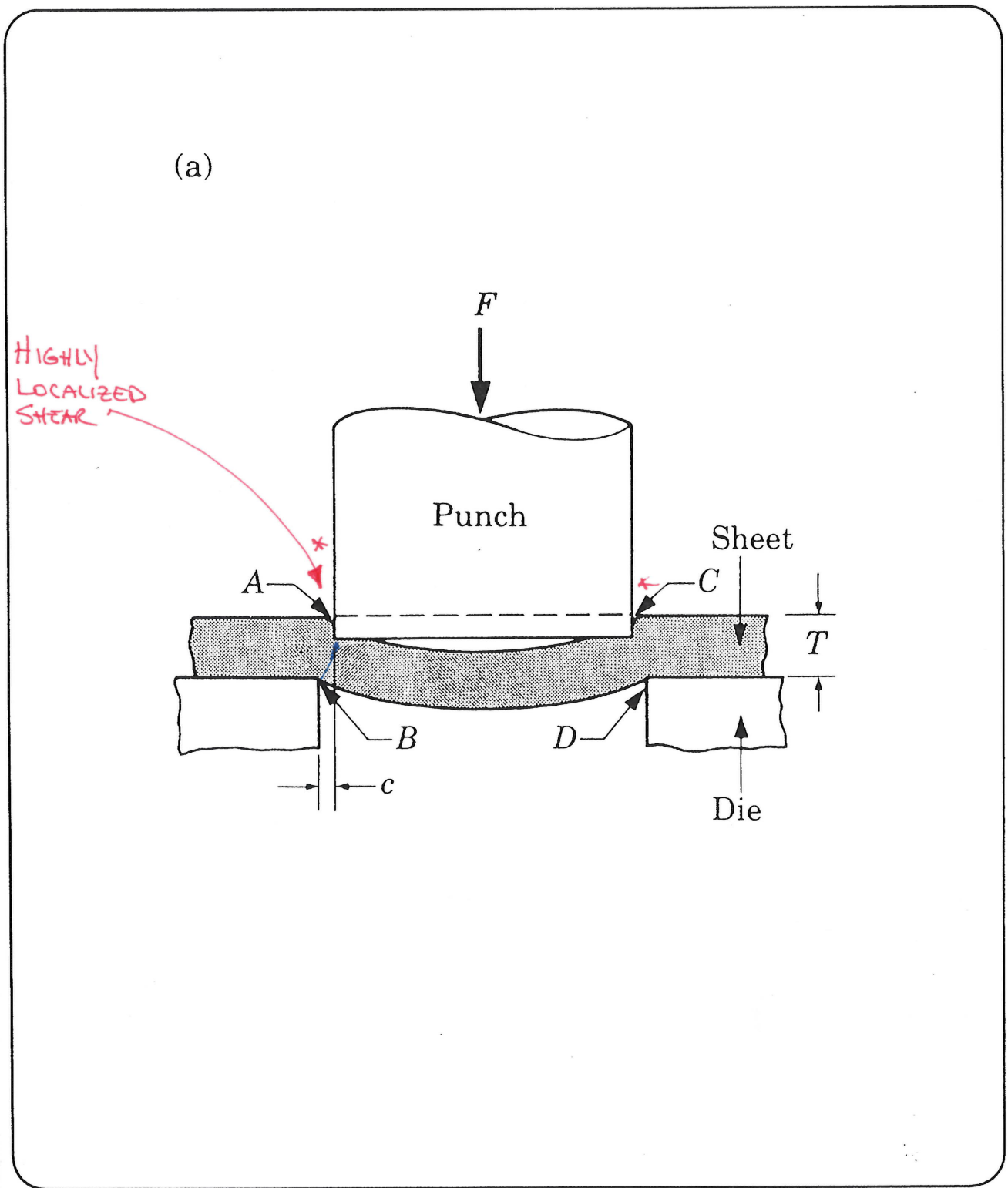
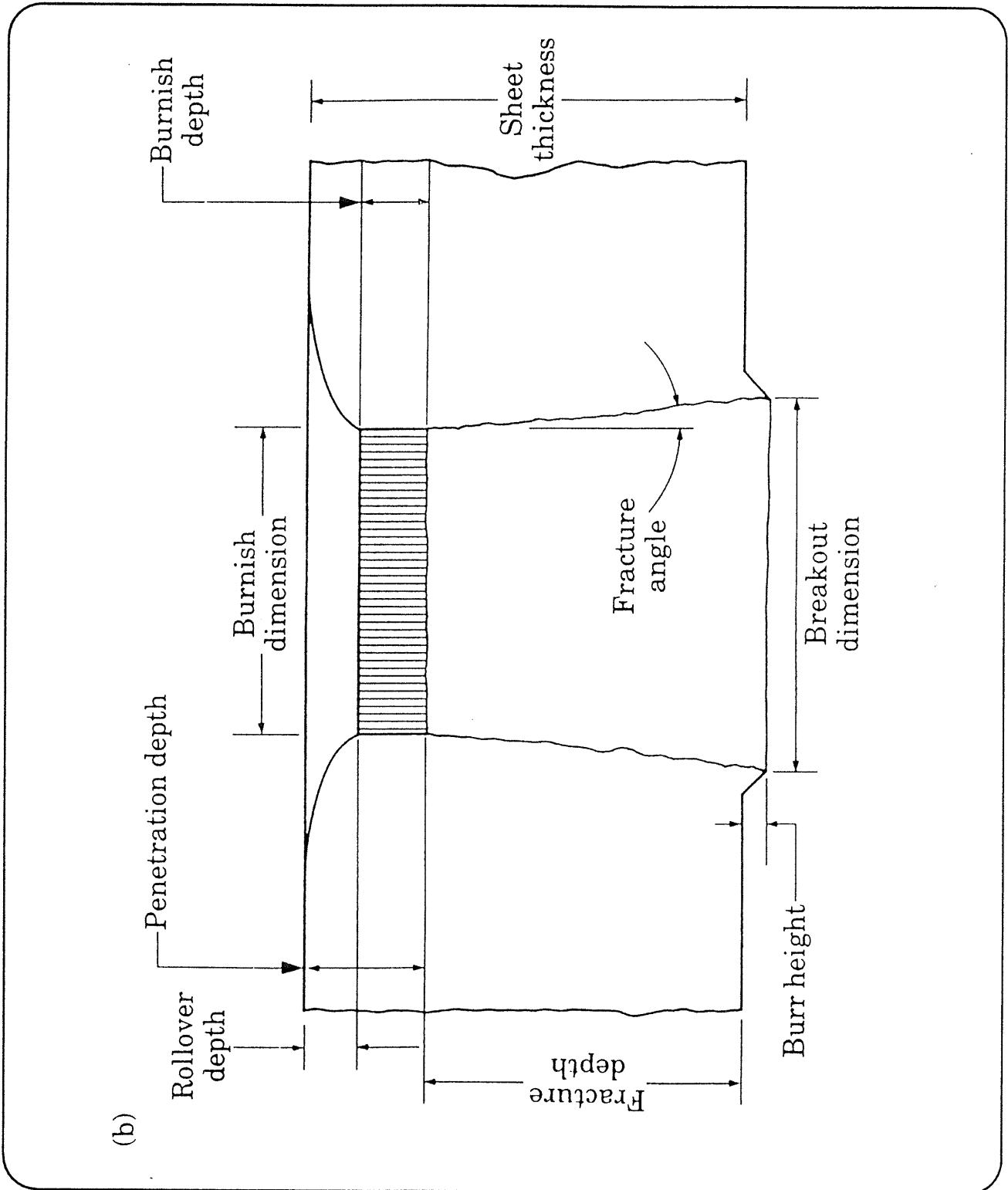
