

Power Screw Operated Sheet Bending Machine

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Abstract- *The bending machine is one of the most important machine tools in sheet metal work shop. It is primarily designed for bending. The bend has been made with the help of punch which exerts large force on the work clamped on the die. The bending machine is designed in such a way that, it works automatically. The automation strategy, when implemented is believed to result in reduced cycle time, costs and improved product quality. Other possible advantages are repeatability, increased productivity, reduced labor and integration of business systems. Automation is achieved with the help of Electro pneumatic system.*

Keywords- AC MOTOR, POWER SCREW, PULLEY, BELT, SHEET BENDING

I. INTRODUCTION

Bending machine is a tool or an instrument which is used to form bends on objects at different angles. There are various kinds of bending machines to bend various objects including pipes, metal sheets, metal plates, hydraulic, cutting and punching machines, etc. Choosing a bending machine according to your need depends upon the type of instrument you want to bend and the amount of pressure it can handle during the bending process.

Mostly used sheet bending machine is hydraulic operated. In this type of sheet bending machine the power generated by hydraulic oil is used to perform bending action. Pressure generated by hydraulic oil is very high therefore this machine is applicable for all type of press building operations. But only one disadvantage is that the initial cost of hydraulic operating sheet bending machine is very high. Therefore, this machine is difficult to use at small scale industries.

For this reason, mechanical operator sheet bending machine is economical and useful for small scale industries. Initial cost of mechanical operating sheet bending machine is low as compare to hydraulic operated. In mechanical type bending machine the pressure generated by the moment of lead screw or power screw is used to perform bending action. This working principle is similar to the mechanical lifting machine.

1.1 HISTORY

From mechanical sheet metal processing in the 18th century to the fully automated double bending machine of the digital age. The history of the bending machine continues.

One thing had not changed in metalworking by the middle of the 18th century: it was still very hard manual labor. But come the Industrial Revolution, more and more threaded rods made of wood and wooden beams were replaced by metal parts; the closing function also consisted of levers, control shafts and eccentric bearings of metal. The wooden bending table was often reinforced with metal, the so-called edge rail, to achieve exact bending results. And mechanical sheet metal production really took off at the end of the 18th century when the English industrialist John Wilkinson invented the reversing rolling mill.

Middle of the 19th century: the first “sheet metal bending brakes” are built Metal sheets were now available in abundance and consequently their processing was also quickly mechanized. The first bending machines were called “sheet metal bending brakes” or “folding benches” around 1875. They were real heavyweights, but they certainly made work easier. Hydraulics then came onto the scene: the locking lever and bending tools were powered by one or several hydraulic cylinders and controlled with a simple lever valve. The shears were initially only moved manually by pure momentum, but later on these were also powered hydraulically. For a long time, the position of the bend was defined with a folding rule or template. These were joined by the first adjustable, manually-powered back stop systems later on.

1.2 WORKING

It works by using the pressure sequence created by AC motor and this equipment is applied largely in bending hard metal pipes. The machine is equipped with dies to carry on with the bending operation and a clamping cylinder is also provided to avoid material slipping out of the clamp

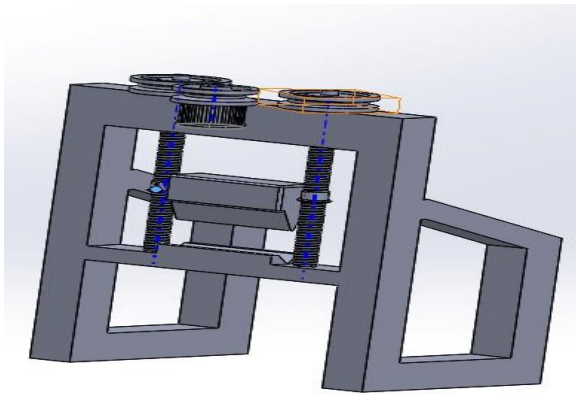


Fig- 1: Model of bending machine

- when the electric motor is starts the lead screw is rotates in clock wise or anti-clock wise direction
- When motor is rotate in clock wise then lead screw are also rotate in clockwise direction.
- The male die mounted on lead screw is move to downward direction.
- The male die is applied force on sheet, which is placed on female die.
- due to force applied by male die on sheet and the sheet gets bend.
- after the compilation of bending process, the male die is gone back in up word Direction, and the process of bending is complete.
- The direction of male die is controlled by controlling the rotational direction of motor or lead screw.

