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Design and Fabrication of Imprint Machine

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Abstract: ***This Research Paper aimed at automating the process of marking serial numbers or identification codes on metal, wood, plastic components. This Machine accurately punch numbers onto metal, wood, plastic parts with varying sizes and thicknesses. The machine's design includes a robust frame, a pneumatic system, and a control system that allows for precise control of the number punching process. The punching mechanism consists of a series of hardened steel punches that can be easily replaced and adjusted to accommodate different numbers and character sizes. The control system allows operators to input the desired serial number or identification code, control the punching force, and regulate the individual spacing. The machine also includes safety to prevent injury to operators and damage to the metal parts. Overall, the design and fabrication of a imprint machine for metal parts will provide an innovative solution for manufacturers looking to streamline their product identification process.***

Keywords: Imprint Machine, Pneumatic System, Punching mechanism, product identification, Automation.

I. INTRODUCTION

In today automobile and industrial world, Pneumatic system play a vital role, it is actually an arrangement of different elements in order to regulate, direct, sense and command itself to achieve the desired result. In Pneumatic system working media is fluid power. Imprint machine operated by a pneumatic system uses compressed air to control its operation. The machine typically consists of a fixed mechanism that holds a punch or stamp. The compressed air is used to power the tool's punching action, which is typically a downward force that stamps a number or character onto a surface.

The pneumatic system includes an air compressor, air reservoir, and a series of valves and hoses that deliver the compressed air to the tool. The air compressor draws in air and compresses it to a high pressure, which is stored in the air reservoir. The valves and hoses control the flow of compressed air to the tool and can be adjusted to control the speed and force of the punching action.

II. WORKING OF IMPRINT MACHINE

1) First step of working is Load the metal part onto the machine, The component to be punched with numbers is loaded onto the machine fixed Base plate or on the conveyors as shown in fig. 3.
2) The metal part is aligned by the operator that ensures the numbers will be punched in the correct location on the part.
3) The machine is activated using solenoid valve to allow compressed air to flow into the pneumatic cylinder to extend the piston and move the punching tool downwards.
4) Pneumatic cylinder moves the punching tool, As the pneumatic cylinder extends the piston, and strikes on the hardened steel punch
5) The quick exhaust valve is mounted between the pneumatic cylinder and solenoid valve. It is used to accelerate the venting capacity to vent the pneumatic actuator more quickly

III. COMPONENTS OF PNEUMATIC SYSTEM

A. Air Compressor [2]

An air compressor is an important component of the pneumatic system. It is a tool which pressurized the atmospheric air with the help of electric motor, Engine. Atmospheric air is pressured in huge amount right into a storage tank and through that, pressure is increased. When the pressure withinside the tank is reached to the top restrict the air compressor is shuts off. This compressed air is held in tank with pressure except and till it's far known as for use. This saved energy in the shape of compressed air is used for numerous applications. When the air is released form the tank to carry out operation on the time the tank is depressurized. After a continues use the pressure of tank is reduced. When this pressure reached to lower limit the air compressor is turned on and pressure is increase in the tank. Electric and gas/diesel powered compressor are the most preferred types of the compressor. We can find out in reserve compressed air capacity with the assist of gallon size of the tank. HP (Horsepower) and CFM (Cubic Feet of Air consistent with Min) are the units used to be measured the power of compressor.

Electric powered compressors are widely used in workshops, industries and garages where electricity is easily available. Common workshop compressor is 110 to 120V OR 230 to 240V and mostly used in remote areas where there is not available of electricity. Compressor tank may be produced in numerous shapes relying at the purpose and size of compressor like horizontal, vertical, twin tank etc. Compressor may be stationery or transportable as pre requirement

B. Double Acting Cylinder[2]

Double acting cylinders have two parts one is outstroke and the other is in stroke. It uses the force of pressurized air to moves in extraction and retraction stroke. When the piston rod is unprotected for punching and sharing, then the stroke length of piston isn't always confined. The numerous cylinder sizes from 2.5mm that is used for peaking components.

C. Filter, Regulator, Lubricator[2]

In FRL, the air leaving from the compressor is grimy and moist and consequently it can be filtered, regulated and lubricated before use. Otherwise, it is able to harm and decrease the life of the equipment like valve and cylinder. In this the air is strained and trap solid particle's and separates the liquid from the compressed air. Filter set up in the line of regulator, dcv etc. The airline filters are performing safe operations like removing the contaminants from pneumatic system.