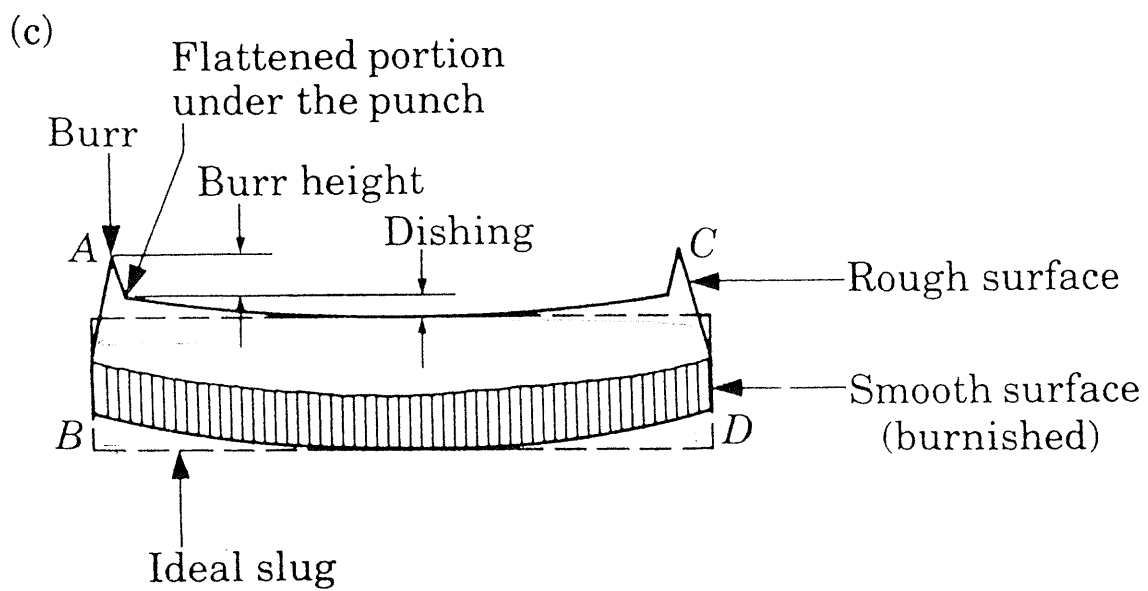


