [B21D 26/053](#) and subgroups thereof.

B21D 26/023**including an additional treatment performed by fluid pressure, e.g. perforating****Definition statement**

This place covers:

Devices and methods for deforming sheet bodies by fluid pressure and performing a piercing, perforating, caulking, marking or other additional treatment by applying fluid pressure to the bodies being deformed.

References**Informative references**

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

Shaping by press-cutting	B21D 28/00
Perforating by punching	B21D 28/24
Stabbing or piercing	B21D 31/02
Combined processes according to methods covered by groups B21D 1/00 - B21D 31/00	B21D 35/00
Application of shaping procedures without cutting in order to connect objects or parts, e.g. coating with sheet metal otherwise than plating	B21D 39/00
Press-fitting, force-fitting, or shrinking in general	B21J 11/00
Uniting components by forging or pressing to form integral members	B21K 25/00

B21D 26/025**Means for controlling the clamping or opening of the moulds****Definition statement**

This place covers:

Control means characterised by the control of clamping the mould and opening the mould, e.g. control of the pressure to be applied on the moulds when clamping or opening moulds.

B21D 26/027**Means for controlling fluid parameters, e.g. pressure or temperature****Definition statement***This place covers:*

Control means for controlling supply pressure, temperature or other variables of the fluid at the time of supply. Means for merely controlling pumps are not included.

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

Pumps or control of pumps per se	F04B
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B21D 26/029**Closing or sealing means****Definition statement***This place covers:*

Means and details that are relevant for the sealed or airtight closing of the mould.

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

Sealings	F16J 15/00
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B21D 26/031**Mould construction ([B21D 26/025](#) - [B21D 26/029](#) take precedence)****Definition statement***This place covers:*

Constructional features or details of the mould, e.g. a mould of which some portion is movable, which are not covered by other subgroups of [B21D 26/021](#).

References**Limiting references***This place does not cover:*

Means for controlling the clamping or opening of the moulds	B21D 26/025
Means for controlling fluid parameters, e.g. pressure or temperature	B21D 26/027
Closing or sealing means	B21D 26/029

B21D 26/033**Deforming tubular bodies (corrugating tubes by applying fluid pressure
[B21D 15/03](#), [B21D 15/10](#))****Definition statement***This place covers:*

Devices and methods for deforming sheet metal in the form of metal tubes, e.g. cylinders, with or without bottom, by applying fluid pressure.

References**Limiting references***This place does not cover:*

Corrugating tubes by applying fluid pressure	B21D 15/03 , B21D 15/10
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Informative references*Attention is drawn to the following places, which may be of interest for search:*

Tube expanders	B21D 39/08
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Special rules of classification

When the invention is characterised by the shape of the bodies to be deformed in combination with a particular material feature of the bodies to be deformed, the invention shall also be additionally classified in [B21D 26/053](#) and subgroups thereof.

B21D 26/035**including an additional treatment performed by fluid pressure, e.g. perforating****Definition statement***This place covers:*

Devices and methods for deforming tubular bodies by fluid pressure and performing a piercing, perforating, caulking, marking or other additional treatment by applying fluid pressure on the bodies being deformed.

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

Shaping by press-cutting	B21D 28/00
Perforating by punching	B21D 28/24
Stabbing or piercing	B21D 31/02
Combined processes according to methods covered by groups B21D 1/00 - B21D 31/00	B21D 35/00
Application of shaping procedures without cutting in order to connect objects or parts, e.g. coating with sheet metal otherwise than plating	B21D 39/00
Press-fitting, force-fitting, or shrinking in general	B21J 11/00

Uniting components by forging or pressing to form integral members	B21K 25/00
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B21D 26/037

Forming branched tubes

Definition statement

This place covers:

Devices and methods for deforming metal tubular bodies by applying fluid pressure specially adapted to obtain branched tubes

References

Informative references

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

Making branched tube fittings, e.g. T-pieces for connecting pipes	B21C 37/29
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B21D 26/039

Means for controlling the clamping or opening of the moulds

Definition statement

This place covers:

Control means characterised by the control of clamping the mould and opening the mould, e.g. control of the pressure to be applied on the moulds when clamping or opening moulds.

B21D 26/041

Means for controlling fluid parameters, e.g. pressure or temperature

References

Informative references

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

Pumps or control of pumps per se	F04B
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Special rules of classification

Control means for controlling supply pressure, temperature or other variables of the fluid at the time of supply. Means for merely controlling pumps are not included.

B21D 26/043

Means for controlling the axial pusher

Definition statement

This place covers:

Control means characterised by the control of the axial movement (speed, timing, steps) of, the counter-pressure applied to, or other variables of the axial pusher during the deformation process.

B21D 26/045**Closing or sealing means****Definition statement**

This place covers:

Details of the sealed or airtight closing of the mould.

