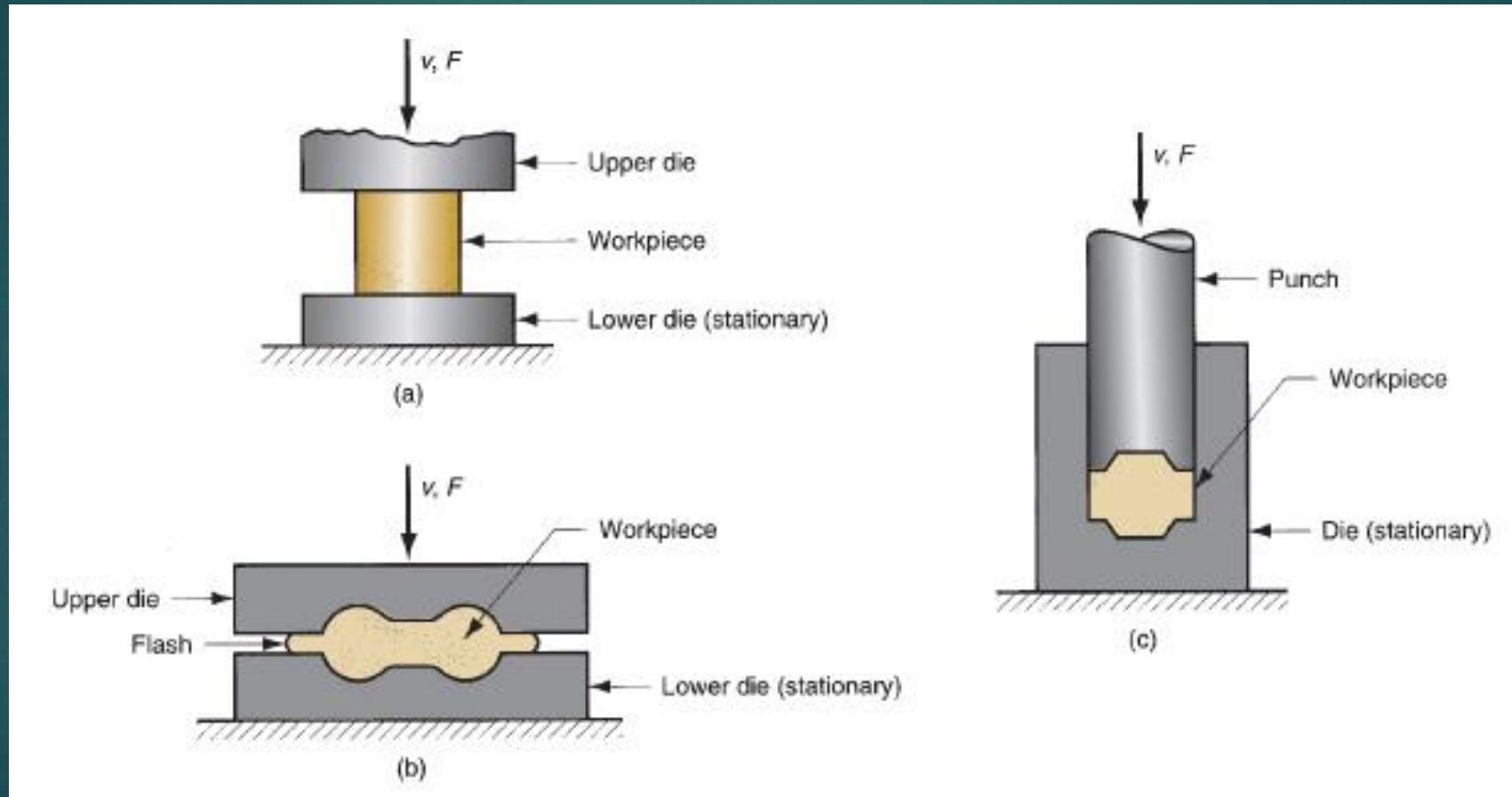


Forging Sheet Metal Working Principle and applications

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Forging & Sheet Metal Working - S.Chattopadhyaya



