SUBJECT:-PRODUCTION TECHNOLOGY (MECH. 2ND YEAR)

NAME:-ABHAY SUNDRIYAL **DATE:-11/04/2020**

Introduction to Press Machine

Press machine is a metal forming machine tool. Which is designed to form or cut metal by applying mechanical force or pressure. With the help of a press machine, you can form metal in any desired shape without removal of chips. The presses are exclusively intended for mass production work.

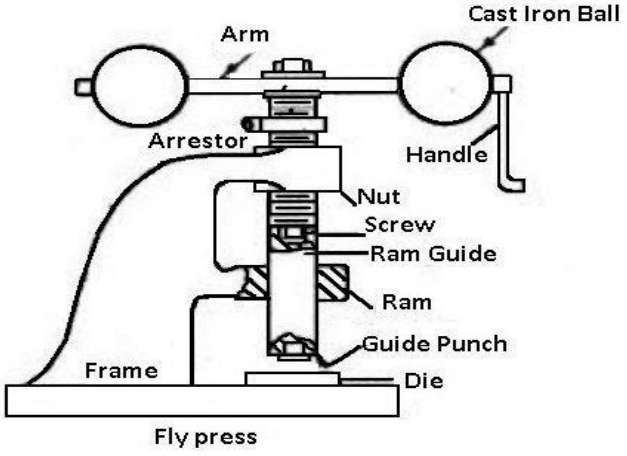
The main advantage of using these types of machine is that they are the fastest and most efficient way to form any sheet metal into the finished product.

The classification of **different types of press machine** are given below:

1. Classification based on the source of power
1. Hand press or ball press or fly press
2. Power Press
2. Classification based on the design of the frame
1. Gap
2. Inclinable
3. Adjustable
4. Horn
5. Straight side
6. Pillar

Classification based on the source of power

Hand press or Ball press or Fly press



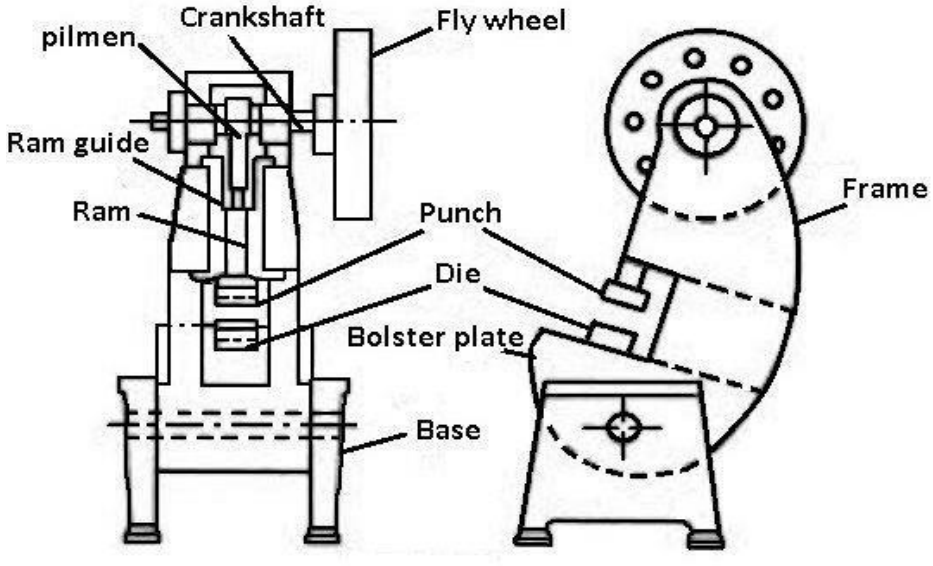
This type of press machine is the most simple of all presses and is operated by hand. The working details of the fly press machine are shown in the image below. The main parts of the hand press machines are a frame, ram, nut and screw, iron ball, handle, guideway, punch, and die. The frame of the machine is rigid "C" shaped casting. The typical shape of the frame leaves the front open which facilitates the feeding of the sheet metal below the ram from the side of the machine.

The two heavy cast iron balls are mounted at the two ends of the arm which is bolted to screw. So that when the handle is turned it causes the screw to rotate within the nut. The ram moves up and down in slides provided at the extension of the frame.

The punch and the die constitute the press tool, the punch being the upper member is fixed to the lower end of the ram and the die which is the lower member of the press tool is fixed on a plate on the table, known as a bolster. The sheet metal to be formed is placed between the punch and the die. The press is operated by a sharp, partial revolution of the arm by pulling the handle and the kinetic energy is stored up in the two heavy balls mounted on the arm.

Power Press

This is widely used types of press machine in the workshop. The constructional feature of a power press is almost similar to the hand press, the only difference being, the ram instead of driven by hand is driven by power.