Figure 16.2 (page 446) Schematic illustration of shearing with a punch and die, indicating some of the process variables







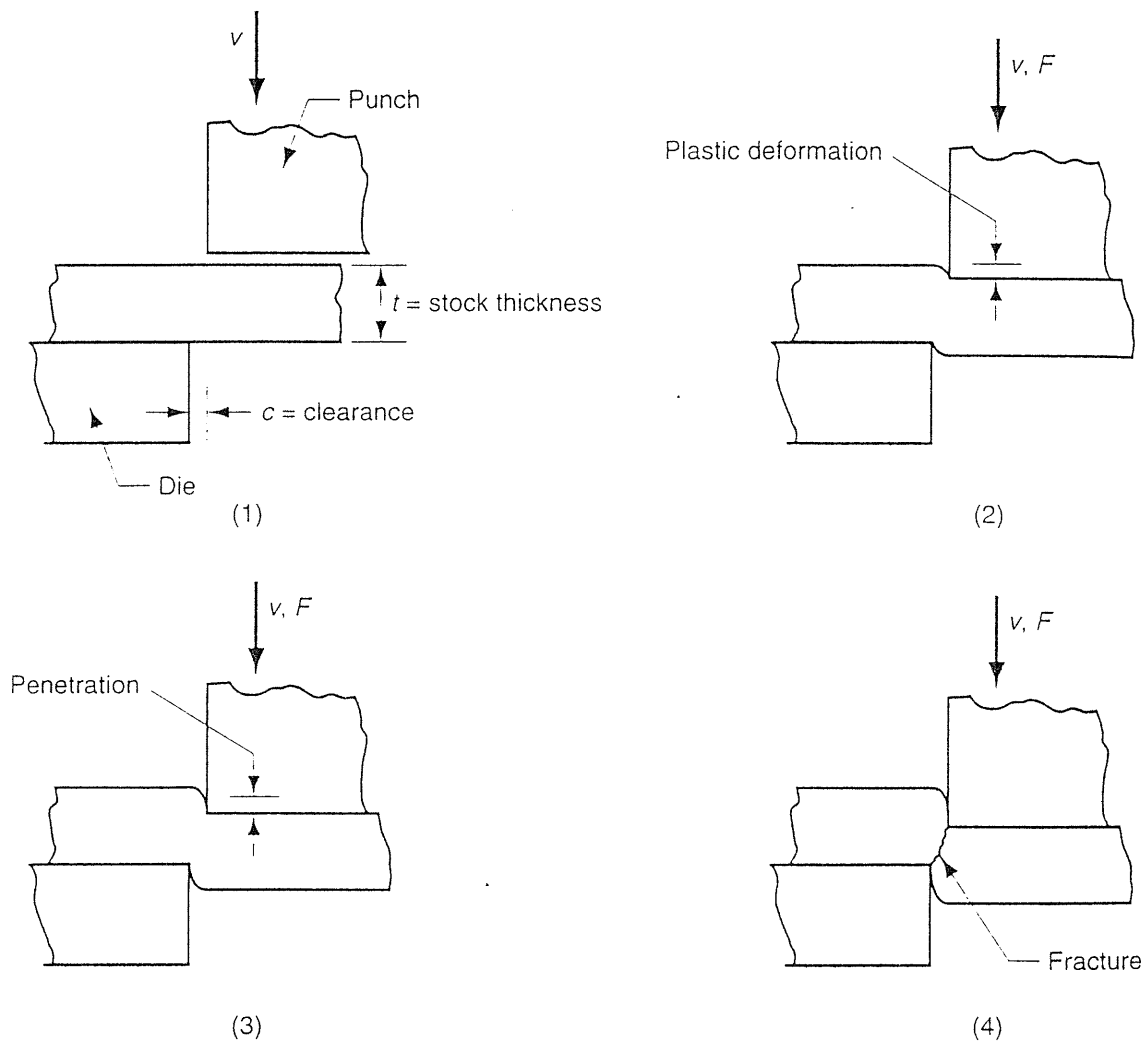


FIGURE 22.1 Shearing of sheet metal between two cutting edges: (1) just before the punch contacts work; (2) punch begins to push into work, causing plastic deformation; (3) punch compresses and penetrates into work, causing a smooth cut surface; and (4) fracture is initiated at the opposing cutting edges that separate the sheet. Symbols *v* and *F* indicate motion and applied force, respectively.

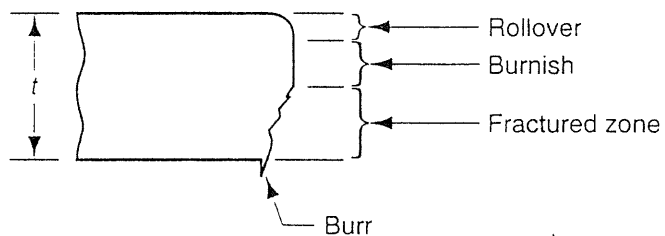
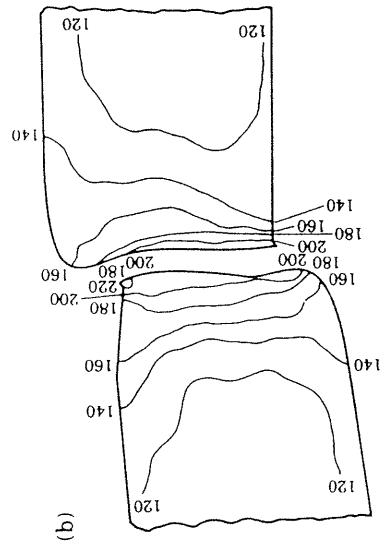


FIGURE 22.2 Characteristic sheared edges of the work.