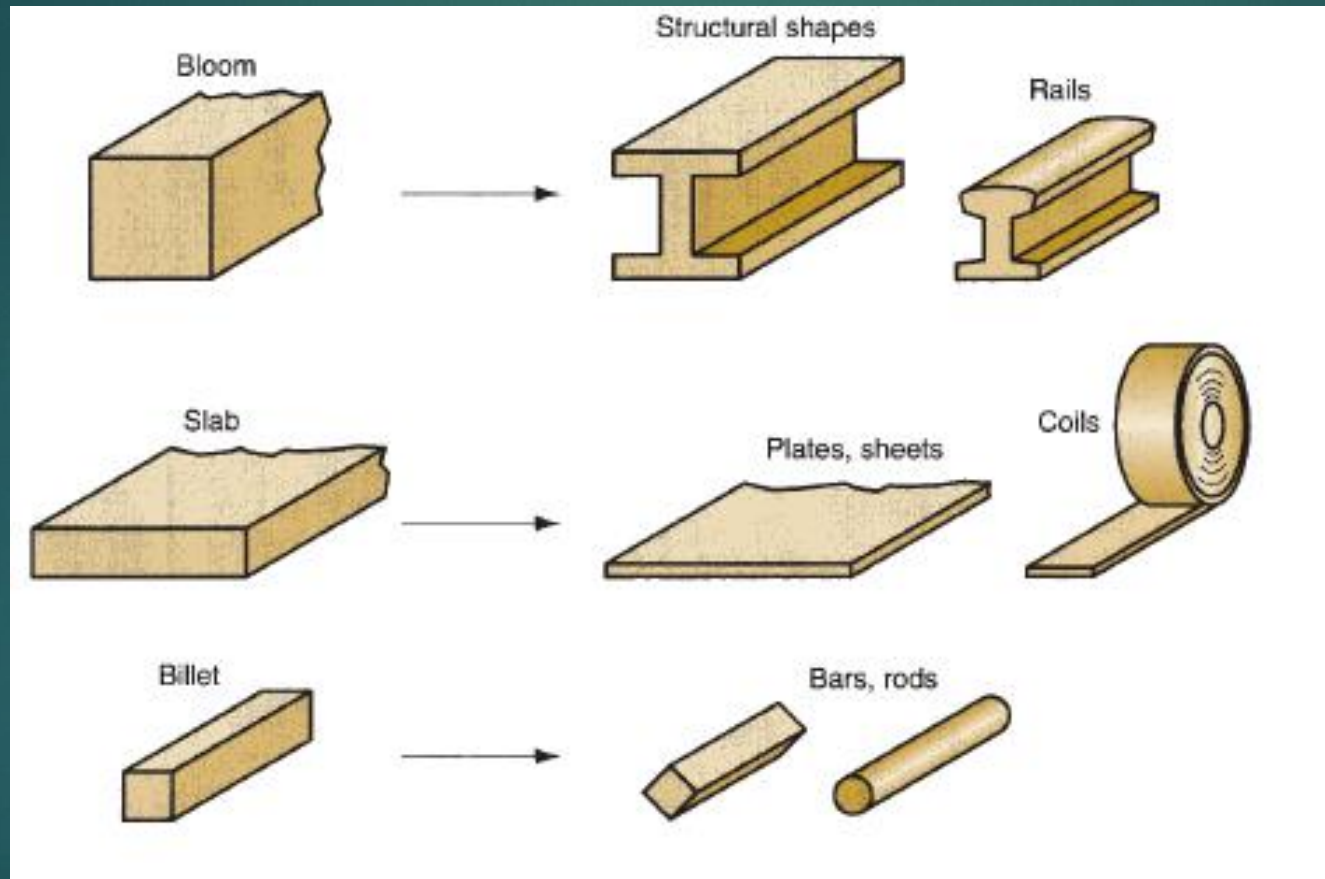
Learning Objective

► Introduction to Forging and Sheet metal Working



Hot Working

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Forging

- ▶ Forging is a deformation process in which the work is compressed between two dies, using either impact or gradual pressure to form the part. It is the oldest of the metal forming operations, dating back to perhaps 5000 B.C.E.
- ▶ Today, forging is an important industrial process used to make a variety of high-strength components for automotive, aerospace, and other applications.

