

Sheet Metal Forming

Drawing and Spinning

Sheet Metalworking

- Sheet metalworking includes cutting and forming operations performed on relatively thin sheets of metal.
- Typical *sheet-metal* thicknesses are between *0.4 mm and 6mm* .
- When thickness *exceeds* about *6 mm*, the stock is usually referred to *as plate* rather than sheet.

Sheet Metalworking

- Sheet-metal processing is *usually* performed at room temperature (cold working) .
- Most sheet-metal operations are performed on machine tools called *presses*.
- The term *stamping press* is used to distinguish these presses from forging and extrusion presses.

Sheet Metalworking

- The tooling that performs sheet metalwork is called a ***punch-and-die***; the term stamping die is also used.
- The sheet-metal products are called ***stampings***.
- The three major categories of sheet-metal processes are
 - ***(1) drawing***
 - ***(2) bending, and***
 - ***(3) cutting,***

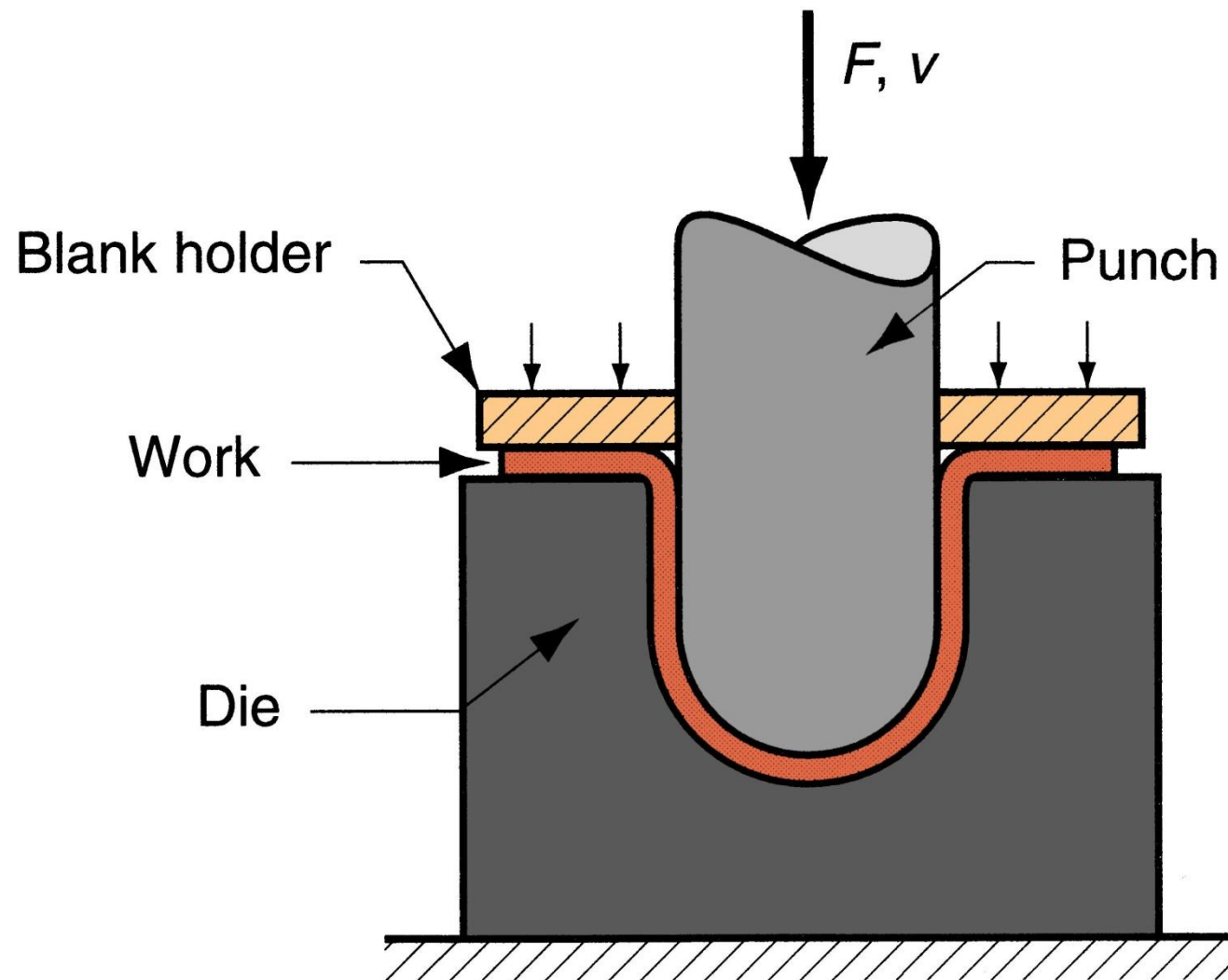
Sheet Metalworking

- *Bending and drawing* are used to form sheet-metal parts into their required shapes
- *Cutting* is used to separate large sheets into smaller pieces, to cut out part perimeters, and to make holes in parts.