D. Pneumatic Exhaust Valve [10]

Quick exhaust valves are mounted on the rod or blind end of a pneumatic cylinder to offer a quick extension and retraction of the equipment. Quick exhaust valves function with the aid of increases the speed of the pneumatic cylinder's rod in order to remove the exhaust air on the port of the cylinder directly.

IV. DESIGN CALCULATION

Pneumatic Cylinder Force calculation

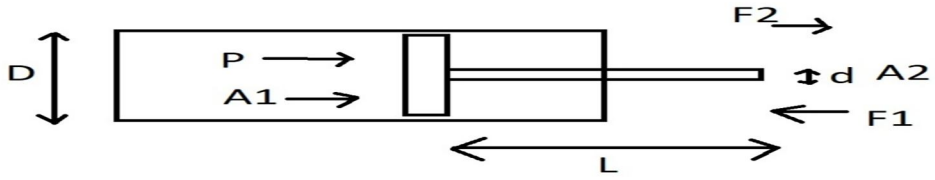
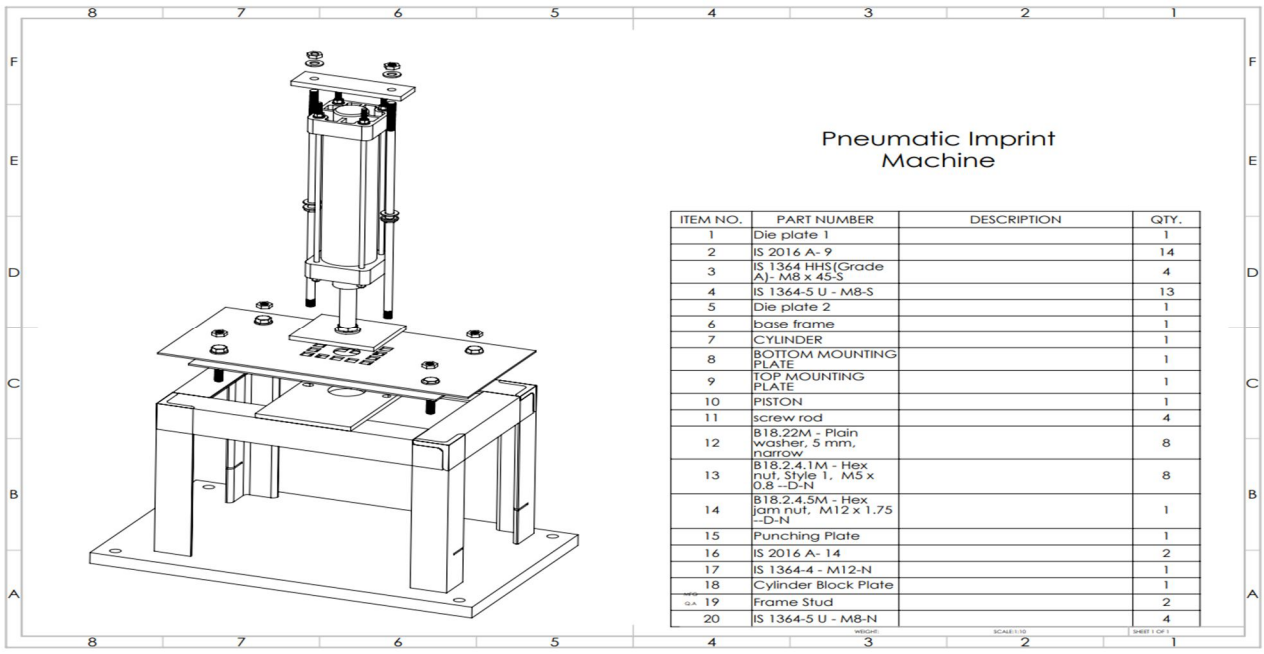


Fig.1

From fig. 1,
D- Bore dia. or Piston diameter(mm)
d Piston rod diameter (mm) -
P- Operating pressure(BAR)
A1- Area of Bore diameter (m * m ^ 2)
A_2- Area of piston rod diameter
L- stroke (mm)
D = 50mm
d 16 mm
P = 5 bar
1 = 15 ^ (- m) * m (stroke length)
For calculation of Area,
Forward area=3.142*d^2/4
(A1) = 1963.49mm^2
Return area (A2) =3.142*[D^2*d^2]/4
= 1762.43m * mm^2

- Force calculation.