2. COMPONENT

- POWER SCREW
- SUPPORTING FRAME
- PULLY AND BELT
- DIES
- NUTS AND BOLTS
- BEARINGS
- MOTOR
- REVERSE FORWARD SWITCH

2.1 POWER SCREW

A power screw is a mechanical component which is used to convert rotary motion into the linear motion. Sometimes a power screw is also known as Translation screw. It uses helical motion of screw to transmit the power rather than holding the parts together.

Parts of power screws

1. A power screw has following three parts.

- It consists a Screw.
- It consists a Nut.
- It consists a part which holds either nut or bolt in place.

2. Depending on the type of holding arrangement power screws can be divided into two parts.

- Screw moves in axial direction and nut kept stationary. E.g., screw jack and vice
- Nut moves in axial direction and screw kept stationary. E.g., lead screw of a lathe.

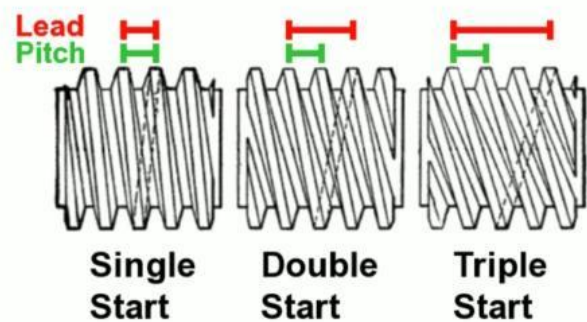


Fig- 2: power screw

2.2 A.C MOTOR

An electric motor like an AC motor works with an alternating current to generate mechanical energy through magnetism blended with AC. The AC motor structure includes coils to generate a rotary magnetic field within an attached rotor toward an output shaft so that a second magnetic field can be generated.

These motors have been used for several years by designers and engineers to apply in different applications. These motors are very helpful in generating stable torque equal to the rated speed. These motors are very simple to handle & can be configured at a less cost.



Fig -3: A.C MOTOR

WORKING PRINCIPLE

The basic working principle of an AC Motor mainly depends on magnetism. The basic AC Motor includes a wire coil & two permanent magnets nearby a shaft. Once an alternating current is supplied to the wire coil, then it turns into an electromagnet that produces a magnetic field. This motor includes two essential parts like stator and rotor. This stator includes a wire loop, a solid metal axle, freely moving metal parts that conduct electricity, a coil, a squirrel cage, etc.

2.3 Advantages

- Power required for operation is obtain from ac motor hence it is not requirement of human effort. As compared to manual operated machine.
- It gives smooth and noiseless service
- Its manufacturing is easy and does not require any specialized machinery
- Multi shaped objects can be manufactured
- Low maintenance cost
- Because of few parts it is cheap and reliable.
- Overall dimensions of power screw are small which results in compact construction

Thus, machines are very accurate and easy to use does not require very high skill level to operate it.

III. CONCLUSIONS

As compare to the manually operated sheet bending machine the power operated sheet bending machine is better. The productivity of power operated sheet bending machine is higher. The part of machine is able to handle the heavy load on machine. The time required to complete bending operation is less and the requirement of extra workers reduced. Power operated sheet bending is less time-consuming process with high productivity.

Metal bending is a huge industry, especially for mass productions such as in automotive engineering where the body panels are punched out of sheet metal. From the research and the discussions, it can be concluded that the basic types of bending include V bending as well as edge bending. It was established that when punch and die with the included angle are employed in the bending operation, is it called V bending whereas when the punch forces a cantilevered sheet metal section over a die in order to achieve desired and optimum bend angle, it is called edge bending. Other processes to be acknowledged for bending operations include air bending, beading, seaming, flanging and tube bending. From the bending operation explored on this assignment, it can be

concluded that V bending can be used for larger sophisticated projects and edge bending can be used for relatively small projects. Irrespective of which method used, there is always a spring-back force on the material.

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