ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 7, Issue 3, March 2020

Fabrication of Hydraulic Bench Vice for Time, Quality, Production

Saikiran K S[1], Sivaprasad M[2], Edwin Joy Pulikkottil[3]

Diploma student, Mechanical Engineering Department, MTI Thrissur, India[1]
Diploma student, Mechanical Engineering Department, MTI Thrissur, India[2]
Lecturer, Mechanical Engineering Department, MTI Thrissur, India[3]

Abstract: Hydraulic bench vice with a hydraulic power pack, the hydraulic vice is capable of holding small and minute work pieces with a large force thus enabling accurate and precise operation. The project combines the advantages of hydraulics, thus eliminating the drawbacks that may be associated with the use of fluid power Also the hydraulic pressure pack amplifiers the force with which the vice grips the work piece. The highlights of this hydraulic bench vice are that it is very economical, accurate, and easy to operate and has wide variety of applications.
Keywords: Hydraulic bench vice with a hydraulic power pack, precise operation

I. INTRODUCTION

Fluid power is the technology that deals with the generation, control and transmission of power using pressurized fluids. Fluid power systems are generally grouped under two broad classifications. These are hydraulics and pneumatics Hydraulic systems uses liquids such as petroleum oil, water, synthetic oil etc.

Pneumatic system uses air or other gases, Liquids provide a very rigid medium for transporting power and thus can provide large forces to move loads with almost accuracy and precision. On other hand pneumatic systems are less expensive to build and operate. Fluid power equipment ranges in size from huge hydraulic presses to small fluid components used to build reliable control systems.

II. OBJECTIVES

The main objectives are:-

- To reduce man power
- To increase the efficiency of the plant
- To reduce the work load
- To reduce the production cost
- To reduce the production time
- To reduce the material handling
- To reduce the fatigue of workers
- To achieve good product quality
- Less maintenance

III. MATERIALS AND COMPONENTS USED

A. Materials required:-

•MDF(Medium density fiberboard)

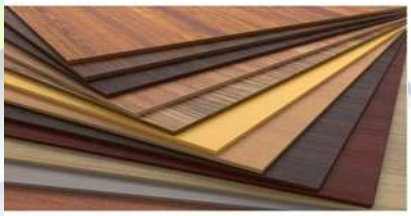

Fig. 1 MDF

MDF is very cheaper material.So its economic value is very higher, It can be stained and can be looked as real wood. The another main advantage is that it have excellent machining character for its suitable density.

•GI square pipe:-

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 7, Issue 3, March 2020

Fig. 2 GI square pipe

•Mild steel :-Used for making frame for mounting pump, motor

B. ***Components used for the project are:-***

Reservoir tank

Fig. 3 Reservoir tank

- PU tube

Fig.4 PU tube

PU tube is Poly urethane tube. It has the properties of plastic and rubber. It also offers tear resistance

- 5/2 Valve

Fig. 5 5/2 Valve

It have 5 ports,2position valves that will help fluid in to one end of double acting device, also other end to exhaust. In one position inlet port is connected to output port also the hydraulic cylinder is extended.

- Rotary vacuum pump

Fig.6 Rotary vacuum pump

The rotary vane vacuum pump is a rotary displacement pump with sealed oil. It consist of eccentrically installed rotor, radial springs, inlet port and outlet port. Outlet port is oil sealed.

- *Double acting* cylinder

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 7, Issue 3, March 2020

Fig.7 Double acting cylinder

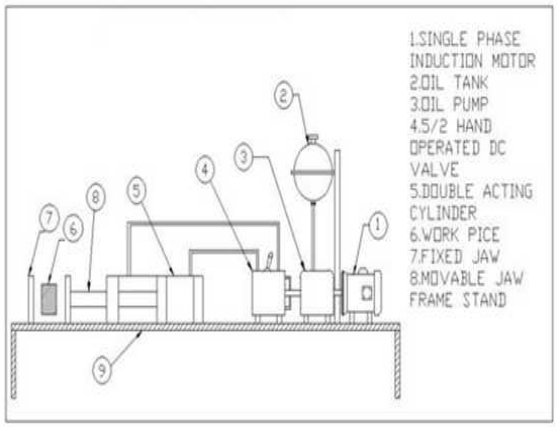

Fig.8 Model-Line diagram

It has two ports at each end, both having extension to other pipes. With the aid of spring, it functions smoothly. When the required pressure reaches, pump goes to neutral position.