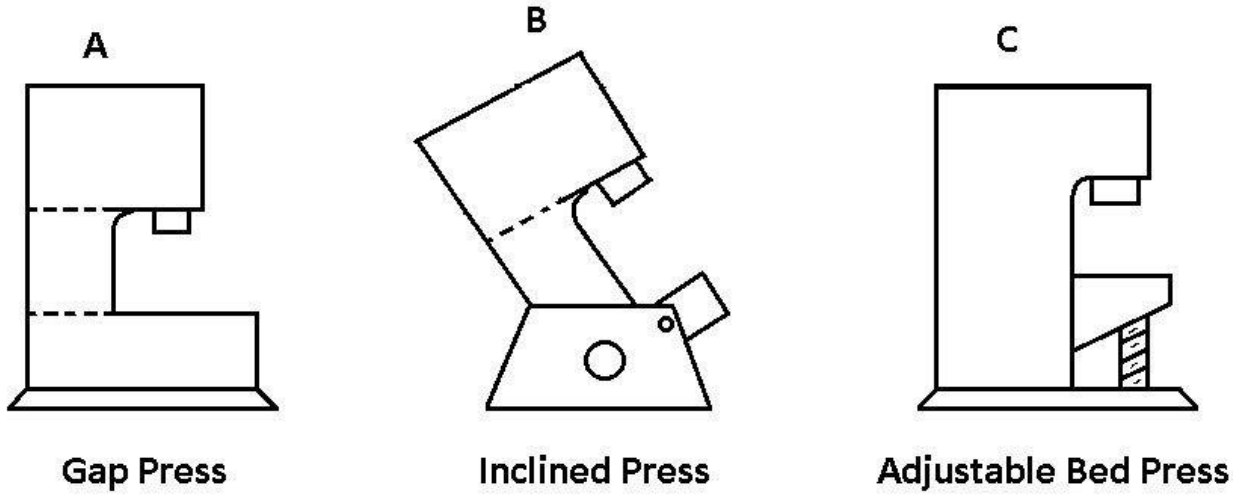


Power press

The power press is characterized as mechanical or hydraulic according to the type of working mechanism used to transmit power to the ram.
The figure illustrates a power press driven by a crank and connecting rod mechanism. The punch is fitted on the end of the ram and the die is attached on the bolster plate. The flywheel mounted at the end of the crankshaft stores up the energy for maintaining a constant downward speed of the ram when the sheet metal is pressed between the punch and the die.

Classification based on the design of the frame

Gap Press



The gap press illustrated in the figure has a gap like opening in the frame for feeding the sheet metal from one side of the press. The frame is attached with the base and provides a rigid construction.

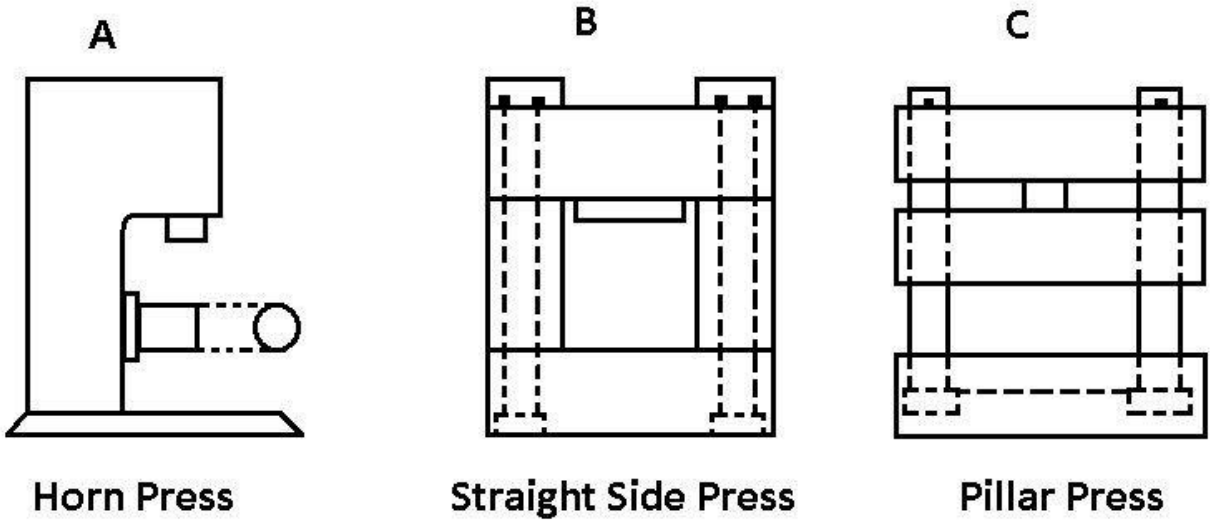
Inclined Press

The inclined press illustrated in the figure is the most common type of press used in industry. The identifying characteristic of the inclined press is its ability to tilt back on its base, permitting the scrap or finished products to be discharged from the die by gravity without the aid of any type of handling mechanism. The press is not so rigid as a gap press due to its construction.