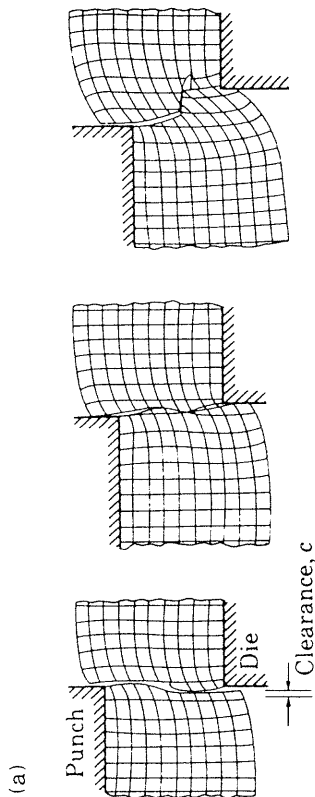
1a

Master 48

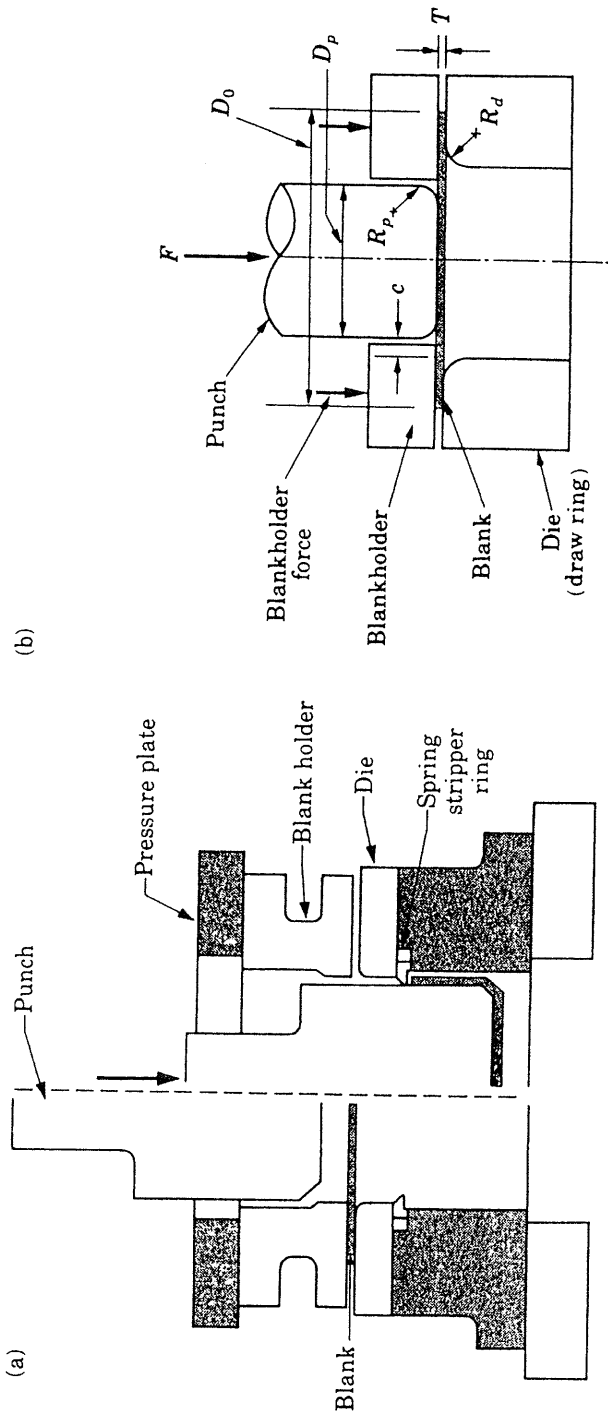
(a) Effect of clearance c between the punch and die on the deformation zone in shearing. Figure 16.3 (page 447)
(b) Microhardness (HV) contours for a 6.4-mm (0.25-in.) thick AISI 1020 hot-rolled steel in the sheared region



(b)



(a)