Drawing



Drawing



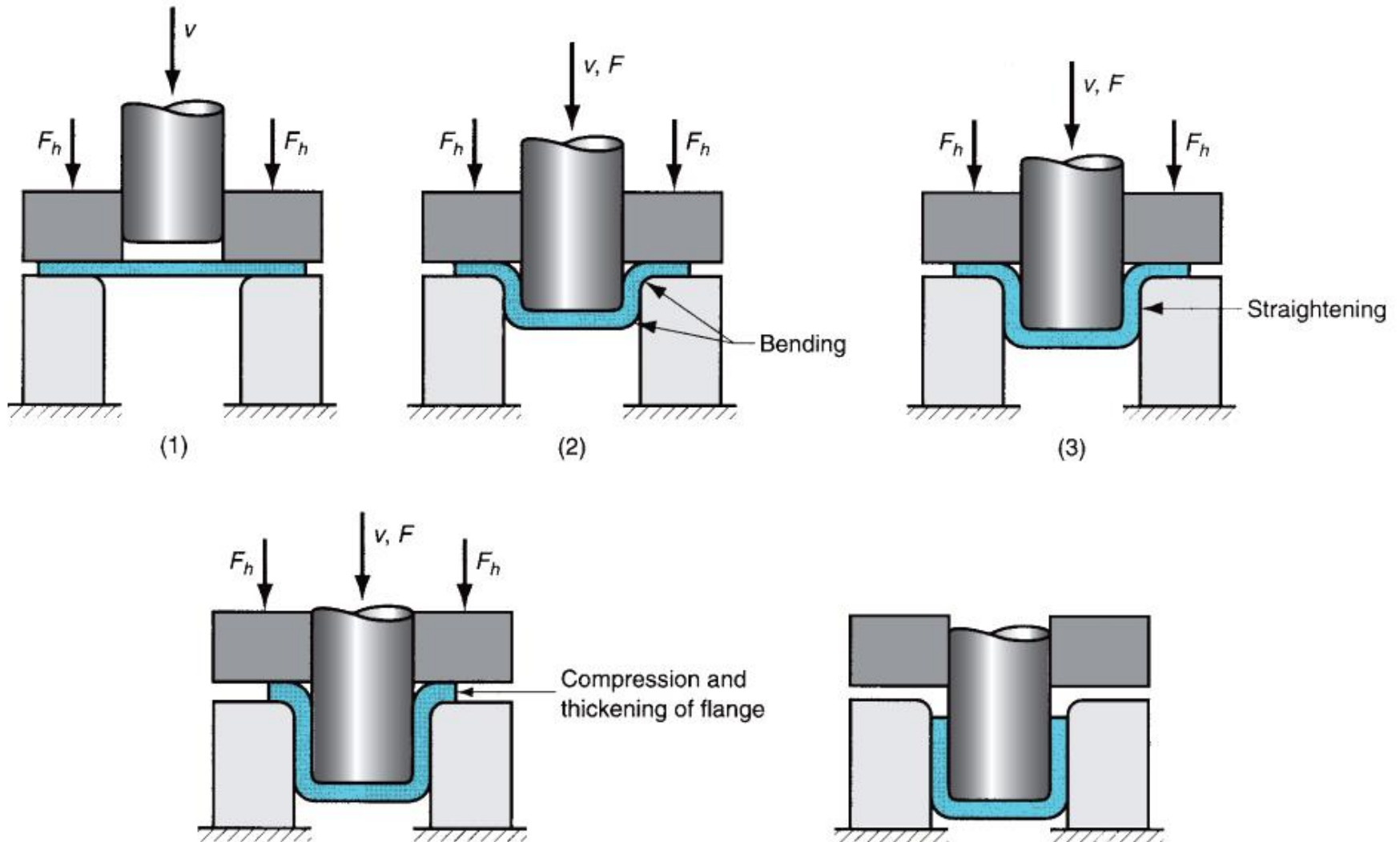
Drawing/ Deep Drawing

- Numerous parts made of sheet metal are cylindrical or box shaped, such as pots and pans, all types of containers for food and beverages , stainless-steel kitchen sinks and automotive fuel tanks.
- Such parts usually are made by a process in which a punch forces a flat sheet-metal blank into a die cavity.
