

Title : Press Tool (Production Technology)

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Lecture No : 1 (09.30 AM to 10.30 AM)

Source of information : Book from PC Sharma, RK Jain

❑ CLASSIFICATION OF PRESS

➤ According to the Power Source

- Manually Operated :-

These presses are used to process thin sheet metal working operations where less pressure or force is required. These are operated by manual power. Most of manually operated presses are hand press, ball press or fly press.

- Power Presses :-

Power presses are normally driven by mechanical mechanism or hydraulic system. Power source of these presses may be electric motor or engine.



➤ According to the Type and Design of Frame

- Inclinable:-

Its frame is called inclinable due to its capability to tilt back up to some angle. It can be locked into any of its inclined positions. Its back is open to exit the scrap so it is also called open back inclinable press.

- Straight side:-

Press These presses have straight side type frame which is preferred for presses having larger bed area and high tonnage. This offers greater rigidity and capable of longer strokes. The frame consists of vertical and straight sides so it is called straight side press.

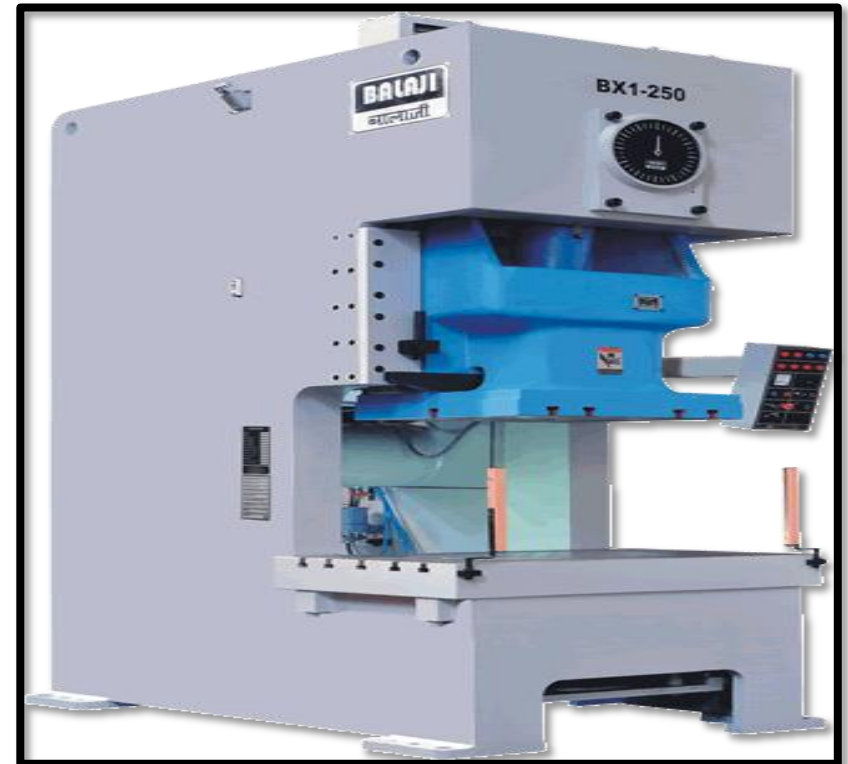


- Adjustable Bed Type Press

It is also called column and knee type press because it has a knee type bed supported on its column shaped frame. Its bed (knee) can be adjusted at any desirable height by moving it vertically up or down with the help of power screws.

- Gap frame press:-

These presses have larger frame openings, that means a wide gap between its base and ram to accommodate larger work pieces. It also has longer beds.



- Horning and open end press:-

It has a solid type of vertical frame with all sides open. Driving mechanism is housed at the back and ram controlling mechanism at the front. It is easily to accommodate work piece and dies in this type of structure. Its is identified as light duty machine.

- Horning Press:-

It consist of a vertical frame, top of which over hangs towards the front. The over hanging portion serves for housing for driving mechanism and ram control. The frame consists of a front face as a work table called horn.

➤ According to the Position of Frame

- Inclinable Frame:-

Already described.

