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A PATH FOR HORIZING YOUR INNOVATIVE WORK

DESIGN AND FABRICATION OF PNEUMATIC UPPER AND SOLE PRESSING MACHINE

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Abstract: Presses are used in industries for a wide variety of uses, including blanking, piercing and pressing. There are many different types of presses. The most popular are pneumatic presses and hydraulic presses. These two models of presses are very similar in function. But pneumatic presses are more preferable than hydraulic presses. The greatest advantage of Pneumatic presses is their speed. Pneumatic presses are 10 times faster than hydraulic presses and they can perform many jobs faster and more efficiently. They can also be stopped at any time by opening the valves to release the air. Pneumatic presses are extremely flexible, that they can be placed in a factory in any required position, even upside down. The objective of our project is to MANUFACTURE THE PNEUMATIC PRESS of 100 kg capacity and to make a flexible fusion of 1mm thickness upper and sole using Roller made up of Mild Steel.

Keywords: Pneumatic, Manufacturing, Presses

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INTRODUCTION

A power press is a machine that supplies force to a die used to blank, form, or shape metal or nonmetallic material. Thus, a press is a component of a manufacturing system that combines the press, die, material, and feeding method to produce a part. Presses are composed of frame, bed, or bolster plate and a reciprocating member called a ram or slide, which exerts force upon work material through special tools mounted on the ram and bed. Energy stored in the rotating flywheel of a mechanical press (or supplied by a hydraulic system in a hydraulic press, or supplied by pneumatic cylinder in a pneumatic press) is transferred to the ram to provide linear movement.

I. Theoritical analysis

Power presses can be classified according to:

1. Energy Supply

- Mechanical presses

- Hydraulic presses

- **Pneumatic presses**

- Steam presses

- Electromagnetic presses

2. Function

- Energy-producing machines

- Force-producing machines

- Stroke-controlled machines

3. Construction

- C-frame presses or gap-frame

- Closed-frame presses or O-frame

- 2-Pillar type

- 4-Pillar type

4. Operation

- Single-Action Press

- Double-Action Press

- Triple-Action Press

- Multi-slide Press

Pneumatic Presses

These type employs pressurized air using compressor as actuator and several valves to generate a high compressive force acting on the male element it's look like the hydraulic presses but it deal with lower pressure requirements i.e. it generate lower acting forces.

C-Frame Presses or Gap-Frame

C-frame construction is often used with smaller-capacity presses. Their main advantage lies in the easily accessible work area, which accounts for shorter setup and adjustment times. This advantage is perhaps outweighed by their faults, mostly attributable to the shape of their frame, whose construction is likely to suffer from deflection under load. However, in current machine building, ribs, back plate and other reinforcements are used to secure the machine's sturdiness and accuracy.

II. REQUIREMENTS AND CONSTRAINTS

1. Store Energy While Braking

2. Return Energy To Start Up

3. Must Fit On A Bicycle

4. Light Weight

5. Good Stopping Range

6. Good Stopping Force

7. Inexpensive And Affordable

TOOL AND TOOL DESIGN

Sheet metal is a material formed into thin and flat strips. The shaping of sheet metal by straining the metal around a straight axis is called **Bending**. A bending operation compresses the interior side of the bend and stretches the exterior side. For bending, we need a die and punch.

When sheet metal makes a transition from a bend to a flat surface, or to another bend it tends to rip and tear. To eliminate this, a bend relief is added so the edge of the sheet metal is perpendicular to the bend. In general, a minimum bend relief is equal to the material thickness plus the inside bend radius. If it is OK for the metal to rip, the minimum bend relief is zero.

One benefit of a bend relief is that it makes the part easier to produce. The bigger the bend relief, the easier it is to align over the end of the tooling. The bend relief eliminates some burrs and sharp points. Without a bend relief, the part may slip unpredictably in the tooling as the bend is made.

Another benefit of a bend relief is fracture propagation reduction. If the part is subject to vibration or flexure, existing cracks may grow rapidly. By eliminating the cracks before cutting, and by cutting the bend relief with curves instead of sharp inside corners, the finished part will be stronger and more stable. I think a bend relief makes the part more attractive.

DIE:

It is fixed with clamps into the T-slot in the work area. The Die for U-bending has a U-slot. This shape of the slot, effects the sheet bending. The radius of U is 12mm.