- Process is generally called deep drawing.

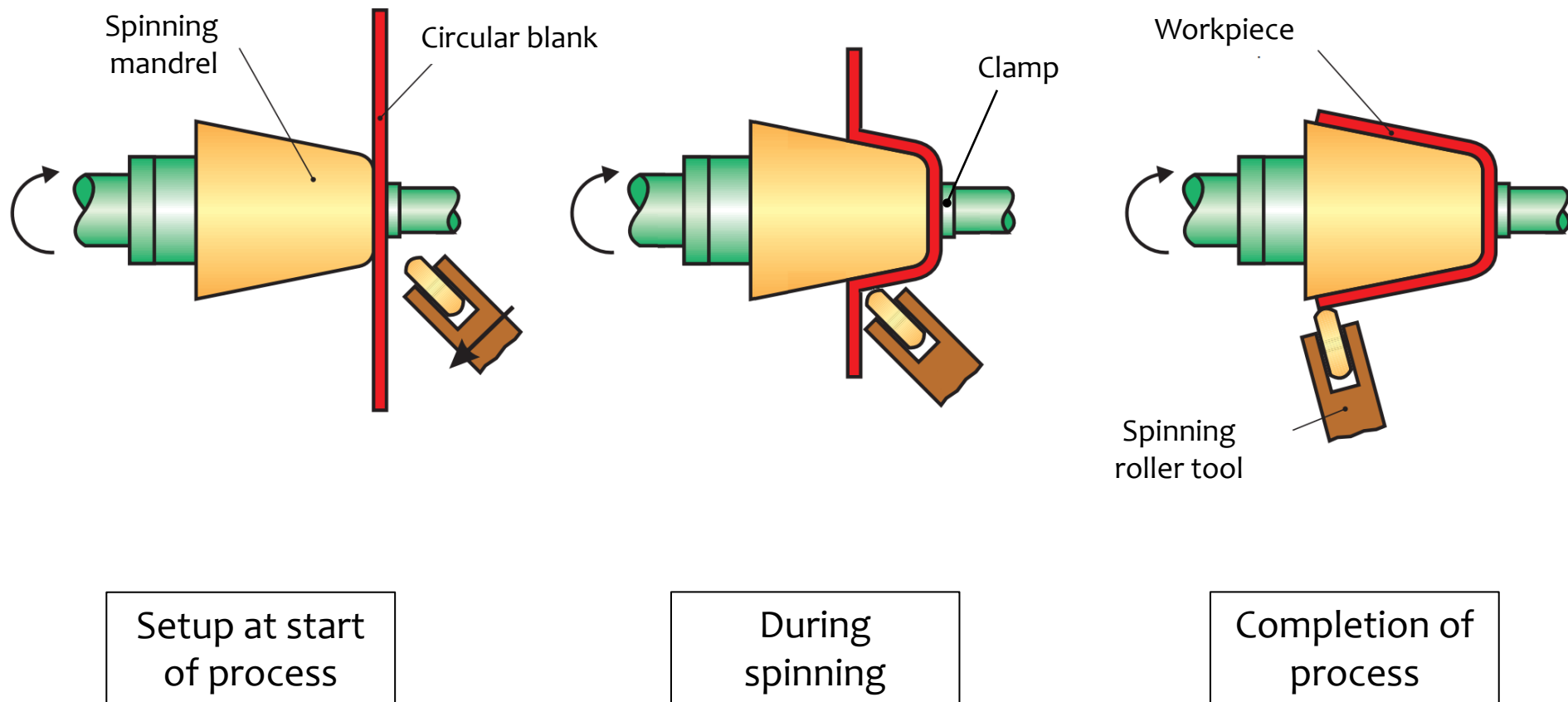
Stages :- Drawing

- Stages in deformation of the work in deep drawing:
 - (1) punch makes initial contact with work,
 - (2) bending,
 - (3) straightening,
 - (4) friction and compression, and
 - (5) final cup shape showing effects of thinning in the cup walls.