Thrust force = Forward Area* P/10
Traction force = [Return area. P/10]/pull force
Now,
Theoretical-
F. Thrust Force (Forward stroke Force)
=981.75 N
Pull Force C Reverse stroke force)= 8812 N
Practical Values
Forward stroke Force = 736.31 N
Reverse stroke Force 660.91



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Die plate 1		1
2	IS 2016 A- 9		14
3	IS 1364 HHS(Grade A)- M8 x 45-S		4
4	IS 1364-5 U - M8-S		13
5	Die plate 2		1
6	base frame		1
7	CYLINDER		1
8	BOTTOM MOUNTING PLATE		1
9	TOP MOUNTING PLATE		1
10	PISTON		1
11	screw rod		4
12	B18.22M - Plain washer, 5 mm, narrow		8
13	B18.2.4.1M - Hex nut, Style 1, M5 x 0.8 --D-N		8
14	B18.2.4.5M - Hex jam nut, M12 x 1.75 --D-N		1
15	Punching Plate		1
16	IS 2016 A- 14		2
17	IS 1364-4 - M12-N		1
18	Cylinder Block Plate		1
19	Frame Stud		2
20	IS 1364-5 U - M8-N		4

Fig.2 shows exploded view

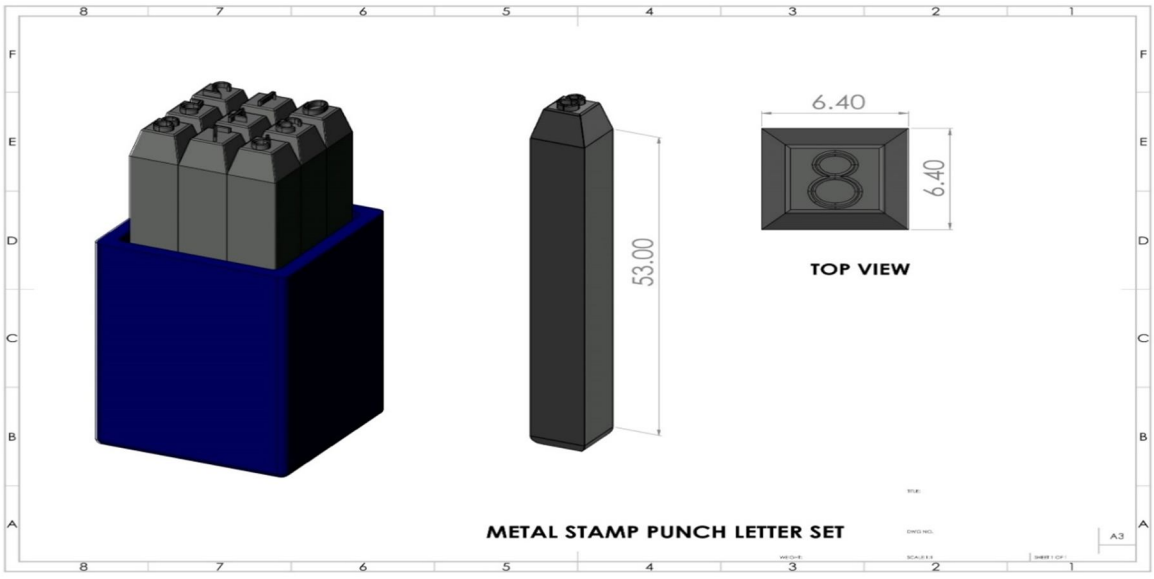
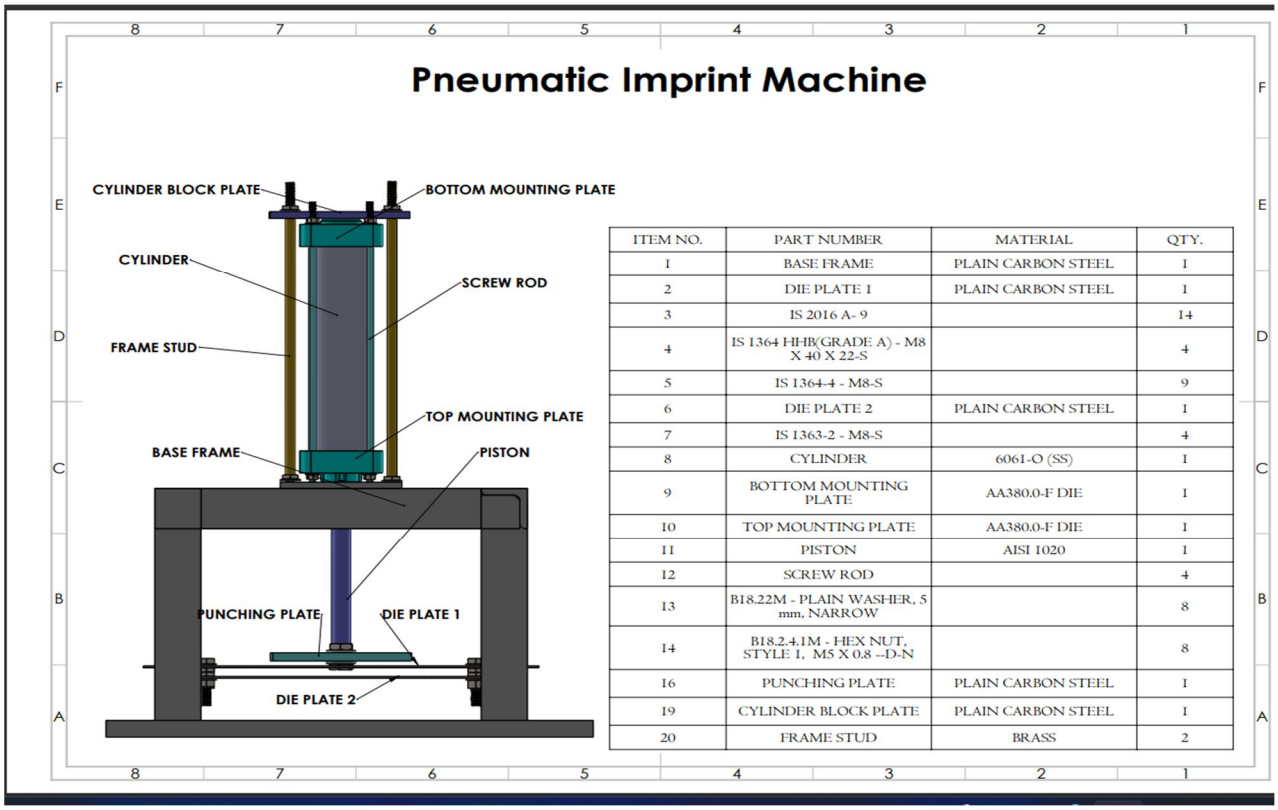
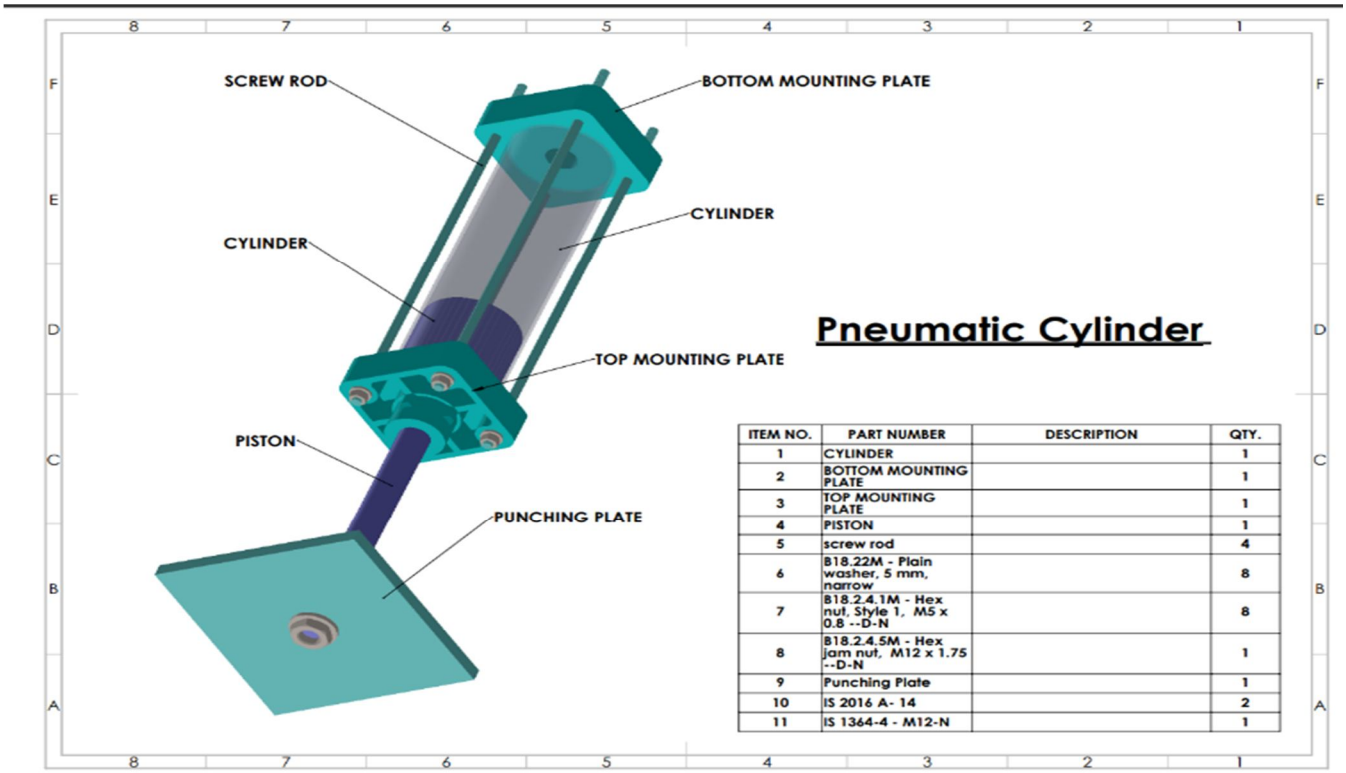