- Vertical Frame:-

Vertical frame type of press is already been discussed, it cannot be adjusted like inclinable frame. Gap, adjustable bed, straight side, open end and honing presses are the example of vertical frames.

- Horizontal Frame:-

It has a fixed frame in horizontal position. It provides the facility of auto ejection of produced part and scrap due to gravity.

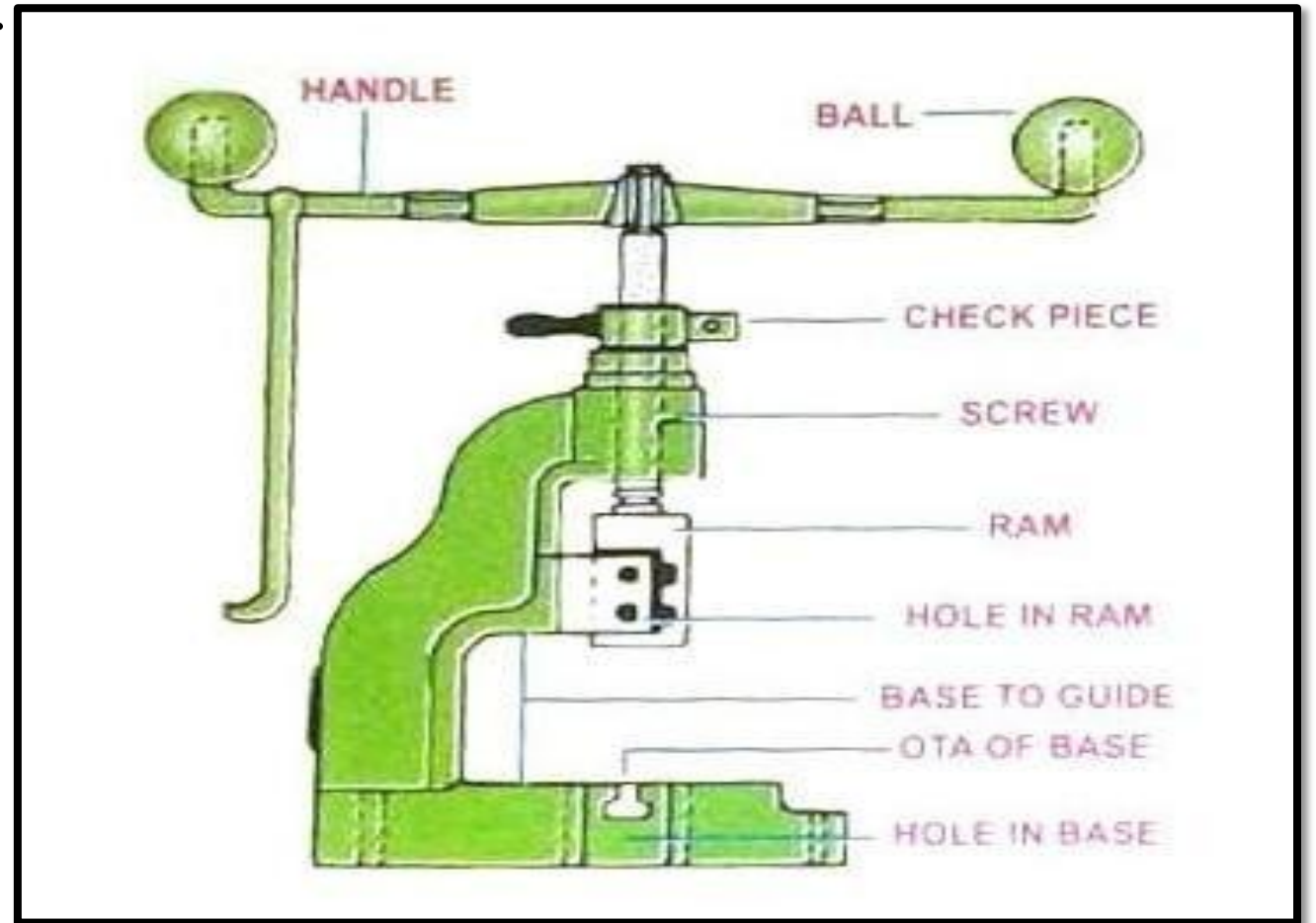
- According to the Actions
 - single action
 - double action
 - triple action press

- According to the Purpose of Use
 - Shearing press
 - Seaming press
 - Punching press
 - Extruding press
 - Coining press
 - Forging press
 - Rolling press
 - Bending press.

