

# Hydraulic Workpiece Holding Device

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**Abstract:** A bench vice is a tool used to hold or clamp a workpiece to allow operations such as cutting, filing, milling, drilling, grinding, etc. It is usually made from cast iron with a fixed jaw and another parallel jaw which moves towards or away from the fixed jaw using the screw. Design and fabrication of a modified vice to improve the productivity, flexibility and comfortability of the existing bench vices have been achieved in this study. In this vice, we can also hold components of different shapes with the help of the adjustable jaws that can be provided if needed. A lever slides the movable jaw, using a lead screw for forward and reverse movement of the movable jaw. Hydraulic machine vice can be used for all types of machines.

**Keywords:** Design and fabrication of a modified vice to improve the productivity

## I. INTRODUCTION

A hydraulic bench vice is a specialized type of vice used in metalworking, woodworking, and other applications where secure clamping and holding of workpieces is required. Unlike traditional bench vices that rely on manual screw mechanisms to tighten and hold objects in place, hydraulic bench vices use hydraulic fluid and a cylinder to exert a controlled and powerful clamping force. Here's some background information on hydraulic bench vices: Hydraulic bench vices are equipped with a hydraulic system that includes a hydraulic cylinder, a piston, and hydraulic fluid (usually oil). When pressure is applied to the hydraulic fluid, it exerts force on the piston, which then pushes the movable jaw of the vice to clamp the workpiece securely. Hydraulic bench vices can provide a significant clamping force, making them ideal for tasks that require a strong grip on workpieces. The hydraulic system allows for precise control of the clamping force, making it suitable for a wide range of materials and applications.

## II. PROBLEM STATEMENT.

During machining, holding the component firmly is always a crucial task. Workpiece never has the same size, shape and material. It requires different forces and different sizes of clamping jaws. In an ordinary vice, the human power requirement is more to tighten the heavy jobs, but in the machine vice, the hydraulic arrangement is used to tighten the job automatically. In this paper, reduction of human effort and enhancing safety play a vital role while designing and fabricating the machine vice, which is used to hold the components during heavy machining works. In normal machine vice, the human labor involved in operating the handle to grip the component tightly is more. Excess amount of human effort generally results in damage to the workpiece. This may be avoided using hydraulic machine vice, in which the workpiece cannot be damaged while clamping the job, as only adequate amount of pressure is exerted to tighten the job.

## SOLUTION

Hydraulic bench vice using hydraulic bottle jack, its lift a perfect solution to the above problem where in bending force is generated is quit large about (3 ton) with minimum human effort

The hydraulic clamping uses a hydraulic jack in conjunction to apply a gradual force up to 3000 N

Loading is done by operating handle of jack which carries the cutting action resulting in safe and damage free operation.

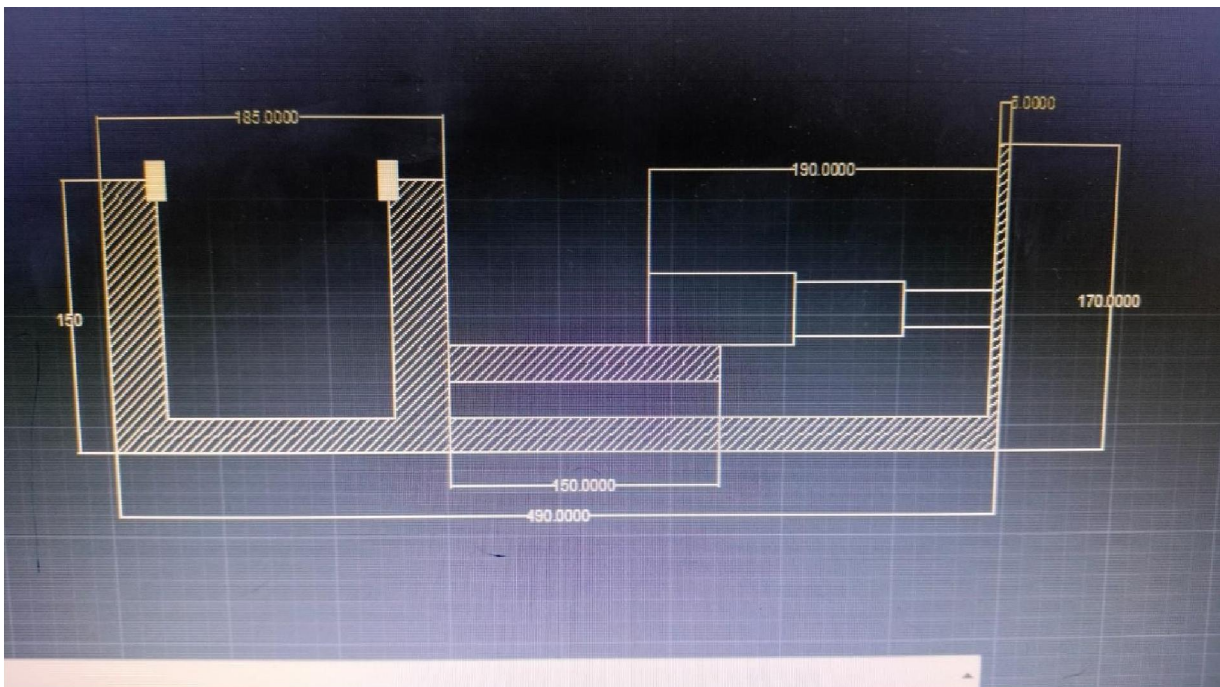
### III. MATERIAL USED

Metal used Hydraulic bench vies are typically constructed using a combination of strong and durable metals to ensure their stability and strength under heavy loads. While the specific choice of materials may vary among manufacturers and models, here are the common metals used in the construction of hydraulic bench vies.

- **Cast Iron:** Cast iron is often used for the main body or frame of the vice. It provides stability and rigidity, making it ideal for the base and stationary jaw of the vice.
- **Steel:** Various steel components are used in hydraulic bench vies, including the jaw faces, guide bars, clamping screws, and other structural elements. Steel is known for its high strength, wear resistance, and ability to withstand the clamping forces applied during use.
- **Stainless Steel:** Stainless steel may be used in parts exposed to moisture and corrosion, such as screws, fittings, or other fasteners. Stainless steel is highly resistant to rust and corrosion.

The combination of these metals and materials is carefully selected to ensure the hydraulic bench Vice's robustness, stability, and longevity. The choice of materials can depend on factors such as the intended use of the vice, quality standards, and the manufacturer's design. Regular maintenance, including cleaning and lubrication, is essential to extend the lifespan and maintain the performance of a hydraulic bench vice

### IV. DESIGN



### V. WORKING SYSTEM

Unlike the lead screw we would expect from a more conventional vice this one is uses a hydraulic jack  
 A substantial /vice frame is constructed around the cylinder from thick steel plate with some careful welding and grinding to ensure a smooth finish  
 The result is substantial clamping force with a very smooth and quick action which doesn't over change the edge of the bench in the way a more traditional one does.  
 The handle to be helped for operating the jack to move sliding jaw



#### VI. CONCLUSION

A Hydraulic /vice is one of the most versatile tools in the fitting and assembly workshops which firmly support and hold the workpiece to perform varying operations like; drilling, striking, filing, etc. The main advantage of the hydraulic vice is that it reduces human effort, working time. The expense we contribute for making this can be got from the production. Because this device reduces the production time, so that production per day increases, because of that profit increases. This hydraulic bench is a very useful and helpful device for the workshop and industries. The smooth and accurate holding of work piece increases the quality of work by using this device.

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