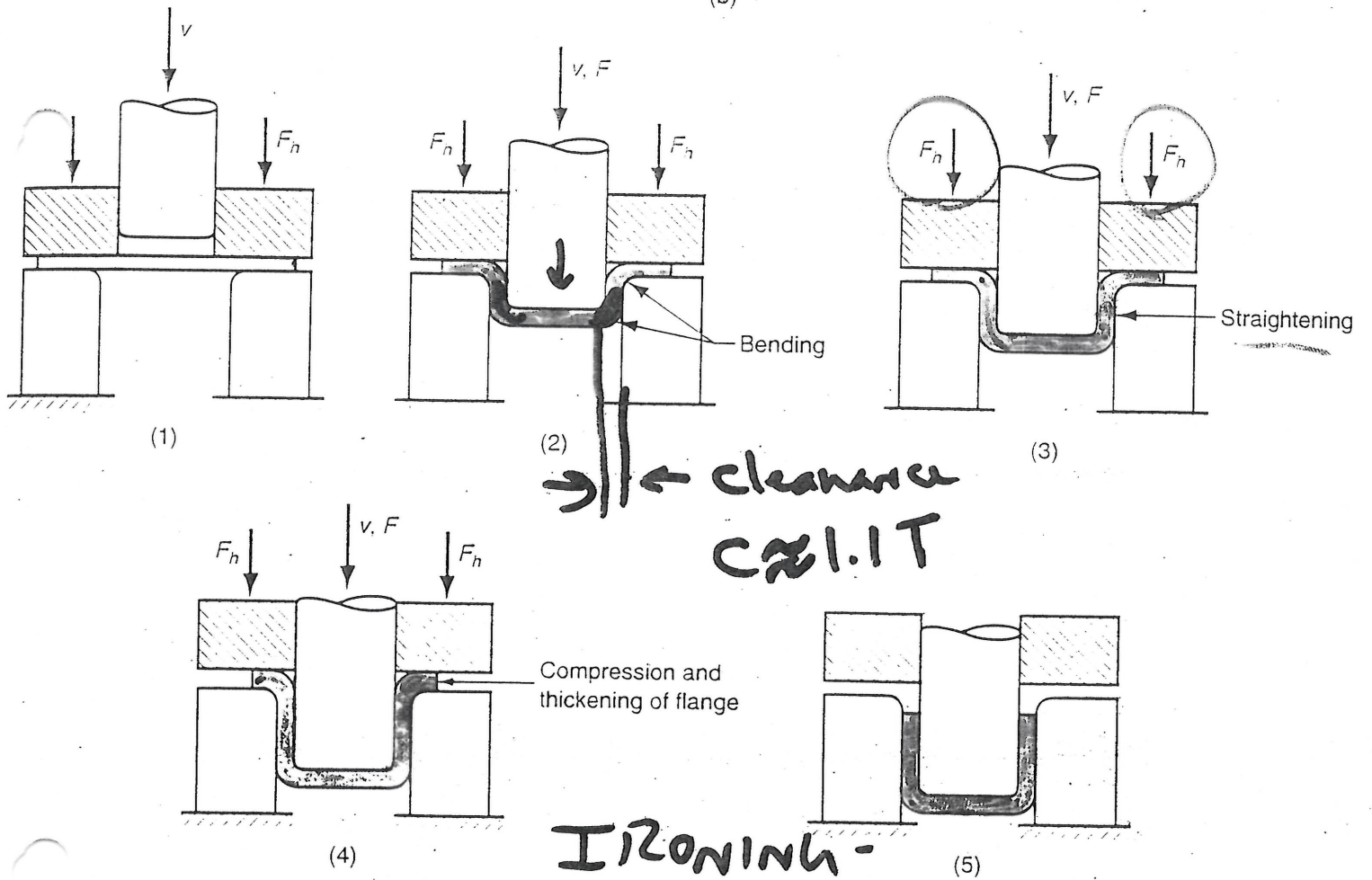
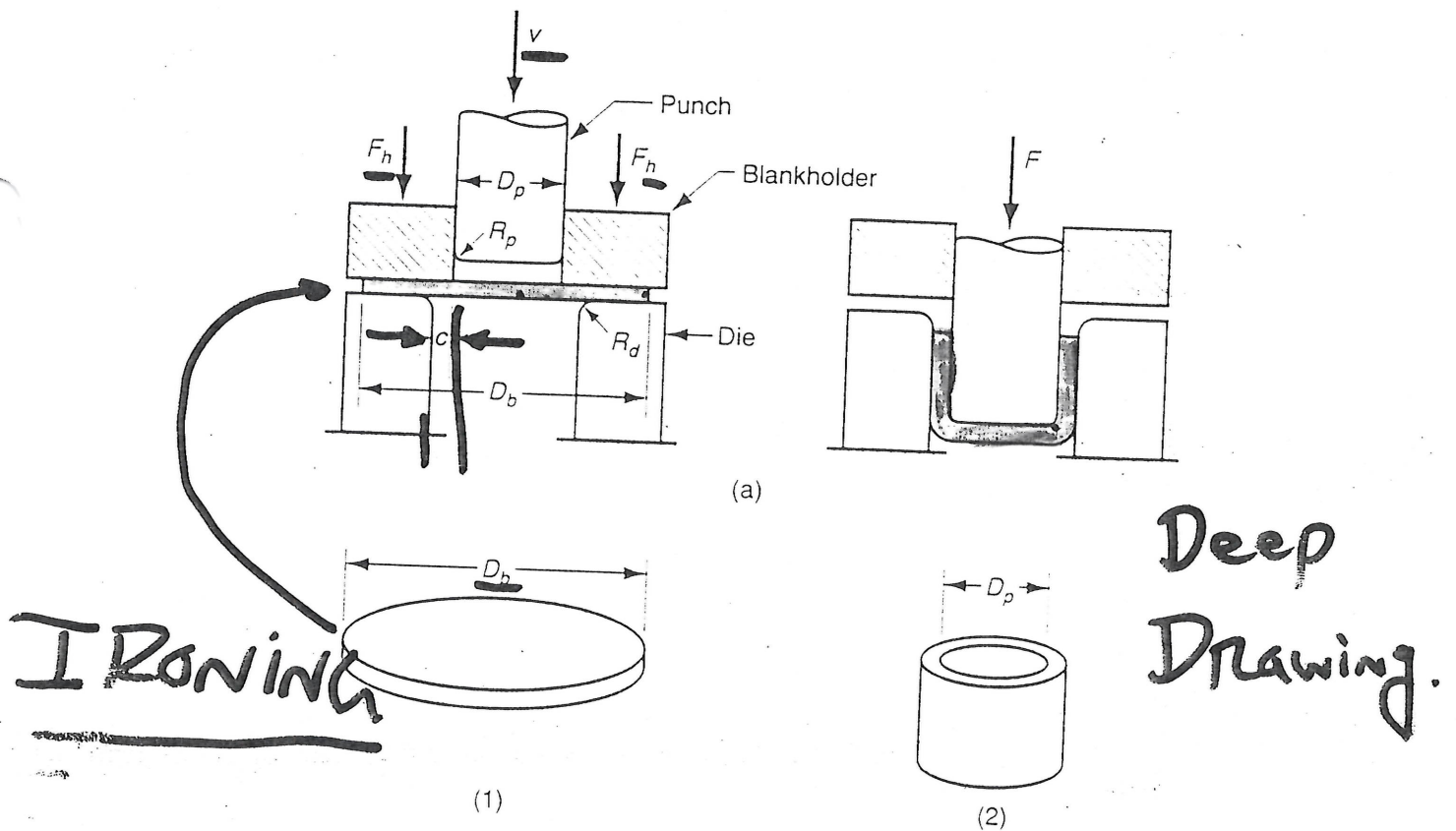


FIGURE 22:20 Stages in deformation of the work in deep drawing: (1) punch makes initial contact with work, (2) bending, (3) straightening, (4) friction and compression, and (5) final cup shape showing effects of thinning in the cup walls. Symbols v = motion of punch, F = punch force, F_h = blankholder force.

FIGURE 20.26
Embossing: (a) cross section of punch and die configuration during pressing; (b) finished part with embossed ribs.

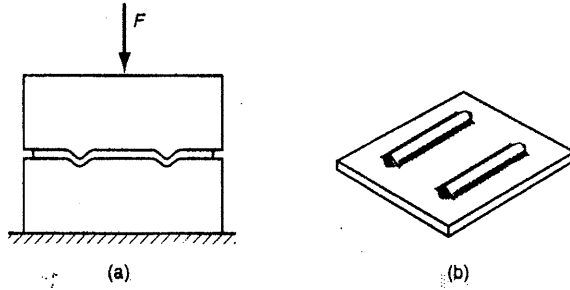


FIGURE 20.27 **Lancing** in several forms: (a) cutting and bending; (b) and (c) two types of cutting and forming.