Stages :- Drawing



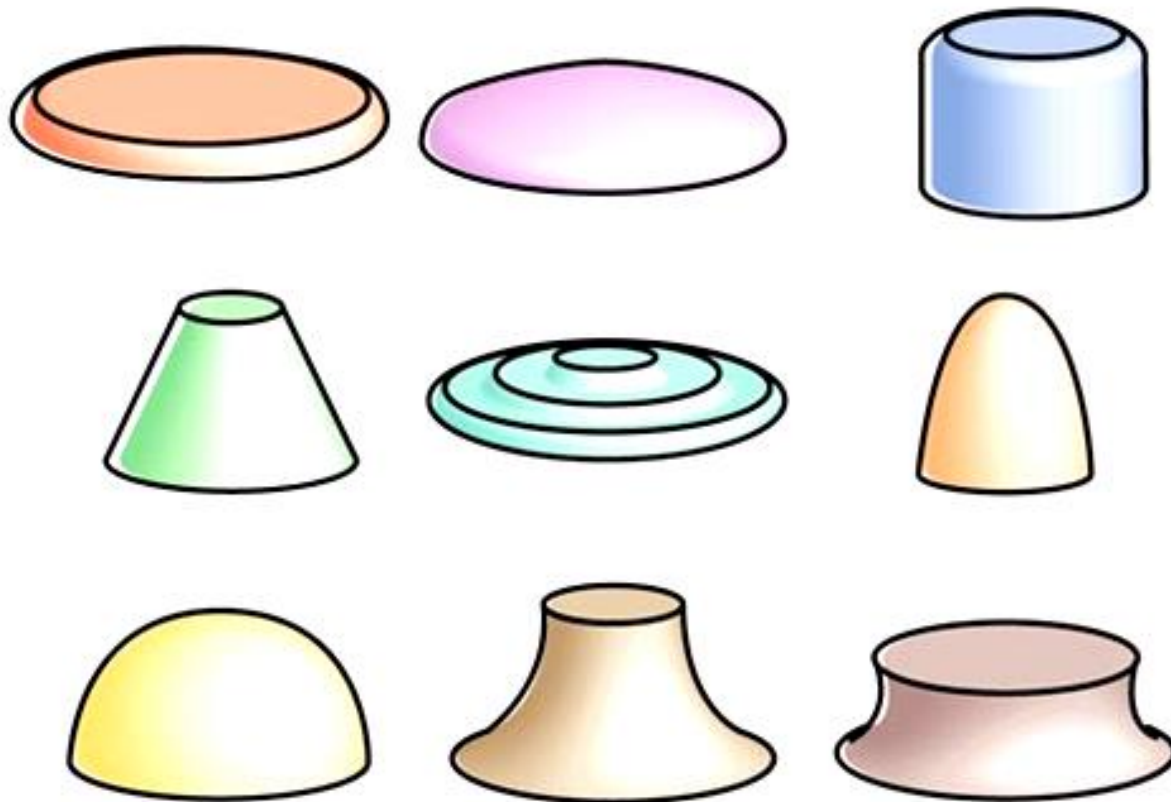
SPINNING



SPINNING

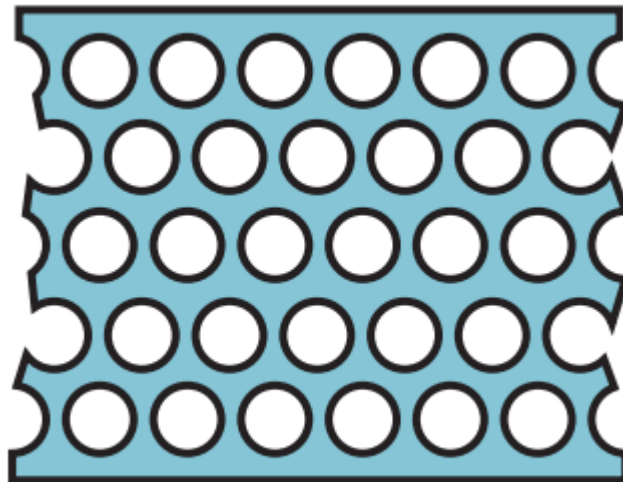
- Spinning is a metal-forming process in which an axially symmetric part is gradually shaped over a mandrel or form by means of a rounded tool or roller.
- The tool or roller applies a very localized pressure (almost a point contact) to deform the work by axial and radial motions over the surface of the part.