References**Informative references**

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

Sealings	F16J 15/00
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B21D 26/047**Mould construction ([B21D 26/037](#) - [B21D 26/045](#) take precedence)****Definition statement**

This place covers:

Constructional features or details of the mould, e.g. a mould of which some portion is movable, which are not covered by other subgroups of [B21D 26/033](#).

References**Limiting references**

This place does not cover:

Forming branched tubes	B21D 26/037
Means for controlling the clamping or opening of the moulds	B21D 26/039
Means for controlling fluid parameters, e.g. pressure or temperature	B21D 26/041
Means for controlling the axial pusher	B21D 26/043
Closing or sealing means of the mould	B21D 26/045

B21D 26/049**Deforming bodies having a closed end****Definition statement**

This place covers:

Devices and methods for deforming metal tubular bodies having a bottom, i.e. a closed end, by applying fluid pressure.

Special rules of classification

When an invention is characterised by the shape of the bodies to be deformed in combination with a particular material feature of the bodies to be deformed, the invention shall additionally be classified in [B21D 26/053](#) and subgroups thereof.

B21D 26/051**Deforming double-walled bodies****Definition statement**

This place covers:

Devices and methods for deforming metal double-walled tubular bodies by applying fluid pressure.

Special rules of classification

When an invention is characterised by the shape of the bodies to be deformed in combination with a particular material feature of the bodies to be deformed, the invention shall be classified in [B21D 26/053](#) and subgroups thereof.

B21D 26/053**characterised by the material of the blanks****Definition statement**

This place covers:

Devices and methods for deforming metal bodies by applying fluid pressure which are characterised by the material, composition or constituents of the bodies to be deformed.

Special rules of classification

When an invention is characterised by the adaptation to deforming metal bodies with a particular material feature in combination with the shape of the bodies to be deformed, the invention shall also be classified in [B21D 26/021](#) or [B21D 26/033](#) and their subgroups.

B21D 26/055**Blanks having super-plastic properties****Definition statement**

This place covers:

Devices and methods adapted for deforming metal bodies comprising a material having super-plastic properties, e.g. a super-plastic alloy, by applying fluid pressure.

B21D 26/057**Tailored blanks****Definition statement**

This place covers:

Devices and methods adapted for deforming metal bodies preassembled from different pieces, e.g. pieces of different materials or pieces of different thickness, by applying fluid pressure.

B21D 26/059**Layered blanks****Definition statement**

This place covers:

Devices and methods adapted for deforming layered blanks by applying fluid pressure.

References**Informative references**

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

Layered products essentially comprising metal	B32B 15/00
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Glossary of terms

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

Layered blank	Blank consisting of several layers of material comprising at least one metal layer, e.g. a blank from a sheet metal coated with resins or a laminate of sheet metals with different degrees of hardness.
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B21D 28/00**Shaping by press-cutting; Perforating****Definition statement**

This place covers:

Methods and devices for shaping sheet metal by press-cutting comprising:

Specific aspects of the drive of press-cutting tools.

Explosive cutting and perforating.

Centering the work, positioning the tools.

Making more than one part out of the same blank or strip.

Incompletely punching in such a manner that the parts are still coherent with the work.

Punching using rotatable carriers (e.g., turret punch presses).

Blanking dies.

Shoulder or burr prevention, which particularly covers fine-blanking.

Yieldable punching pads.

Applications of drive in order to reduce noise and/or wear.

Notching the peripheries or circular blanks.

Methods and devices for perforating, i.e. punching holes in metal profiles, sheets or flat parts, tubes or hollow bodies, annular parts, other articles of special shape (means that the shape is so that cam systems are necessary to access the perforating location).

Specific aspects of the drive of perforating tools and explosive perforating.

Perforating tools and die holders.

References

Limiting references

This place does not cover:

Ejecting or stripping-off devices arranged in punching machines or tools	B21D 45/00
Cutting nails or pins from strips or sheet material	B21G 3/26
Shearing or nibbling metal sheets, tubes or profiles	B23D
Cutting non-metallic sheet material and metal foil in general	B26D

Special rules of classification

When no shape is given to an article (simply separating two articles) it is considered to belong to shearing ([B23D](#)).

B21D 31/00

Other methods for working sheet metal, metal tubes, metal profiles (deforming one surface of tubes helically by rolling [B21H 3/00](#); upsetting [B21J 5/08](#); working metal by removing material therefrom [B23](#); embossing [B44B](#))

Definition statement

This place covers:

Methods and devices other than straightening, bending, corrugating, stamping, spinning, deep-drawing, stretching, punching.