➤ Constructional feature of Presses

- Fly Press

A fly Press is a machine tool used to shape sheet metal by deforming it or cutting it with punches and dies.



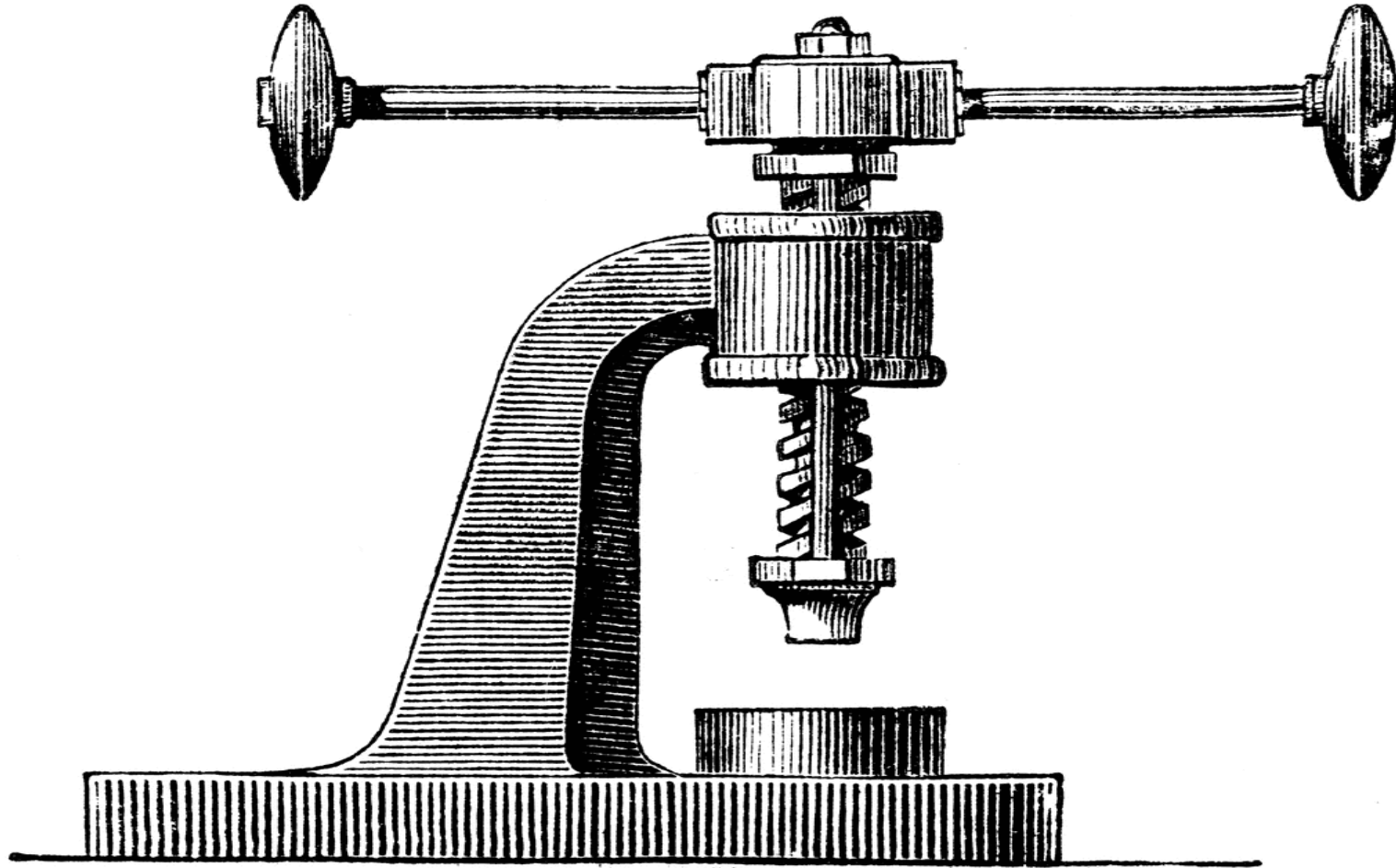
- Hydraulic Press

A hydraulic press is a machine using a hydraulic cylinder to generate a compressive force. It uses the hydraulic equivalent of a mechanical lever.