IV. WORKING PRINCIPLE

The hydraulic bench vice with power pack has a hydraulic pump, which works when Ac current comes to the motor which is coupled with pump. When the hand lever in the 5*2 valve is operated or moved in the to and fro motion, the hydraulic fluid in the hydraulic pump moves through the tube and moves the piston of the hydraulic cylinder in the forward direction.

The hydraulic cylinder piston moves the movable jaw in the forward direction with the piston movement. When the pressure is applied through the hydraulic cylinder, the hydraulic cylinder piston moves the movable jaw of the clamping device in the forward direction and makes jaw to come closer to the fixed jaw and clamps if any work piece is held in between the movable and the fixed jaw. When the fluid enters to the opposite side of the position through the working 5*2 valve the piston moves backward and unclamping of work piece occurs.

V. ADVANTAGES AND DISADVANTAGES

A. ***Advantages:-***

- Reduces the working time in holding the work pieces.
- Accuracy in holding when compared to ordinary to ordinary vices.
- Less effort required.
- Increases the productivity.

B. ***Disadvantages:-***

- In hydraulic system leakages will be there.
- Dirty premises.
- Expanse of components in hydraulic system.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 7, Issue 3, March 2020

VI. DESIGN OF VICE

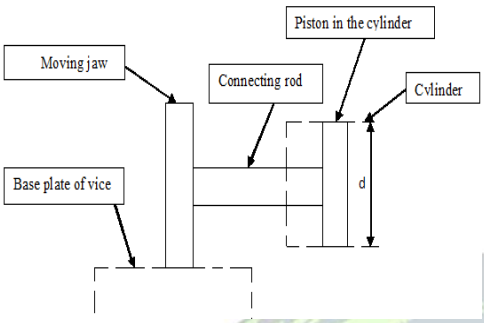

Fig.9 Design of vice

The whole weight of the part that is the sliding jaw welded with the piston of the hydraulic cylinder with a connecting rod is acting on the base plate of vice and cylinder holding the piston.

The force required to move the weight acting on the base plate of vice= $\mu 1 \times W1$

$\mu 1$=Coefficient of friction of base plate of vice

W1=Weight acting on the base plate of vice

The force required to move the weight acting on the cylinder=$\mu 2 \times W2$

$\mu 2$=Coefficient of friction of cylinder

W2=Weight acting on the cylinder

The minimum force required to move the whole body= $((\mu 1 \times W1)+(\mu 2 \times W2))/2$

The force acting on the piston by the fluid should be equal to or more than this men minimum force

The pressure of the liquid should be therefore equal to more than $(((\mu 1 \times W1)+(\mu 2 \times W2))/2)/((\pi \times d^2)/4)$

VII. CONCLUSION

The main advantage of the hydraulic bench vice is that it reduces human effort, working time. The expanse 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.

ACKNOWLEDGMENT

We sincerely acknowledge my word of thanks to our principal Mr. C.P.Unnikrishnan, MTI Thrissur for his support by providing inspiration. We feel immense happy in acknowledging our sincere thanks to Mr. Anzil.N S., HOD Mechanical, MTI Thrissur We extend my gratitude to Mr. Edwin Joy Pulikkottil, Lecturer, MTI Thrissur for his kind support in completion of this project. We also thankful to our guide Mr. Reuben Thomas for his valuable help during completion of this paper. We also giving our thanks to MTI Mechanical staff and our team members.

REFERENCES

[1]. Edwin Joy Pulikkottil, Anand P," The Effect of Nano TiO2 Filler Weight on the Mechanical Properties of Chopped Strand Mat Reinforced Epoxy Composite", International Journal of Research, ISSN NO:2236-6124, Volume VIII, Issue V, MAY-2019, pages 1115-1124

[2]. M. Ranjitkumar " Design and analysis of manually operated floor cleaningmachine'', vol:2 Issue 16, March – 2015

[3]. F. Bétin, " Design for Electrical Machines'' International Journal of Electrical Engineering & Technology , vol:1 Issue 22, August– 2016.

[4]. A.Javidinejad, " Structured Teaching of Machine Design for Future Design Engineers'', International Journal of Mechanical Engineering and Technology,3(2), 2012, pp. 120–127.

[5]. C. Anuchandran, '' Design & Fabrication of Bench vice'' International Journal of Application or Innovation in Engineering & Management, Volume 4,Issue 7, July 2015.

[6]. A.S.Kadam, ''Design &Fabrication of vices '' Department of Mechanical Engineering, Indian Institute of Technology Delhi,Volume 5, Issue 1, June -2012.

[7]. L.Vardhaman ,''semi-automatic floor cleaning machine'' International Journal of Design and Manufacturing technology(IJDMT), volume 8, Issue 1, January, April 2016.