- Basic geometric shapes typically produced by spinning include cups, cones, hemispheres, and tubes.

SPINNING



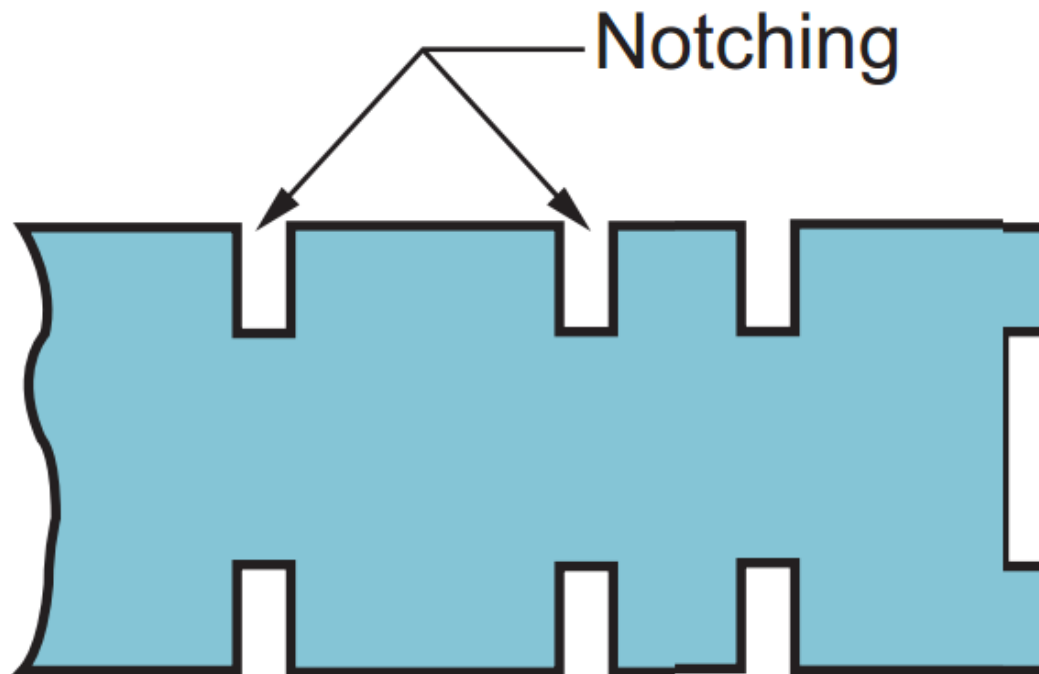
Perforating

- Perforating involves the simultaneous punching of a pattern of holes in sheet metal, as in Figure .
- The hole pattern is usually for decorative purposes, or to allow passage of light, gas, or fluid.