- **SCREW PRESS**

A screw press is a type of machine press in which the ram is driven up and down by a screw.



❑ CLASSIFICATION OF PRESS DIE

➤ Based on type of press operation

- Blanking dies

Die used for blanking piercing, punching, notching perforating, trimming, shearing and parting.

- Squeezing dies

Dies used for coining, sizing, swaging, flatterring.

- Bending dies

Dies used for bending, curling, forming etc.

- Drawing dies

Die used for curling, flanging embossing, bulging

➤ Based on types of die construction

- Simple die:-

Simple die are dies designed to perform only one specific operation like blanking, punching, notching, trimming etc.

- Transfer Dies:

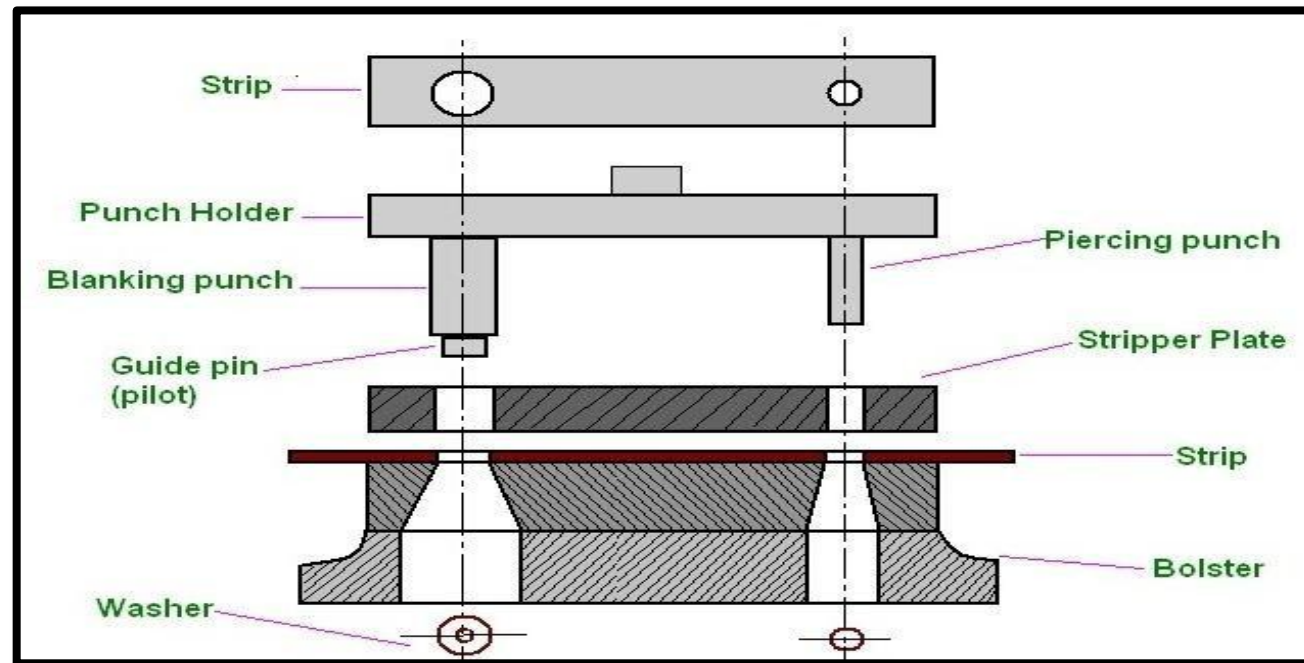
Unlike the progressive dies where the stroke is fed progressively from one station to another. In transfer dies the already cut blanks are fed mechanically from one station to other station.