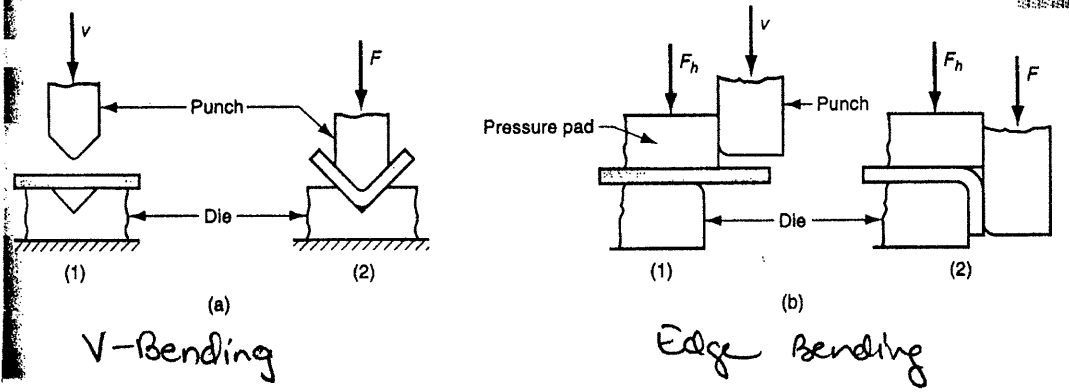
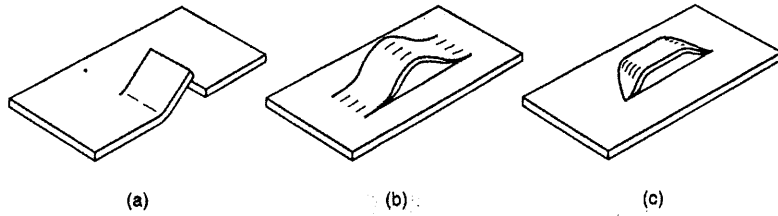


FIGURE 20.42
Conventional spinning: (1) setup at start of process; (2) during spinning; and (3) completion of process.

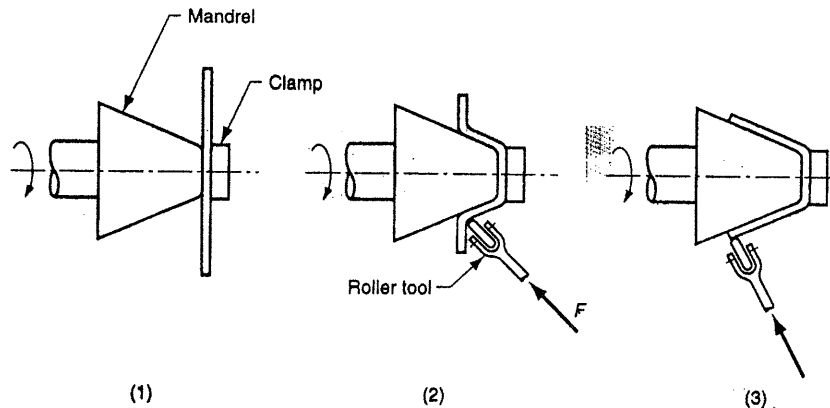


FIGURE 20.3 Shearing operation: (a) side view of the shearing operation; (b) front view of power shears equipped with inclined upper cutting blade. Symbol v indicates motion.

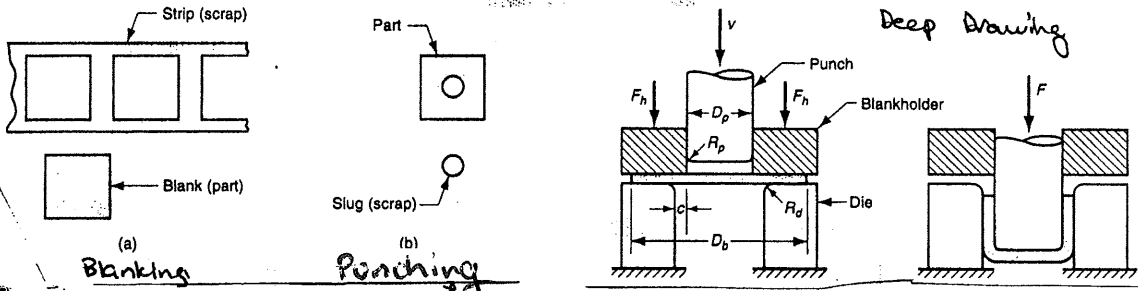
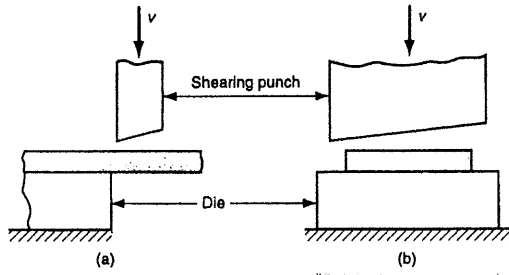


FIGURE 20.9 (a) Slotting, (b) perforating, (c) notching and seminotching. Symbol v indicates motion of strip.