Fig. 3 Hardened Steel Metal Punch Letter Set



ITEM NO.	PART NUMBER	MATERIAL	QTY.
1	BASE FRAME	PLAIN CARBON STEEL	1
2	DIE PLATE 1	PLAIN CARBON STEEL	1
3	IS 2016 A- 9		14
4	IS 1364 HHB(GRADE A) - M8 X 40 X 22-S		4
5	IS 1364-4 - M8-S		9
6	DIE PLATE 2	PLAIN CARBON STEEL	1
7	IS 1363-2 - M8-S		4
8	CYLINDER	6061-O (SS)	1
9	BOTTOM MOUNTING PLATE	AA380.0-F DIE	1
10	TOP MOUNTING PLATE	AA380.0-F DIE	1
11	PISTON	AISI 1020	1
12	SCREW ROD		4
13	B18.22M - PLAIN WASHER, 5 mm, NARROW		8
14	B18.2.4.1M - HEX NUT, STYLE 1, M5 X 0.8 --D-N		8
16	PUNCHING PLATE	PLAIN CARBON STEEL	1
19	CYLINDER BLOCK PLATE	PLAIN CARBON STEEL	1
20	FRAME STUD	BRASS	2

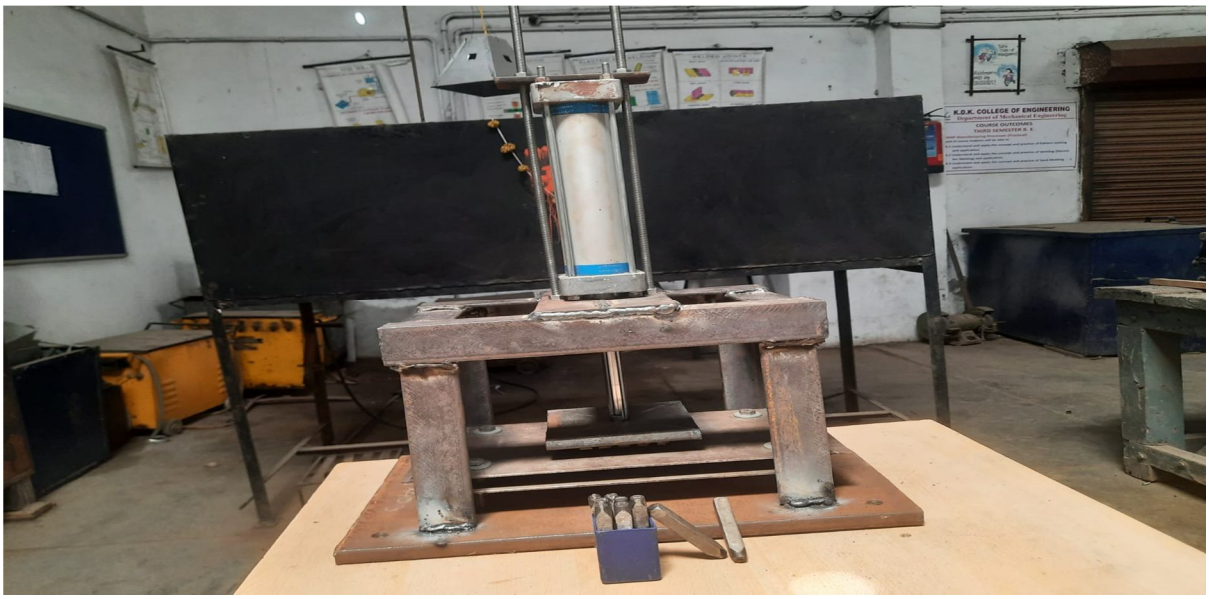
Fig.4 shows the assembly of imprint machine