- Multiple Dies:

Multiple or gang dies produce two or more work piece at each stroke of the press. A gang or number of simple dies and punches are ganged together to produced two or more parts at each stoke of the press.

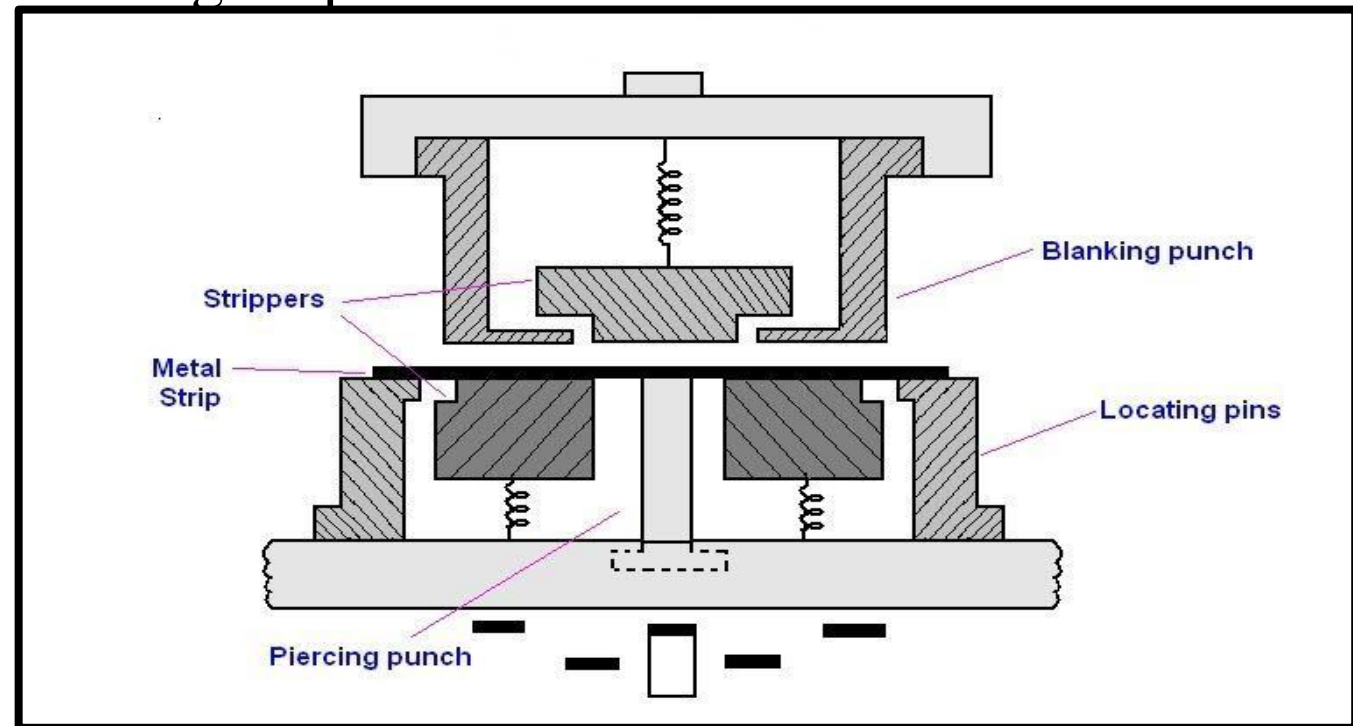
- Progressive dies:-

Progressive dies are made with two or more stations. Each station performs an operation on the work piece or provides an idler station so that the work piece is completed when the last operation has been accomplished. After the first part has traveled through all the stations, each subsequent strokes of the press produces another finished part.