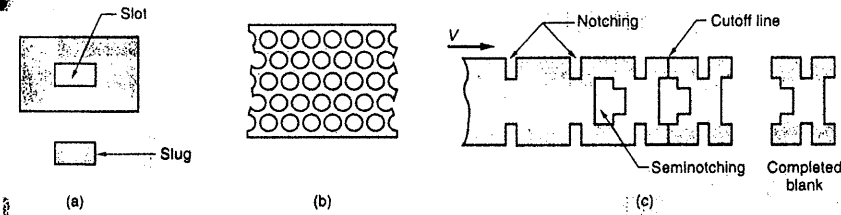


FIGURE 20.16 Flanging: (a) straight flanging, (b) stretch flanging, and (c) shrink flanging.

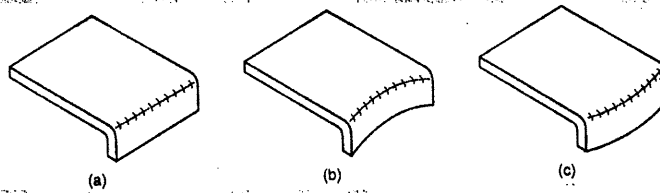


FIGURE 20.17 (a) Hemming, (b) seaming, and (c) curling.

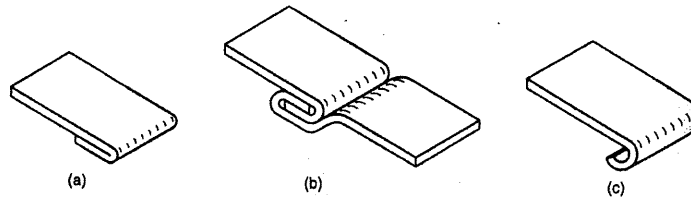
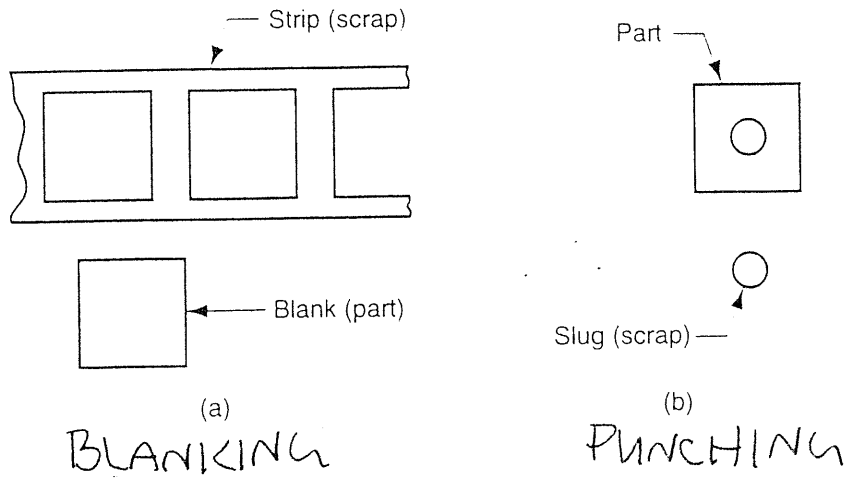
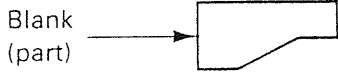
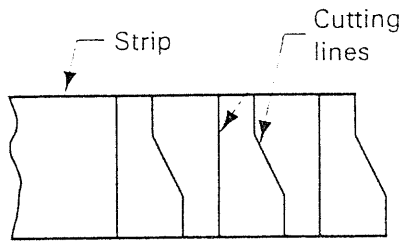


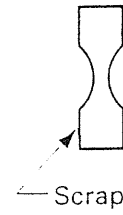
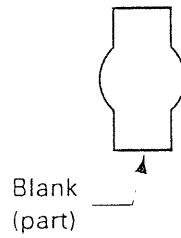
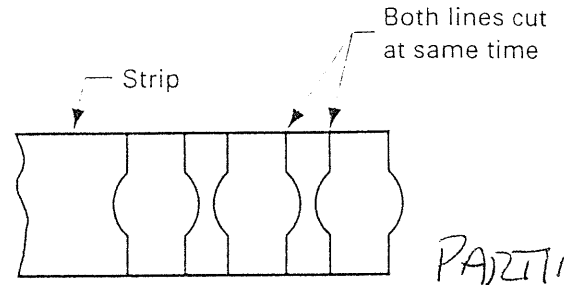
FIGURE 22.4 (a) Blanking and (b) punching.



* NOTE: MIN SCRAP.

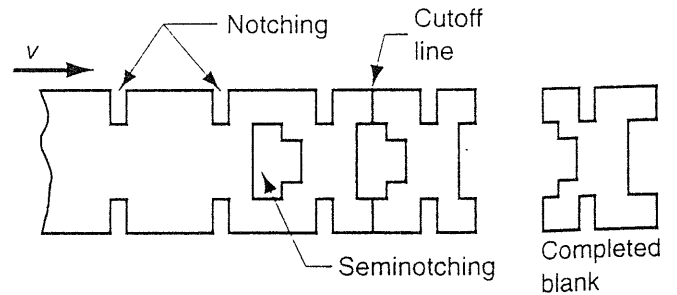
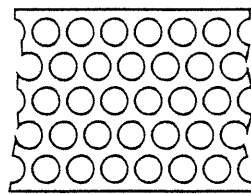
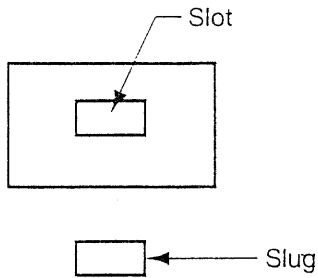


CUTOFF
(Shearing, but edges not straight, each cut a new part)



PARTIAL CUTTING A NEW PART VIA A PUNCH.
↑ Has scrap.

FIGURE 22.9 (a) Slotting, (b) perforating, (c) notching and seminotching. Symbol v indicates motion of strip.