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	CYLINDER		1
2	BOTTOM MOUNTING PLATE		1
3	TOP MOUNTING PLATE		1
4	PISTON		1
5	screw rod		4
6	B18.22M - Plain washer, 5 mm, narrow		8
7	B18.2.4.1M - Hex nut, Style 1, M5 x 0.8 --D-N		8
8	B18.2.4.5M - Hex jam nut, M12 x 1.75 --D-N		1
9	Punching Plate		1
10	IS 2016 A- 14		2
11	IS 1364-4 - M12-N		1

Fig.5 shows pneumatic cylinder and punching plate assembly of the imprint machine

A] Actual photograph of Imprint Machine



V. CONCLUSION

1) The successful design and fabrication of the Imprint machine has demonstrated the feasibility and practicality of the concept. The machine is capable of accurately and efficiently punching numbers on a variety of materials, making it suitable for use in a range of applications.

2) The results of our testing and evaluation indicate that the machine meets the requirements set out in the design specifications, including speed, accuracy, and reliability. We believe that this machine has the potential to be a valuable tool for businesses and organizations that require precise numbering on their products.

3) Future research and development could explore the possibility of incorporating additional features into the machine, such as variable font sizes or the ability to punch letters and symbols. Additionally, further testing and optimization could be conducted to improve the speed and efficiency of the machine.

4) Overall, the design and fabrication of the Imprint machine has been a challenging and rewarding project that has provided valuable insights into the engineering design process. We believe that this project has the potential to inspire further innovation in the field of industrial automation and machinery.

REFERENCES

[1] A REVIEW by Bhushan V. Golechha, Prashant S. Kulkarni M. Tech Student, Dept. of Mechanical Engg. MIT, Aurangabad Assistant professor, Dept. of Mechanical Engg. MIT, AurangabadVol-3 Issue-1 2017 IJARIIE-ISSN(O)239543963686 www.ijariie.com 414 DESIGN, ANALYSIS AND OPTIMAZATION OF 10 BAR PNEUMATIC PRESS MACHINE

[2] Aniket N. Sanap, Mechanical Department, Loknete Gopinathji Munde Institute of Engineering Education & Research Nashik, India volume 3, Issue 3, March–2018 International Journal of Innovative Science and Research Tech Introduction & Overview of Pneumatic Press with Various Attachment

[3] Ankit H Parmar and et al, “Design and Modification of Foremost Element of Hydraulic Press Machine”, International Journal of Advanced Scientific and Technical Research, Issue 4, Vol. 3, 2014

[4] Bhavesh Khichadia, Dipeshkumar Chauhan, “A Review on Design And Analysis of Mechanical Press Frame”, International Journal of Advance Engineering and Research Development, Volume 1, Issue 6, 2014

[5] B. Parthiban and et al, “Design and Analysis of hydraulic press structure and cylinder”, International Journal of Research in Aeronautical and Mechanical Engineering, Vol.2 Issue.3, pp. 47-56, 2014.