Forging

- ▶ These components include engine crankshafts and connecting rods, gears, aircraft structural components, and jet engine turbine parts.
- ▶ In addition, steel and other basic metals industries use forging to establish the basic form of large components that are subsequently machined to final shape and dimensions.

Forging

- ▶ Forging is carried out in many different ways.
- ▶ One way to classify the operations is by working temperature. Most forging operations are performed hot or warm, owing to the significant deformation demanded by the process and the need to reduce strength and increase ductility of the work metal.
- ▶ However, cold forging is also very common for certain products. The advantage of cold forging is the increased strength that results from strain hardening of the component.
- ▶ Either impact or gradual pressure is used in forging

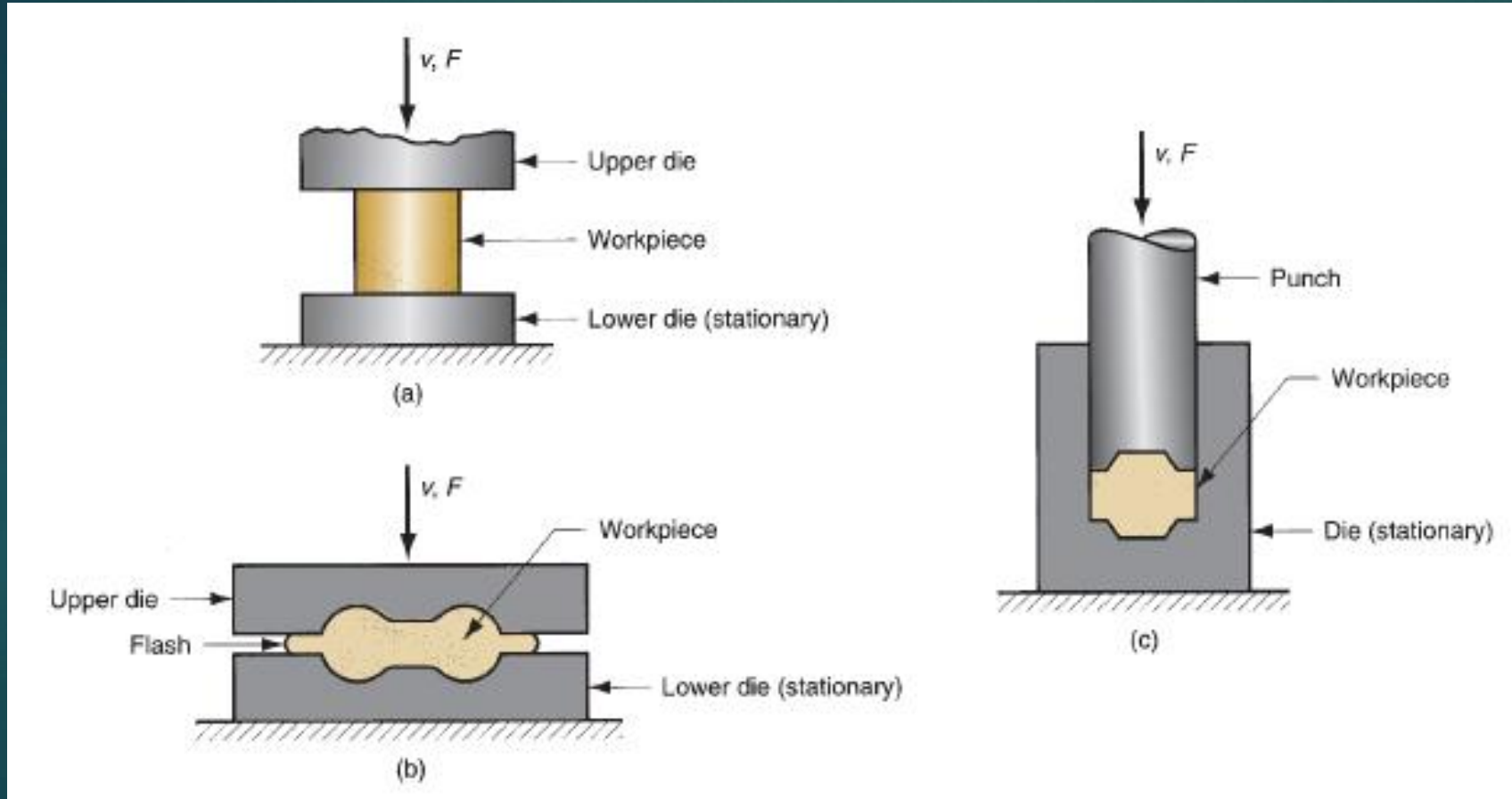
Forging

- ▶ The distinction derives more from the type of equipment used than differences in process technology.
- ▶ A forging machine that applies an impact load is called a *forging hammer*, while one that applies gradual pressure is called a *forging press*.