Adjustable bed Press

The adjustable bed press illustrated in the figure has the mechanical arrangement for raising or lowering the table on which the die is fitted. This enables the setting of different sizes of work and dies on the machine. The press is not so rigid as the other types.

Horn Press



The horn press illustrated in the figure. It has a cylindrical horn like projection from the machine frame, which serves as the die support. The horns may be interchanged for the different sizes of work. The press is intended for the cylindrical workpiece.

Straight Side Press

The straight side press illustrated in the figure. This press machine has two vertical rigid frames. These are mounted on two sides of the base which are intended for absorbing critical load exerted by the ram. The machine is suitable for heavy work, but due to the presence of side frames, the sheet metal cannot be fed from the side.

Pillar Press

The pillar press illustrated in the figure. It is a hydraulic press having four pillars mounted on the base. The pillars support and guide the ram.

Press Working :

Press working may be defined as, a manufacturing process by which various components are made from sheet metal. This process is also termed as cold stamping. The machine used for press working is called a press.

The main features of a press are:

- A frame which support a ram or a slide and a bed, a source of mechanism for operating the ram in line with and normal to the bed.
- The ram is equipped with suitable punch/punches and a die block is attached to the bed.

- A stamping is produced by the downward stroke of the ram when the punch moves towards and into the die block.
- The punch and die block assembly is generally termed as a "die set" or simple as the "die"

Press working operations:

The sheet metal operations done a press may be grouped into two categories.

1: Cutting operations

2: Forming operations

In cutting operations the work piece is stressed by its ultimate strength. The stresses caused in the metal the applied forces will be shear stresses. The cutting operations include:

(a) Blanking (b) Punching (c) Notching
(d) Perforating (e) Trimming (f) Shaving
(g) Slitting (h) Lancing

In forming operations , the stresses are below the ultimate strength of the metal , in this operation , there is no cutting of the metal but only the contour of the work piece is changed to get the desired product.

The forming operations include:

(a) Bending (b) Drawing (c) Squeezing

Sheet metal Cutting Operations:

1: Blanking:

Blanking is the operation of cutting a flat shape from sheet metal. The product punched out is called the "blank" and the required product of the operation the hole and the metal left behind is discarded as waste.

2: Punching or Piercing:

It is a cutting operation by which various shaped holes are made in sheet metal. Punching is similar to blanking except that in punching, the hole is the desired product. The material punched out from the hole being waste.

3: Notching:

This is cutting operation by which metal pieces are cut from the edge of the sheet , strip or blank.

4: Perforating:

This is a process by which multiple holes are very small and close together are cut in a flat sheet metal.

5: Trimming:

This operation consists of cutting unwanted excess of material from the periphery of a previously formed component.

6: Shaving:

The edge of a blanked part are generally rough, uneven and un square. Accurate dimensions of the part are obtained by removing a thin strip of metal along the edges.

7: Slitting:

It refers to the operation of making incomplete holes in a work piece.

8: Lancing:

This is a cutting operation in which a hole is partially cut and then one side is bent down to form a sort of tab. Since no metal is actually removed and there will be no scrap.

9: Nibbling:

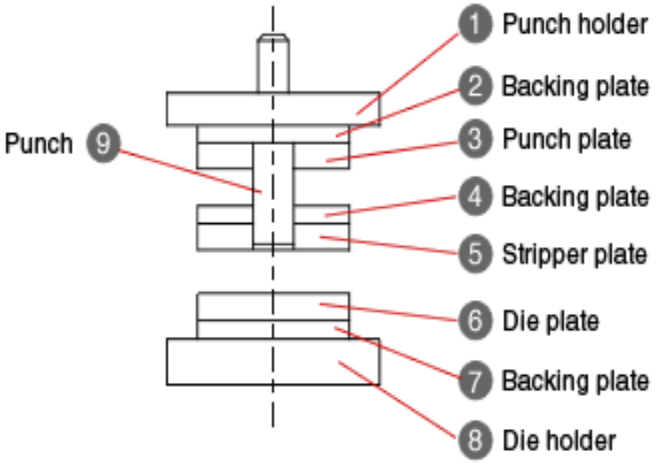
The nibbling operation , which is used for only small quantities of components, is designed for cutting out flat parts from sheet metal. The flat parts from simple to complex contours. This operation is generally substituted for blanking. The part is usually moved and guided by hand as the continuously operating punch cutting away at the edge of the desired contour.

Die Materials

The die materials used for the main parts of medium-sized and large-sized dies are described here.

