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Hand Operated Hydraulic press machine

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ABSTRACT: A hydraulic press is a machine using a hydraulic cylinder to generate a compressive force. Frame, hydraulic cylinder and press table are the main components of the hydraulic press. In this project press frame, cylinder and press table are the main components of the hydraulic press. In this project press frame, cylinder and press table are designed by the design procedure. They are analyzed to improve their performance and quality for press working operation. Using the optimum resources possible in designing the hydraulic press components can effect reduction in the cost by optimizing the weight of material utilized for building the structure. An attempt has been made in this direction to reduce the volume of material. So in this paper we consider an industrial application project consisting of mass minimization of H frame type hydraulic press. This press has to compensate the forces acting on the working plates and has to fulfill certain critical constraints. Here we use implementation for analysis and optimization of hydraulic press. The aim of this paper is to integrate the mechanical system of hydraulic press with hydraulic system to facilitate the ease of operation to manufacture the smaller parts in a bulk. In the present scenario, time constrain is a crucial part for completion of any production process. Thus with the aid of atomization, the production time can be reduced as well as higher degree of accuracy can be achieved as the human efforts will be alleviated. Thus an attempt has been made to provide the smooth and rapid functioning of press work with the help of hydraulic system.

KEYWORDS: Hydraulic press, optimisation, Hydraulic press.

I. INTRODUCTION

Hydraulic press is a tool to produce compressive force by means of fluid. It depends upon Pascal's principle that the pressure throughout an enclosed entity is constant. By means of hydraulic system larger forces can be produced in contrast with mechanical and electrical systems. Such forces can be used for the press work application such as blanking, punching, piercing, coining, trimming etcetera. Press work is a method of mass production involving the cold working of metals, usually in the form of thin sheet or strip. Press working is one of the extensively employed methods of fabricating parts of intricate shapes with thin walls. Press working processes make use of large forces by press tools for a short time interval which results in cutting or shaping the sheet metal. Since, press working does not involve heating of the parts, close tolerances and high surface finish can be obtained on the part. Since presses can produce components at fairly fast rates, the unit cost of labor for operating the press is fairly low. Press working forces are set up, guided and controlled in a machine referred to as a Press. Thus an attempt has been made to atomize the process of press work using Hydraulic mechanism in press machine. The inputs and outputs of the control system including hydraulic mechanism are solely mechanical such as rotating shaft or reciprocating plunger. The prime remuneration of implementing this system is the movement of the mechanical devices can be operated by means of hydraulic components such as actuators to initiate the movement which could be in the form of lever to apply manually or by means of switches to operate automatically. Furthermore, direction control valves have been implemented to control the directions of piston movements and regulate the same. Thus the whole mechanism has been simplified with the use of hydraulic equipment's. Moreover, the use of pressure control valve and direction control valves makes it easier to regulate the forces and control the speed of the setup.

II. METHODOLOGY

DESIGN CONCEPTS AND CONSIDERATIONS - The machine was designed with provisions for adjustments, such that hydraulic pistons can fit. The hydraulic fluid is pumped manually, thus ensuring that the machine does not require electrical energy.

DESIGN ANALYSIS - Hydraulic cylinders are circular structures in which a piston slides when hydraulic fluid is admitted into it. Hydraulic press is a mechanical device which is based on the Pascal's Law which states that equal intensity of pressure exerts on all direction in a closed system.

MACHINE MANUFACTURING PROCEDURE/DESCRIPTION - A hydraulic is a machine press using a hydraulic cylinder to generate a compressible force. It was the hydraulic equivalent of a mechanical lever. In this project I used four 40 ml hydraulic pistons as cylinders and 50 ml hydraulic piston as a lever by using a bit of applied force through the lever it can press in one point to the end.

USES OF A HYFRAULIC PRESS - Water driven press is utilized for practically all mechanical purposes. However, fundamentally it is utilized for changing metallic items into sheets of metal. In different enterprises, it is utilized for the diminishing of glass, putting forth powders in defense of the restorative business and for shaping the tablets for medicinal use. The other regular employments of the pressure driven presses are as per the following:

1. For pounding vehicles.
2. Fat-Free cocoa powder.
3. For sword making.

III. AIM OF PROJECT

The aim of hydraulic press machine is to generate a large amount of compressive force with the help of hydraulic cylinder. It employs a hydraulic lever in place of a mechanical lever Here the hydraulic press machine is used to imprint and emboss the logo on the patch of leather. Secondly if the die and heating assembly is removed from the ram the machine can also be used to remove the bends and purposefully bend the job.

IV. CONSTRUCTION

The following components are involved in Hydraulic press:

1. Frame (Body)
2. Hydraulic Cylinder Hydraulic Pump
3. Piston Rod
4. Pressure Relief Valve

1. Frame (Body): The frame or the body Is used to support and hold other parts of the press. Its primarily used for assembly and forming applications that require a pass-through design for part loading and unloading operations. Materials can be passed from front to back and/or left to right before and after force is applied.



Figure no 1: Frame

2. Hydraulic Cylinder Hydraulic Pump: A range of Hydraulic cylinders are designed & engineered for almost every conceivable application of low, medium and high-pressure hydro Hydraulic Power Pack is important and essential Parts of Hydraulic Machine with complete Hydraulic system.



Figure no 2: Hydraulic Cylinder Hydraulic Pump

3. Piston Rod: Hand operated hydraulic pumps convert mechanical energy into hydraulic energy [combination of pressure and flow] by delivering hydraulic fluid under pressure through directly applied manual effort. They use the simple principle of handle providing leverage to an internal piston.



Figure no 3: Piston Rod

4. Piston Rod: Plunger or piston “rod load” is an important power and design consideration for reciprocating pumps. Rod load is the force caused by the liquid pressure acting on the face of the piston or plunger. This load is transmitted directly to the power frame assembly and is normally the limiting factor in determining maximum discharge pressure ratings. This load is directly proportional to the pump gauge discharge pressure and proportional to the square of the plunger or piston diameter. Occasionally, allowable liquid end pressures limit the allowable rod load to a value below the design rod load. It is important that liquid end pressures do not exceed published limits.



Figure no 4: Piston Rod

5. Pressure Relief Valve: Pressure relief valves are used in hydraulic systems to limit the system pressure to a specific set level. If this set level is reached, the pressure relief valve responds and feeds the excess flow from the system back to the tank. The pressure relief valve is a normally closed pressure control valve.



Figure no 5: Pressure Relief Valve

V. WORKING

The hydraulic press works on the principle of Pascal's law, which states that when pressure is applied to a confined fluid, the pressure change occurs throughout the entire fluid. Within the hydraulic press, there is a piston that works as a pump that provides a modest mechanical force to a small area of the sample. Here a manually (hand) operated pump is been used to pump the hydraulic oil into the cylinder. As the oil enters the cylinder the piston gets pushed. At the end of the rod a heating coil is been placed to heat up the die attached to it as per requirement The heated die heats punches in the leather and the print gets embossed on the material (leather).

ADVANTAGES AND DISADVANTAGES

Advantages:

- Capacity of high tonnage
- It is safe compared to mechanical press
- Less noise
- Generates immense amount of pressure
- Easy to use

Disadvantages:

- The pressure is regulated at ascertain level and cannot exceed more than that
- Some hydraulic fluids are flammable
- The operational speed is low.
- They consume high energy.
- There is a carbon footprint.
- There is possibility of hydraulic fluid leakage.

VI. CONCLUSION

In conclusion, the hydraulic press machine made is capable of producing high amount of pressure. The aim of the project which is to imprint and emboss on the leather with the help of press and heating arrangement is achieved.

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