- ▶ Another difference among forging operations is the degree to which the flow of the work metal is constrained by the dies.

Forging

- ▶ By this classification, there are three types of forging operations,
- ▶ (a) open-die forging,
- ▶ (b) impressiondie forging,
- ▶ and (c) flashless forging.

Three types of Forging (a) open-die forging, (b) impression-die forging, and (c) flashless forging.



Open-die forging

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- ▶ In *open-die forging*, the work is compressed between two flat (or almost flat) dies, thus allowing the metal to flow without constraint in a lateral direction relative to the die surfaces.

Impression-die forging

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- ▶ In *impression-die forging*, the die surfaces contain a shape or impression that is imparted to the work during compression, thus constraining metal flow to a significant degree

Impression-die forging

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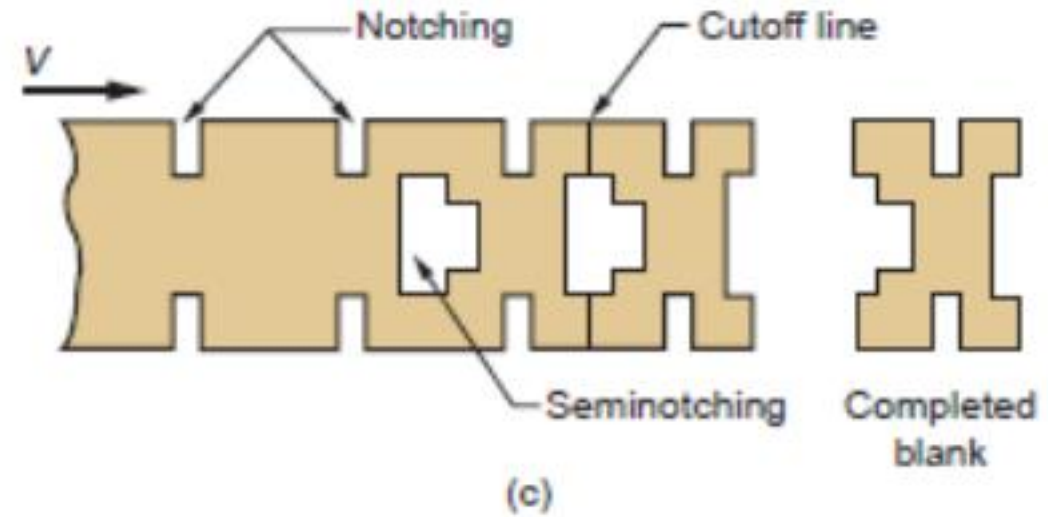
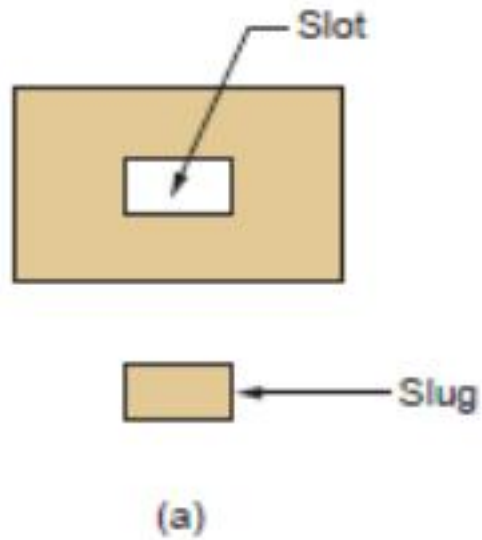
- ▶ In this type of operation, a portion of the work metal flows beyond the die impression to form *flash*.
- ▶ Flash is excess metal that must be trimmed off later.