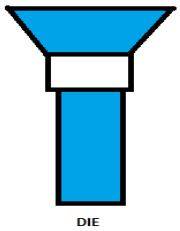


Fig no.1

CALCULATIONS FOR U-BENDING:

1. Shear Force = 0.667 x Su x W x t2 L

Where Su = Ultimate tensile stress W = Width of component t = Thickness of sheet metal L = Radius = Rd + Rp + c = 1.5 + 0.5 + 0.2 = 2.2mm Rd= Radius of the Die Rp= Radius of the Punch C = Clearance

Fsh = 0.667 x 50 x 50 x 1.52 2.2

= 1705.39 N

2. Thickness of Die (Td) = 3√Fsh

= 12 x F.S (2) =24mm

3. Thickness of the Punch = 1.5 Td

F.S = Factor of Safety = 1.5 x 12 x F.S (1.4)

= 24mm

The sheet used for bending in U form is Galvanized Iron. The material of Die and Punch is EN-31

IV WORKING OF PNEUMATIC PRESS

The pneumatic press is provided with a 6 bar capacity cylinder. Compressor is a pump which stores up air at working pressure say 6 psi (pounds per square inch) and compresses air, raising it to a higher pressure. The compressed air from the compressor (in this case 6 psi) is delivered to the cylinder (160mm Bore) of the pneumatic press (sometimes, can also be used to generate a vacuum).

When the lever is operated, the high pressure air in the cylinder is released, pushing the piston and the rod attached to it, downwards.

The released air is free and non- toxic. Often the air is slightly modified by taking out some of the water vapor and adding a small amount of atomized oil to make the gas more machines friendly by using FRL unit A 160mm (6.299 inches) diameter cylinder has an area of πr2. So if we have 6 psi air pressure pushing on 3.14 square inches of surface. That cylinder has 6psi x 31.14 inch2 = 186.88 lbs of pressure.

This pressure pushes down the road. Ram connected to the rod is forced downwards which in turn pushes down the punch which is fixed to the ram. This punch, hits the metal sheet placed on the die having a U-Groove. The pressure is applied until the part has been formed to the proper angle.

Fig.No.2.Roller

When the lever is operated in reverse direction as operated before, the ram moves upwards, moving away the punch from the die. The operation is continuous and can be controlled by lever mechanism. The sheet metal of 1.5mm thickness, after U-bending, will have 9mm inner diameter and 12mm outer diameter at the bend.

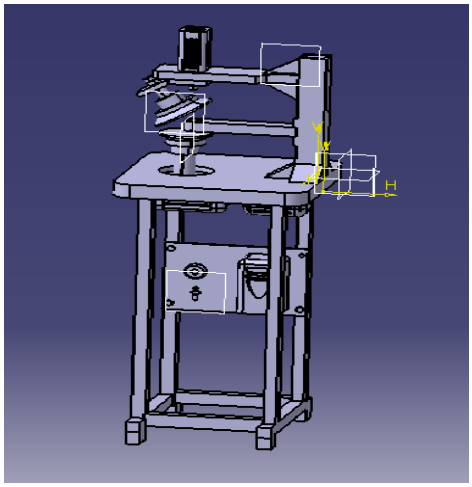
Fig.no.2 bottom assembly

Thus the operation is completed, and the shoe is bent in desired form.

Salient features

Low space requirement

Simple operation with direction control valve Suitable for varied sizes of carriers



This project has met its objective to produce a C-Frame Pneumatic Press and its function is limited to Bending.

IV CONCLUSION

We designed a pneumatic press which costs less than that available in the market. We are very good at what we have done and had fun doing it. Our pneumatic press is useful to do metal forming operations and as it is a 100kg capacity press. We can do simple operations like bending, blanking and piercing, which is very useful and helpful to do small works at our college. We chose a simple c-frame press which occupies less space which any one can operate, and manufactured it at 1/3rd of the original cost in the market. We have also done analysis of c-frame of the press. We tested our project by producing a U-bend of sheet metal. Our product was first planned to be a washer but due to cost considerations of die we have limited to bending operation. As our project is based on manufacturing of pneumatic press and U-bending, further modifications can be done and increase its applications.

FUTURE EXTENSION:

We contemplate the following future features which can be incorporated into this project:-

1. A die to produce a washer of less than 1mm thickness.

2. Automation of pneumatic press.

3. Improvements in pneumatic press by adding components like timers, silencers etc

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