Although there are several types of die structures, explanations are given here are based on the widely used movable stripper structure. The plate configuration of the die shown in Fig. 1 shows the largest configuration of a movable stripper structure.

[Fig. 1] Configuration of main parts of a die



(1) Holder SS400, S50C (S55C), FC250, SKS3, and A7075

The punch and die holder are not only for fixing the die to the press machine but also for supporting the rigidity of the die. They also have the role of adjusting the die height and providing the space for springs, etc.
Usually, the materials used are SS400 or S50C. There is no big difference between the two. Among cast iron types, FC250 is used. This is the material used when cast iron die sets are used. When high rigidity is required for purposes such as high volume production, etc., SKS3 is used after heat treatment (to a hardness of about 56 HRC). When low weight is required, the aluminum alloy A7075 may be used.

(2) Backing plate SK3, SK5, SKS3, and S50C

Backing plates are used at three locations in a die. They are used for the purpose of backing up so as to prevent components such as small diameter punches, etc., from getting too deep inside the holder due to the force of press operation. Apart from that, backing plates are used for preventing the parts from getting detached (stripper backing plate) and for adjusting the height of the die.
For backing up, an SK material is used after heat treatment (to a hardness of about 56 HRC). The SKS material is used when high rigidity is required. Materials such as S50C, which is used without heat treatment, is used for backing up or preventing the detachment of parts such as a large-sized punch with a large pressure receiving area, or for adjusting the height.

(3) Punch plate SS400, S50C (S55C), SKS3, SKD11, pre-hardened steel

A punch plate is used for the purpose of holding a small punch. Usually, SS400, S50C, etc. are used without heat treatment. In the case of dies for high volume production, pre-hardened steel having a certain amount of hardness, or heat treated SKS3 or SKD11 may also be used. The SK material is rarely used. When the machining tolerance of SKS3 is of concern, the material SKD11 may also be used which is a decision based on the wire cutting characteristics.

(4) Stripper plate S50C, pre-hardened steel, SKS3, SKD11

While the main function of a stripper is to remove scrap, very frequently it is made to have important secondary functions of pressing the material or guiding the tip of the punch (punch guide).

When removing scrap in small volume production is important, materials such as S50C or pre-hardened steel are used which do not require heat treatment. When materials without heat treatment are used, although they are made to have the functions of pressing the material and guiding the punch, the plate may get deformed when there is wrong punching. When a punch guide or a material pressing member is added, a material such as SKS3 or SKD11 is used after heat treatment.

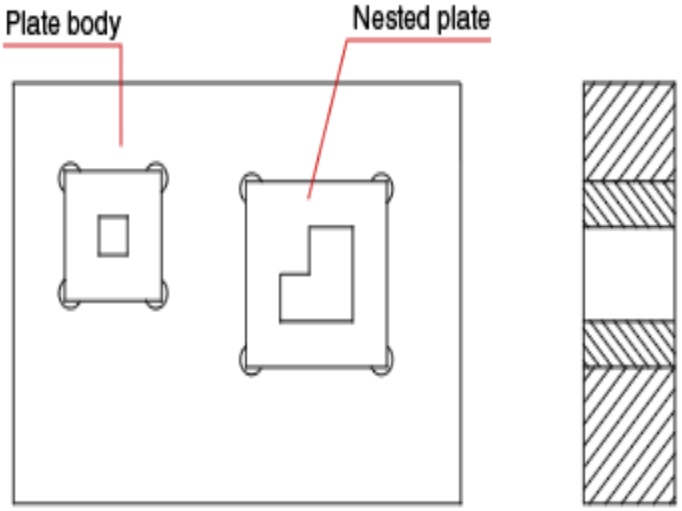
(5) Die plate SK materials, SKS3, SKD11

SK materials or SKS3 is used in dies for small volume production. The standard material used is SKD11. This trend has become established because preparation of dies using electric discharge wire cutting machines has become widespread.

(6) Nested plates (see Fig. 2)

The descriptions given above assume single type plates. In dies, nested type (insert type) plates are used very often. Such plates are used for stripper plates or die plates. In the case of small volume production, materials such as S50C without heat treatment are sometimes used for the main plate. For medium or higher volume production, materials such as SKS3 or SKD11 are used after heat treatment.
The materials SKD11, SKH51, pre-hardened steel, and cemented carbide, etc. are used as the materials for nested plates. The selection of the material is based on ease of maintenance, accuracy, and operating life.

[Fig. 2] Nested type plates



(7) Punch

The materials used for punches are SKS3, SKD11, SKH51, powdered high speed tool steel, cemented carbide, etc.
The standard material used is SKD11. SKS3 is sometimes used in the case of small volume production. SKH51 is used when the size is small, or when toughness is required. Powdered high speed tool steel or cemented carbide are used when wear resistance is required or for large volume production.