Flashless forging

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- ▶ In *flashless forging*, the work is completely constrained within the die and no excess flash is produced.
- ▶ The volume of the starting work-piece must be controlled very closely so that it matches the volume of the die cavity

(a) Slotting, (b) perforating, (c) notching and seminotching.
Symbol v indicates motion of strip



Slotting

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► Slotting is the term sometimes used for a punching operation that cuts out an elongated or rectangular hole.

Perforating

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

Notching

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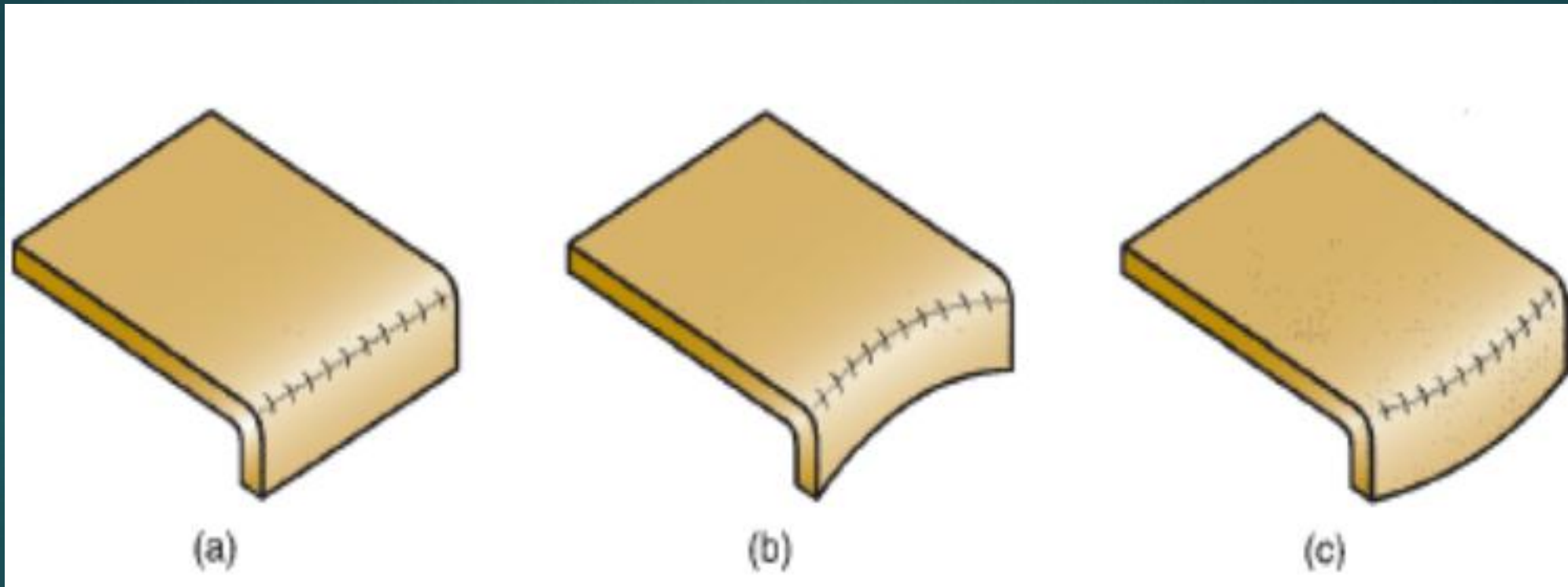
- ▶ To obtain the desired outline of a blank, portions of the sheet metal are often removed by notching and semi-notching.
- ▶ *Notching* involves cutting out a portion of metal from the side of the sheet or strip.