For example:

shaping with a tool pressed against a sheet stock and without die or counter tool (e.g.: single point forming);

stabbing or piercing with the thrust of a pointed tool, e.g. for making sieves;

expanding after slitting for making expanded metal, gratings;

deforming by sequential impacts like hammering, beating.

References

Informative references

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

Expanding tube ends	B21D 41/02
Deforming one surface of tubes helically by rolling	B21H 3/00
Upsetting	B21J 5/08

B21D 33/00

Special measures in connection with working metal foils, e.g. gold foils (cutting or perforating of metal foil analogous to paper [B26](#))

Definition statement

This place covers:

Special measures to adapt sheet metal working apparatus according to subclass [B21D](#) for working metal foils, e.g. gold foils

References

Informative references

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

Manufacturing of metal foils from a thick stock	B21C
Perforating, cutting or severing of metal foils in a manner analogous to the working of paper	B26
Bending, corrugating, stamping metal foils in a manner analogous to the working of paper	B31

B21D 35/00

Combined processes according to {or processes combined with} methods covered by groups [B21D 1/00](#) - [B21D 31/00](#) ([B21D 21/00](#) takes precedence)

Definition statement

This place covers:

Processes combining two or more metal working methods covered by the above groups and listed below:

- straightening,
- bending,
- corrugating,
- forming single grooves,
- flanging or other edge treatment,
- stamping,
- spinning,
- deep-drawing,
- stretching,
- shaping by applying fluid pressure or by applying magnetic forces,
- punching blanks, perforating,
- other methods for working sheet metal (single point forming, stabbing or piercing, expanding, hammering,...),
- special measures in connection with working metal foils.

B21D 37/00

Tools as parts of machines covered by this subclass

Definition statement

This place covers:

Tools as parts of machines covered by this subclass (forms or constructions of tools uniquely adapted for particular operations in the relevant groups for the operations).

Selection of materials for the tools.

Die constructions enabling assembly of the die parts in different ways: the shape of the tool can be changed by moving or exchanging certain parts of the tool.

Movable or exchangeable mountings for tools: all systems to hold, clamp, lock the tools in their working place.

Dies with different parts for several steps in a process: e.g., progressive stamping dies, succession of tools for shaping in several steps, succession of a blanking station and drawing stations.

Dies sets: complementary dies which cooperate by the means of guiding means; the die sets are adapted to be mounted between the ram and the table/bolster of a press.

Pillar guides: details of guiding arrangements of die sets.

Particular arrangements for handling and holding in place complete dies in order to install them for example in a press.

Heating or cooling the tools.

Lubricating of the tools or tools including lubricating of the workpiece.

Making tools by operations not covered by a single other subclass, by using techniques of the present subclass: e.g. cutting tools obtained by bending a metal strip.

References

Informative references

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

Yieldable or resilient stamping tools	B21D 22/10
Lubricating or coating of blanks for deep-drawing	B21D 22/201
Additional equipment in association with the tools for deep-drawing	B21D 24/16
Mounting of simple tools like perforating punches	B21D 28/34
Coating metal sheets (with oil or others)	B05B
Mounting of dies, platens or press rams	B30B 15/026
Loading or unloading of dies	B30B 15/028
Guides for presses	B30B 15/041
Press plates with heating or cooling means	B30B 15/064
Heating or cooling presses and parts thereof	B30B 15/34
Lubricating in general	F16N

B21D 39/00

Application of procedures in order to connect objects or parts, e.g. coating with sheet metal otherwise than by plating ({joining mitred profiles [B21D 53/745](#); } riveting [B21J](#); uniting components by forging or pressing to form integral members [B21K 25/00](#); welding [B23K](#); press-fitting, force-fitting, or shrinking in general [B23P 11/00](#), [B21D 19/00](#); by adhesives [F16B 11/00](#) {; Connections as such [F16L](#), [F16B](#)}); Tube expanders

Definition statement

This place covers:

Methods and devices for connecting objects or parts by sheet metal deformation:

coating objects or parts with sheet metal,

connecting sheet metal with sheet metal,

connecting metal tubes with metal tubes (also tube-like fittings),

connecting tubes with rods,

connecting of tubes in openings,

as well as tube expanding devices as such.

References

Limiting references

This place does not cover:

Riveting	B21J
Uniting components by forging or pressing to form integral members	B21K 25/00
Welding	B23K
Force-fitting, or shrinking in general	B23P 11/00
Connecting by adhesives	F16B 11/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Joining mitred profiles	B21D 53/745
Connecting metal panels in roof working	E04D 15/04
Setting of casings, screens, liners in wells	E21B 43/10
Expanding tools specially adapted for wellbores	E21B 43/105
Crimping electrical connections	H01R 43/04

Informative references

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

Flanging	B21D 19/00
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Joining sub-units of motor vehicles or trailers	B62D 65/02
Connections as such in roof coverings obtained by forcing together the marginal portions of adjacent slabs or sheet	E04D 3/368
Connections as such in general (products)	F16L , F16B

B21D 41/00

Application of procedures in order to alter the diameter of tube ends
([B21D 39/00](#) takes precedence {; plastic tubes [B29C 57/08](#)})

Definition statement

This place covers:

Methods and devices for enlarging, reducing or closing tube ends.