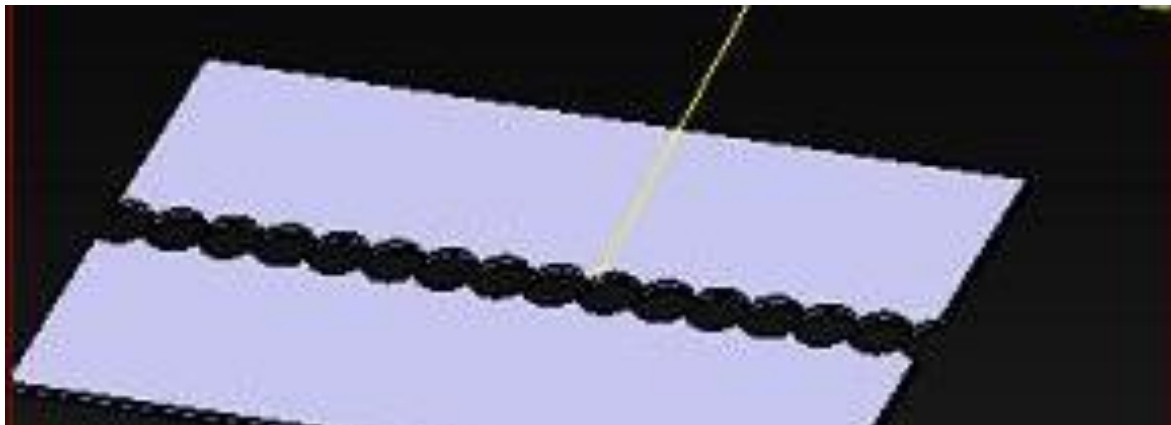
Notching

- Notching involves cutting out a portion of metal from the side of the sheet or strip.



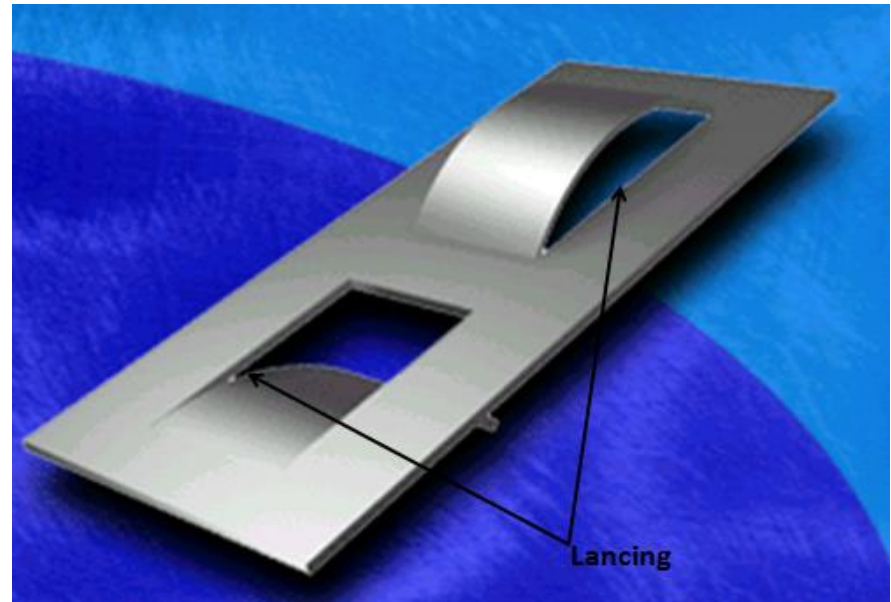
NIBBLING

- In nibbling , a contour is progressively cut by producing a series of overlapping slits or notches.
- A machine called a nibbler moves a small straight punch up and down rapidly into a die.
- A sheet is fed through the gap and many overlapping holes/slits/notches are made.



Lancing

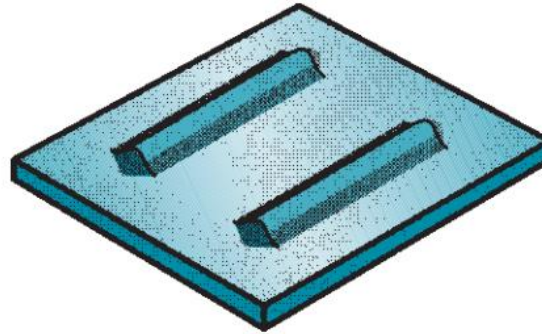
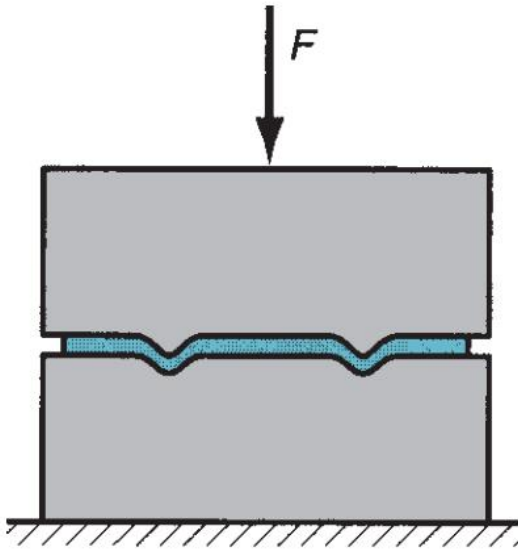
- Lancing involves cutting out a portion of metal from the side or in between the sheet or strip with one or multiple edges remaining attached to the parent strip.