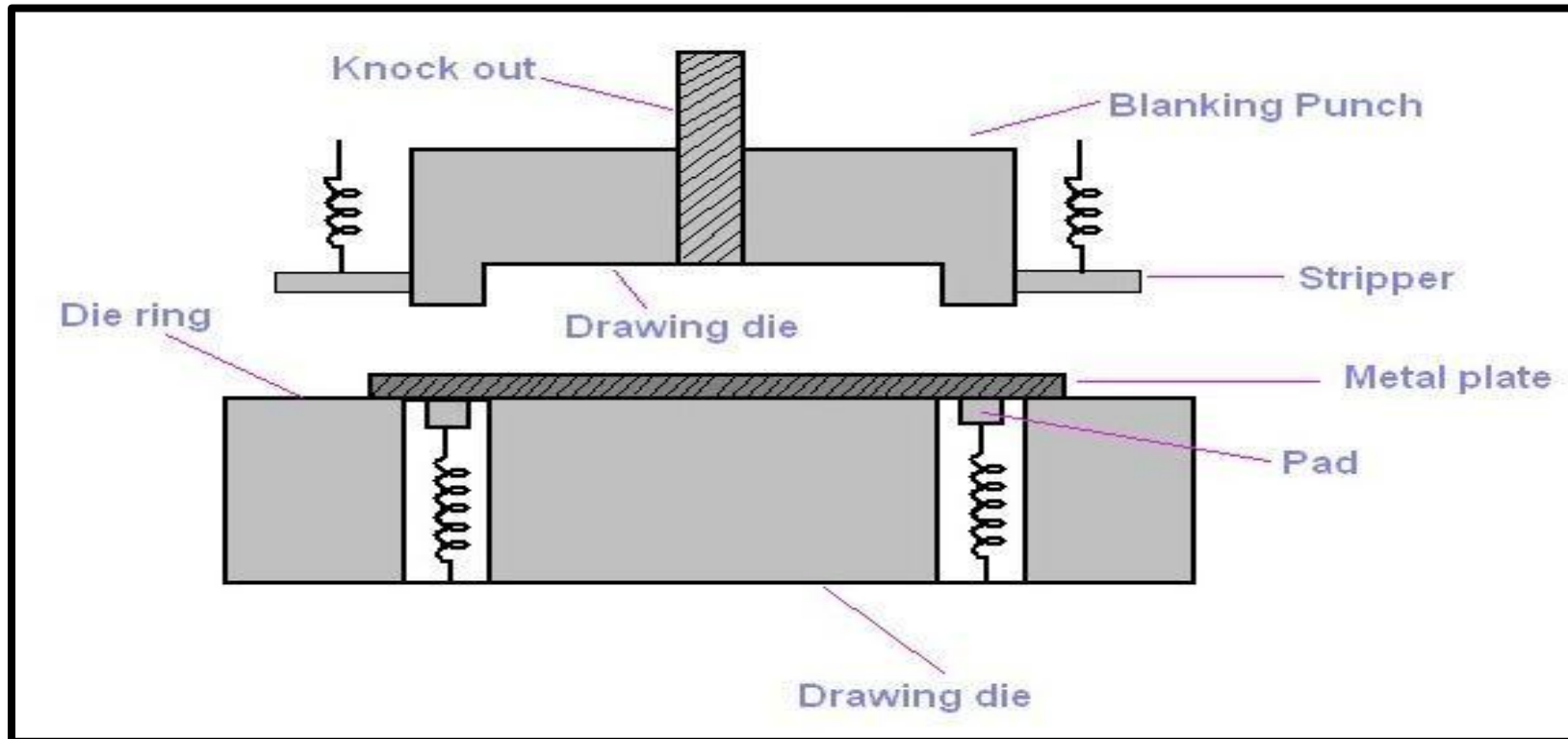
- Compound die

In these dies, two or more operations may be performed at one station. Such dies are considered as cutting tools since, only cutting operations are carried out. Figure shows a simple compound die in which a washer is made by one stroke of the press. The washer is produced by simulation blanking and piercing operations. Compound dies are more accurate and economical in production as compared to single operation dies.



- Combination die:-

In this die also , more than one operation may be performed at one station. It is difficult from compound die in that in this die, a cutting operation is combined with a bending or drawing operation, due to that it is called combination die.