[6] D. Ravi, “Computer Aided Design and Analysis of Press”, Middle-East Journal of Scientific Research 20 (10): pp.1239-1246, 2014

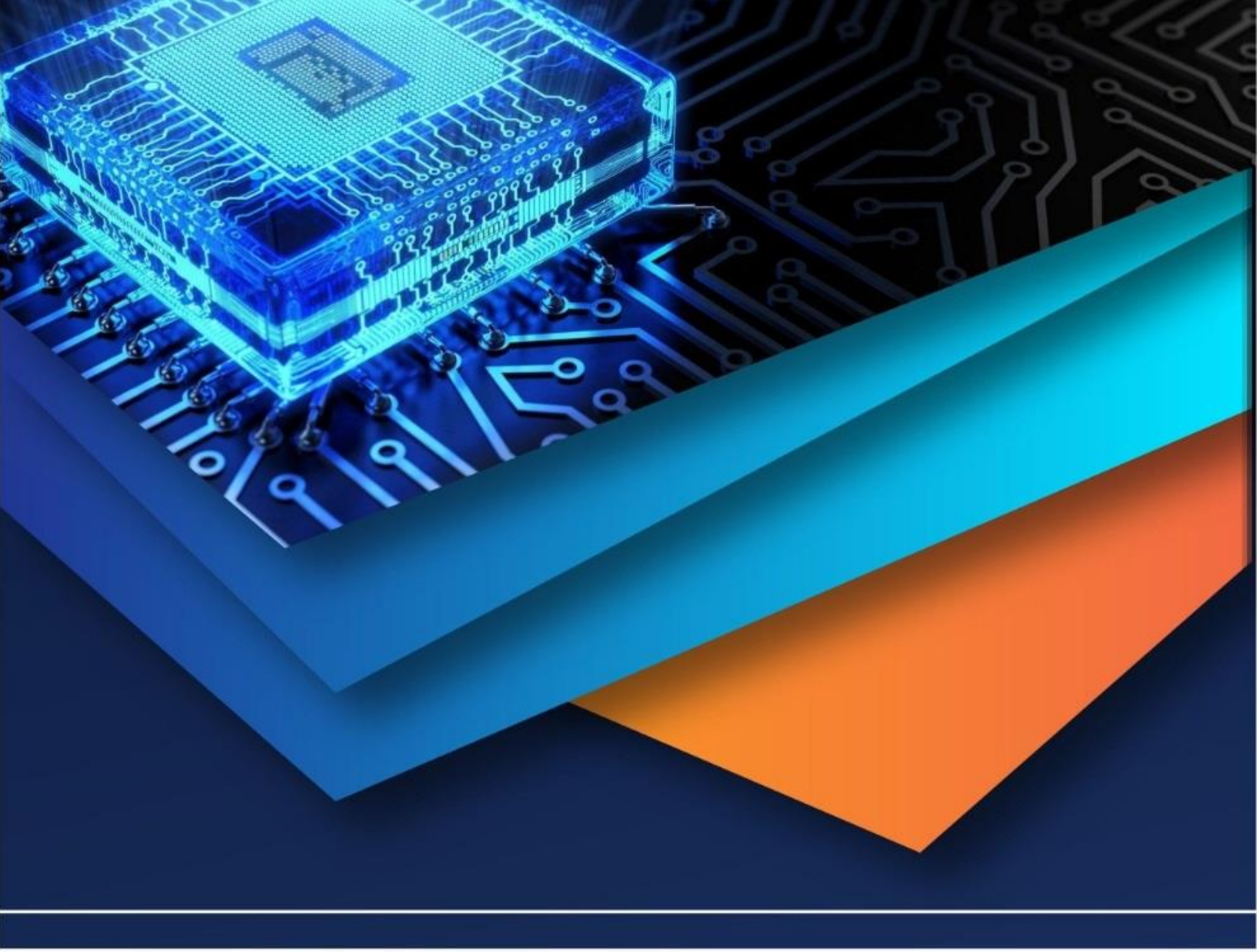
[7] Santoshkumar S. Malipatil and et al, “Analysis and Structural Optimization of 5 Ton H-Frame Hydraulic Press”, International Journal of Innovative Science, Engineering & Technology, Vol. 1, Issue 5, pp.356-360, 2014

[8] Rajdipsinh G. Vaghela and et.al., “Design and Analysis of C-Frame of 15 Ton Pneumatic Power Press Using FEA ”, Journal of Emerging Technologies and Innovative Research , Vol. 1, Issue 2, pp.78-91

[9] Rangraj S. More, Shreenidhi R kulkarni, “Finite Element Analysis and Optimization of C Type Hydraulic 200 ton press ”, International Research Journal of Engineering and Technologies , Vol.2, Issue 3, pp.1385-1391, 2015

Books :

[10] Pneumatic handbook 1982,SBN:9780872017269, 0872017265,Published:1982,Publisher:Gulf Publishing Company,Original from:the University of California Digitized:4 June 2008 Language:English Editor:Ronald Horace Warring



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