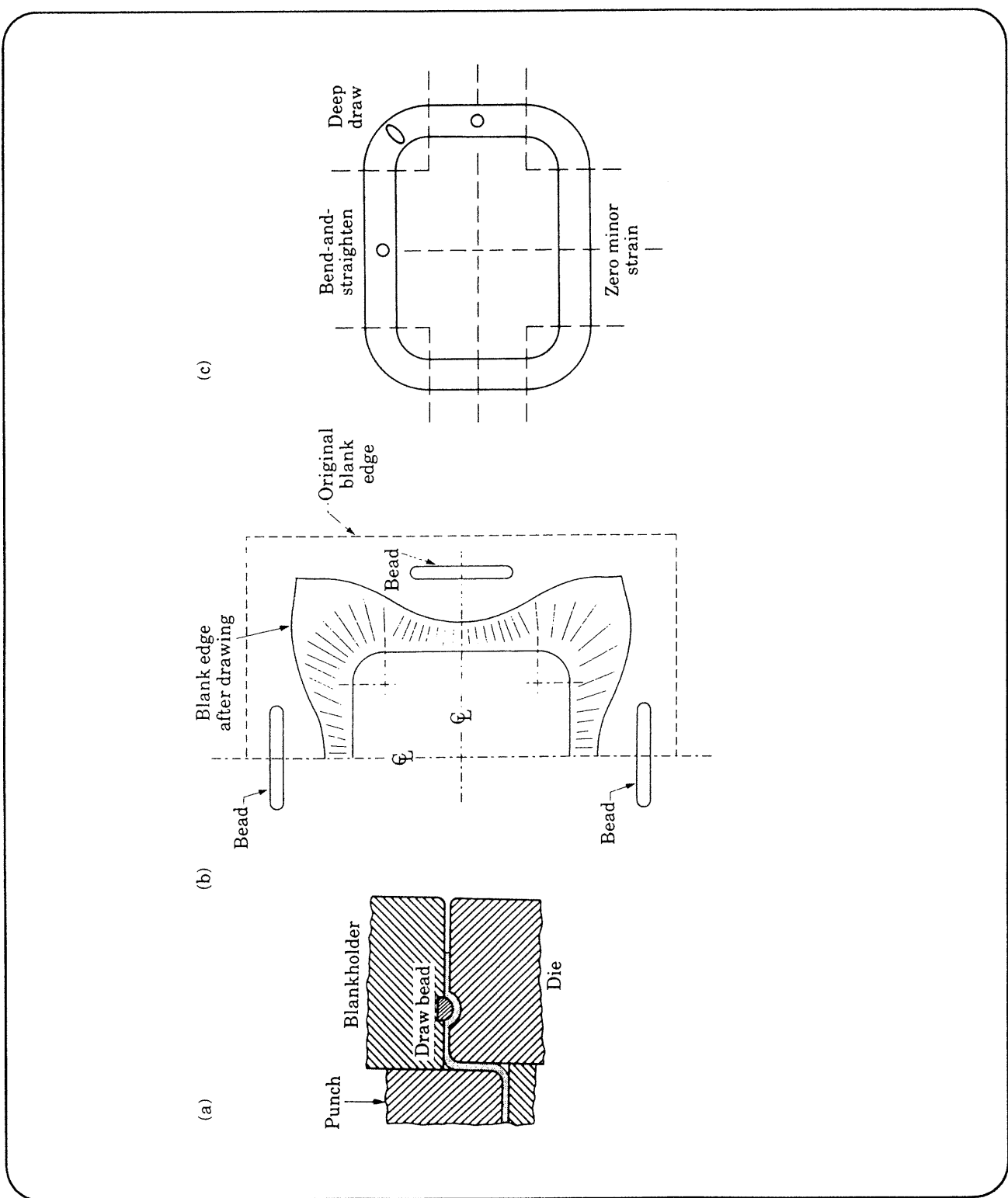
Punch a Rectangular hole.

Perforating - holes punched simultaneously

NOTCHING - ON EDGE
SEMI-NOTCHING - INTERIOR

Figure 16.38 (page 476)

(a) Schematic illustration of a draw bead.
(b) Metal flow during drawing of a box-shaped part, using beads to control the movement of the material.
(c) Deformation of circular grids in drawing.



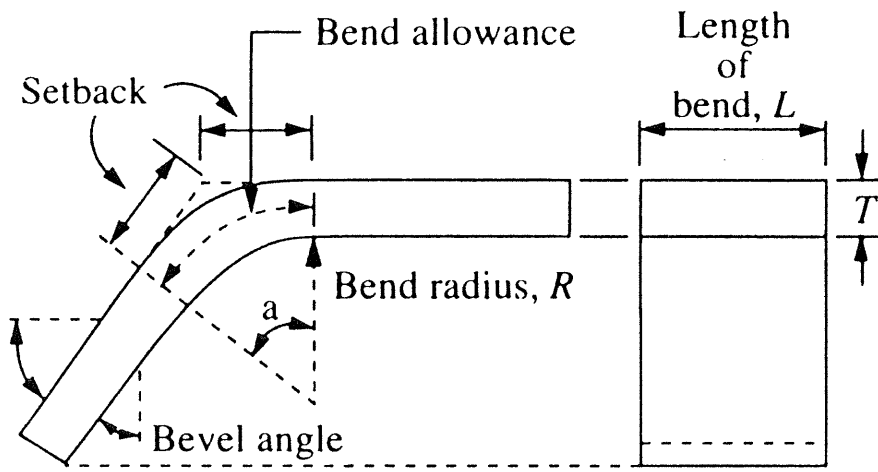


Figure 16.23 (page 465) Schematic illustrations of various bending operations in a press brake