Semi-notching

- ▶ *Semi-notching* removes a portion of metal from the interior of the sheet.
- ▶ Semi-notching might seem to be the same as a punching or slotting operation.
- ▶ The difference is that the metal removed by seminotching creates part of the blank outline, while punching and slotting create holes in the blank.

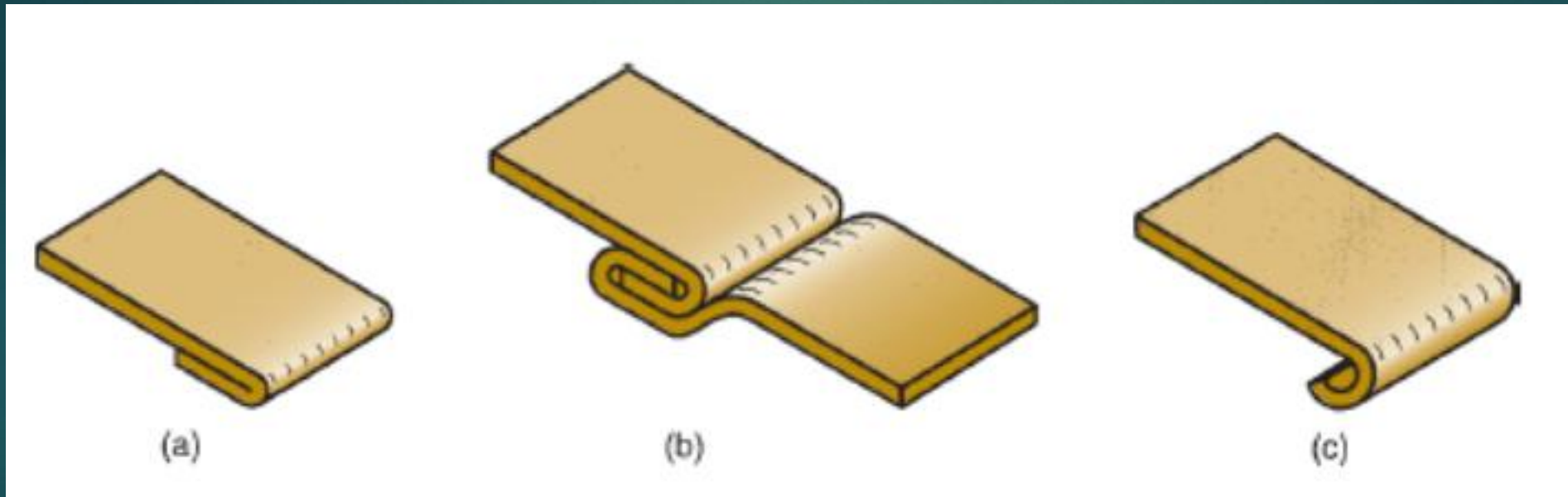
Flanging: (a) straight flanging, (b) stretch flanging, and (c) shrink flanging.

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a) Hemming, (b) seaming, and (c) curling.

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Miscellaneous bending operations: (a) channel bending, (b) U-bending, (c) air bending, (d) offset bending, (e) corrugating, and (f) tube forming. Symbol: F applied force.