Embossing

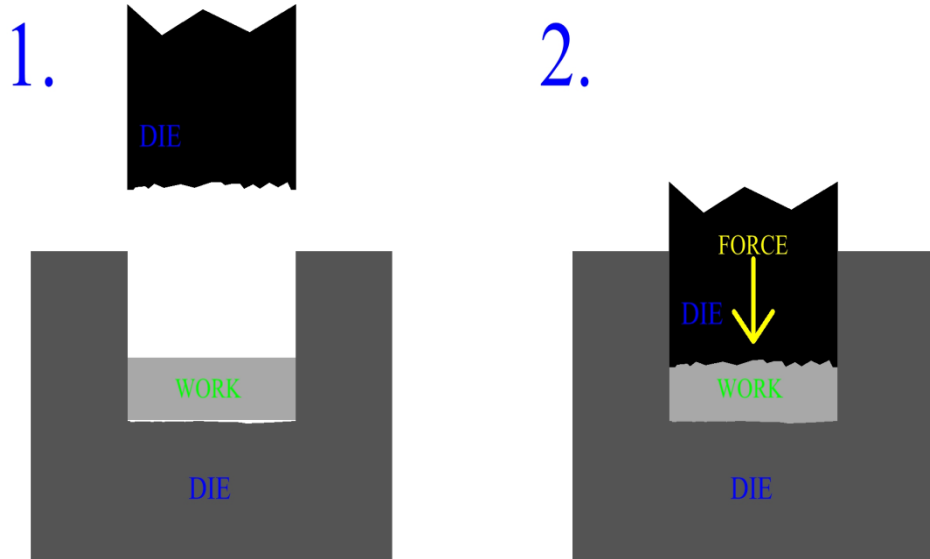
- Embossing is a forming operation used to create indentations in the sheet, such as raised (or indented) lettering or strengthening ribs, as depicted in Figure.
- Some stretching and thinning of the metal are involved.
- Embossing dies possess matching cavity contours, the punch containing the positive contour and the die containing the negative.