B21D 43/00

Feeding, positioning or storing devices combined with, or arranged in, or specially adapted for use in connection with, apparatus for working or processing sheet metal, metal tubes or metal profiles; Associations therewith of cutting devices

Definition statement

This place covers:

Methods and devices for feeding, positioning or storing combined with, or arranged in, or specially adapted for use in connection with the apparatus for mechanical working of sheet metal or metal tubes, rods or profiles without essentially removing material or with the apparatus for press-cutting, sheet metal or other metal stock material. Associations of cutting devices with the above feeding, positioning or storing devices.

References

Informative references

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

Additional equipment in association with the tools for deep-drawing	B21D 24/16
Feeding wire or rods	B21F
Feeding, positioning in machine tools and in metal-working not otherwise provided for	B23Q
Manipulators	B25J
Transport or storage in general	B65G
Handling thin or filamentary material	B65H

B21D 45/00

Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass

Definition statement

This place covers:

Ejecting or stripping-off devices arranged in machines or tools dealt with in this subclass and corresponding methods.

Ejecting covers ejecting the worked part or the scrap out of the tool or transporting them out of the working device.

Stripping-off covers separating the workpiece from a perforating punch after punching or from a punching die after forming.

B21D 47/00

Making rigid structural elements or units, e.g. honeycomb structures

Definition statement

This place covers:

Processing sheet metal or metal tubes, or processing metal profiles according to any of groups [B21D 1/00](#)- [B21D 45/00](#), in the manufacture of finished or semi-finished articles for making statical constructions as for example honeycomb structures, beams or pillars.

B21D 49/00

Sheathing or stiffening objects (by winding wire or tape thereon [B65H 54/00](#), [B65H 81/00](#); specially adapted for manufacturing conductors or cables [H01B 13/26](#))

Definition statement

This place covers:

Processing sheet metal or metal tubes, or processing metal profiles according to any of groups [B21D 1/00](#)- [B21D 45/00](#) for sheathing or stiffening objects.

References**Informative references**

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

Sheathing or stiffening objects by winding wire or tape thereon	B65H 54/00 , B65H 81/00
Sheathing or stiffening objects specially adapted for manufacturing conductors or cables	H01B 13/26

B21D 51/00

Making hollow objects (from thick-walled or non uniform tubes [B21K 21/00](#))

Definition statement

This place covers:

Processing sheet metal or metal tubes, or processing metal profiles according to any of groups [B21D 1/00](#)- [B21D 45/00](#), in the manufacture of hollow objects, e.g. hollow objects not characterized by the particular use or hollow objects characterized by the particular use (e.g. vessels, high pressure containers, cans or tins, collapsible or like thin-walled tubes, inlet or outlet arrangements, can ends or closures there for, boxes, cigarette cases or the like, cartridge cases).

References

Limiting references

This place does not cover:

Re-forming tubes from doubled flat material	B21C 37/14
Making hollow objects from thick-walled or non-uniform tubes	B21K 21/00
Making closures, e.g. caps folded of thin metal foils in the way of making paper caps	B31D 5/00

Informative references

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

Making heat exchangers	B21D 53/02
Closing containers or receptacles after filling	B65B 7/00
Containers	B65D
Making closures in conjunction with applying same	B67B

B21D 53/00

Making other particular articles (making wire fabrics [B21F](#); making chains or chain parts [B21L](#))

Definition statement

This place covers:

Processing sheet metal or metal tubes, or processing metal profiles according to any of groups [B21D 1/00](#)- [B21D 45/00](#), for making other particular articles. The processes covered by this group are special processes for producing a specific article (e.g. heat exchangers, wheels, parts for vehicles, etc...). Processes in general are covered by the relevant group of this subclass.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Making chains or chain parts	B21L
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Informative references

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

Saw chains per se	B27B 33/14
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B21D 55/00

Safety devices protecting the machine or the operator, specially adapted for apparatus or machines dealt with in this subclass (for presses in general [B30B](#); safety devices in general [F16P](#))

Definition statement

This place covers:

Safety devices and methods for protecting the machine or the operator, specially adapted for apparatus or machines dealt with in this subclass. Noise reducing measures are also covered.

References**Informative references**

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

Safety devices for presses	B30B
Safety devices in general	F16P

Special rules of classification

Only safety devices for press-cutting tools for shaping or tools for perforating by punching are covered in this group and they may be hand held or ground supported.