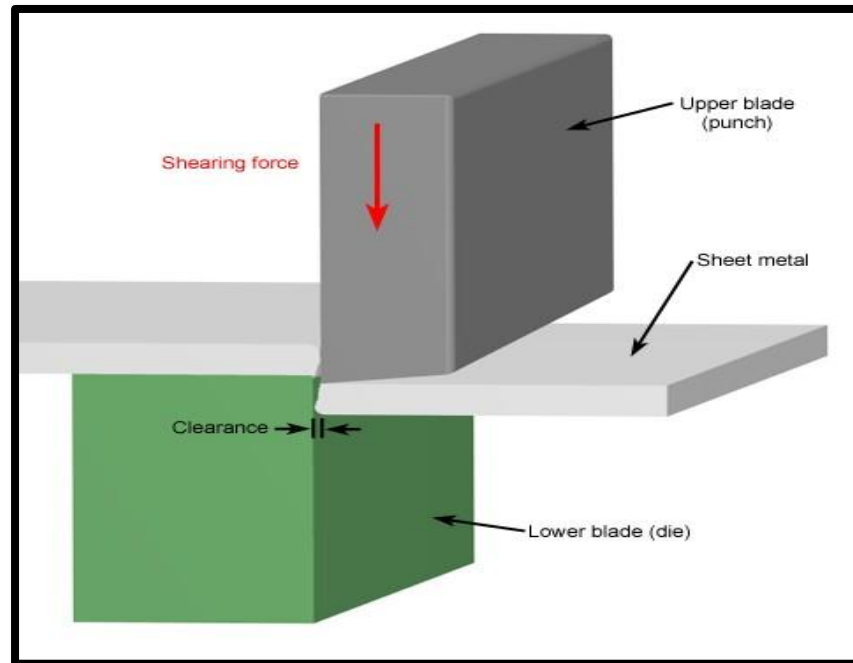
□ CUTTING ACTION IN DIE

➤ Spring back

- One of the principal concerns in a sheet metal operation, is the spring back of the metal.
- When the metal is deformed, it is first elastically deformed and then plastically.
- When the applied load is removed, the plastic component of the deformation remains permanently, but the elastic part springs back to its original shape.

➤ Shearing action

- The metal is brought to the plastic stage by pressing the sheet between two shearing blades so that fracture is initiated at the cutting points.
- The fractures on either side of the sheet further progressing downwards with the movement of the upper shear, finally result in the separation of the slug from the parent strip



□ **Clearance**

- When correct clearances are used, a clean break would appear as a result of the extension of the upper and lower fractures towards each other.
- With an insufficient clearance additional cut bands would appear before the final separation.
- Ductile materials require smaller clearances and longer penetration of the punch compared to harder materials.

□ CUTTING FORCE

➤ Stripping force

- Thicker materials or small hole in the middle of a strip require more stripping force than thin material or a hole towards one of the edges.
- A punch which has smooth side walls would strip very easily.
- Similarly more effort is required to strip punches that are close together.
- general estimate of the stripping force may vary from 2.5 to 20% of the punch force but 5 to 10 percent is good for most of the applications.
- Stripping force $P_s = 1.5 L t$
- L = perimeter of cut
- t = stock thickness
- P_s = Stripping force, ton

➤ Shear force

- To reduce the required shearing force on the punch, for example to accommodate a component on a smaller capacity punch press, shear is ground on the face of the die or punch.
- The effect of providing shear is to distribute the cutting action over a period of time depending on the amount of shear provided.
- Thus the shear is relieved of the punch or die face so that it contacts the stock over a period of time rather than instantaneously.
- It may be noted that providing the shear only reduces the maximum force to be applied but not the total work done in shearing the component.

➤ **Cutting force**

- Cutting force is the force applied on the stock material in order to cut out the blank or slug.

$$\text{Cutting force} = L \times S \times T_{\text{max}}$$

L= Length of periphery to be cut in mm.

S= Sheet thickness in mm

T_{max}= Shear strength in N/mm^2

➤ **Press force**

- Press force will be cutting force with stripping force

$$\text{Press Force} = \text{Cutting force} + \text{Stripping force}$$

Q. 1 Explain with neat sketches compound die and progressive die.?

Q. 2 Write short note on material utilization factor for a sheet metal on a press tool using press tool die.

Q. 3 Explain with neat sketches compound die and progressive die.

Hard copy submission date (31/3/2020).

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