Embossing

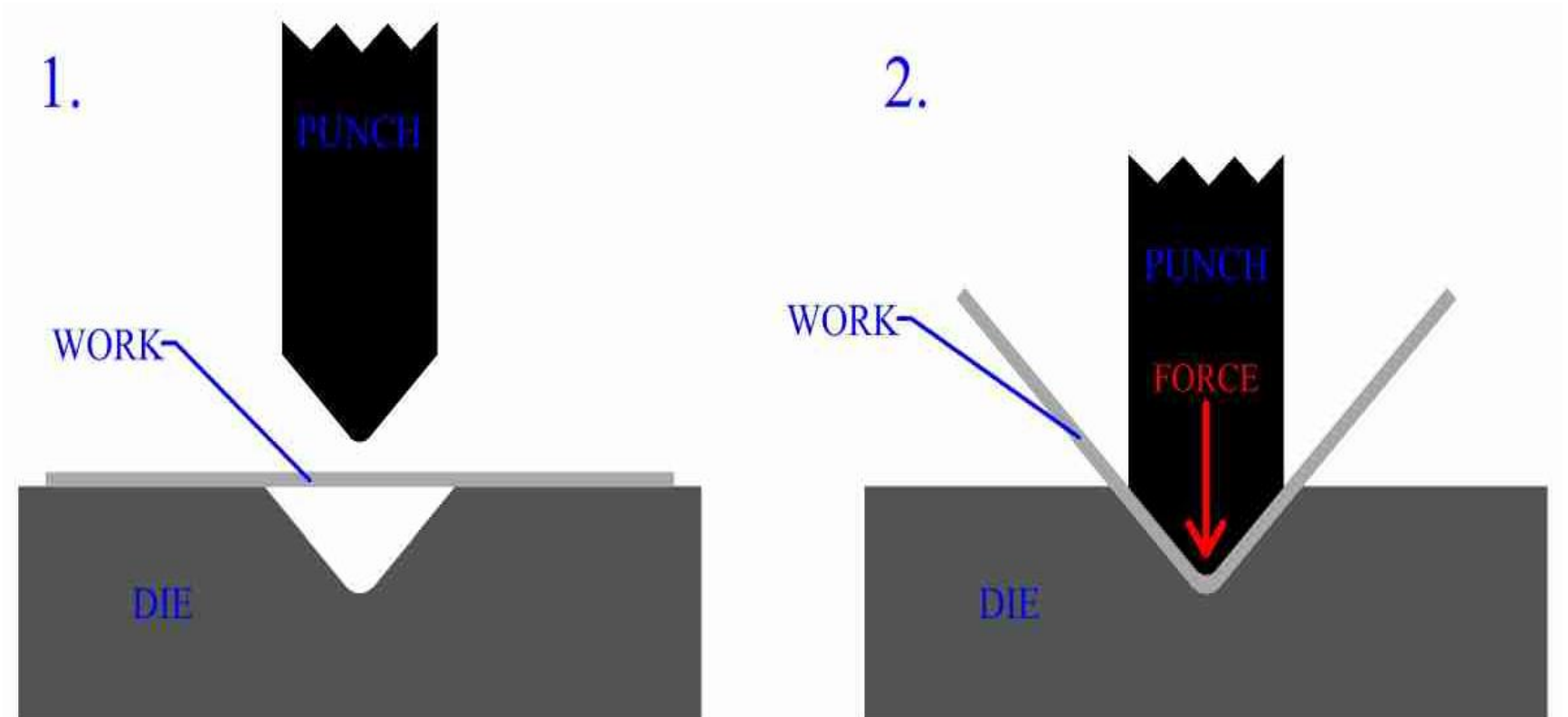


Coining

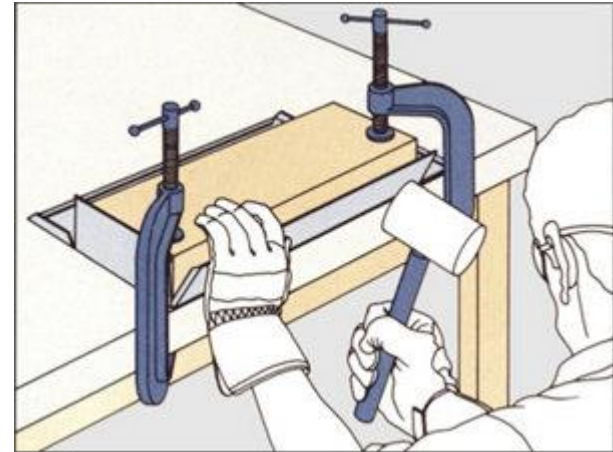
Coining is a forming operation in which metal flow occurs only at the outer layer of the sheet or strip, able to create different impressions on both sides.



Bending



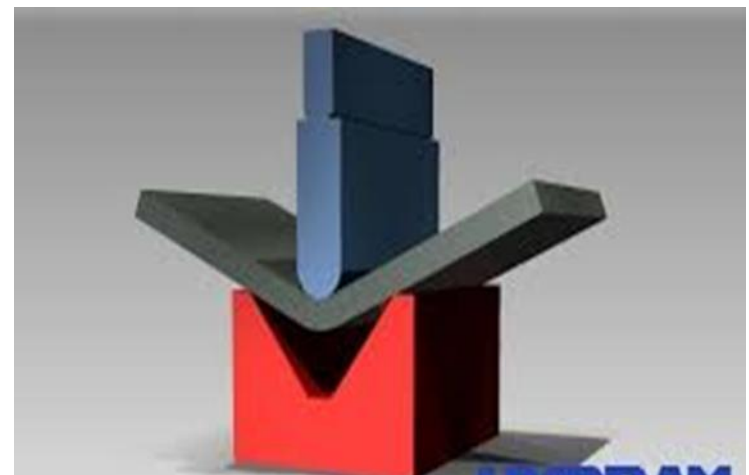
Bending



Manual bending through hammers



Bending machine



Bending through punch and dies