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Low Cost Automated Hammering Machine

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Abstract: ***This Project focus on cad modeling, design, and fabrication of the automatic hammering machine. Our primary goal for this is to design is to eliminate man power and utilize electrical energy for automatic hammering machine. Besides, we tend to obtain the maximum torque by minimizing the r.p.m. of gear which a result it can also control the impact velocity for hammering torque force as per required design of gear and r.p.m., In our project, we are using torque force to perform various manufacturing operations in industries like riveting, upset forging, punching, etc. Also, the time required for operation is less so it is useful in mass production. In this project, we have devised a solid model of project assembly by using Solid works Software. The model consists of a motor, shaft, hammer, spring, pulley, mechanical counter. From this, we erect a conceptual model of an automatic hammering machine. As this s operation is repetitive much more human effort is required which drains energy as well as time. By keeping in mind these parameters, a worker can use this machine to increase productivity. Moreover, if a handicapped person if willing to perform such operation can perform this operation with ease. It is simple in construction and compact in design highly qualified workers are not required. There are various benefits that when industry views while using automated systems. These benefits can be very helpful in the long period. It can be the best and long-lasting product.***
Keywords: Solid works, Automatic, CAD modeling, impact velocity, torque, force

I. INTRODUCTION

A hammer is a tool or device that delivers a blow (a sudden impact) to an object. Most hammers are hand tools used to drive nails, fit parts, forge metal, and break apart objects. Hammers vary in shape, size, and structure, depending on their goals. Hammering is the most widely used industrial as well as installation activity. The hammering of screws, metal sheets, metal parts, etc. requires a lot of time and effort. So, to minimize the time and effort here you are going to build an automated hammering system.

This machine will perform accurate, fast, and automated hammering wherever and whenever needed using a 12V battery. The person just needs to insert the workpiece and start the hammering machine. This machine can be used for automatic hammering work as and when needed. Here you will use a dc motor in order to move the hammer. The DC motor consists of a pulley attached to it which is connected to a larger pulley for efficient power transfer and to increase torque. This large pulley is connected to a shaft that has a connecting rod attached to it. This rod is used to achieve lateral motion from the spinning shaft. We now attach the other end of a hammer to this connecting rod through a mid-swinging arrangement in order to achieve coveted hammer motion with enough torque. We now use a suitable bed where the workpiece can be placed.

A. Slider Crank Mechanism

In this prototype design, we used a slider-crank mechanism to convert rotary motion into linear motion. A crank is an arm attached at a right angle to a rotating shaft by which reciprocating motion is imparted to or received from the shaft. It is used to convert circular motion into reciprocating motion, or vice versa. The arm may be a bent portion of the shaft or a separate arm or disk attached to it. Attached to the end of the crank by a pivot is a rod, ordinarily called a connecting rod (conrod). The end of the rod attached to the crank moves in a circular motion, while the other end is usually constrained to move in a linear sliding motion. The term often refers to a human-powered crank that is used to manually turn an axle, as in a bicycle crank set or a brace and bit drill. In this case, a person's arm or leg serves as the connecting rod, applying reciprocating force to the crank. There is ordinarily a bar perpendicular to the other end of the arm, often with an easily rotatable handle or pedal attached.

B. Components

1) Motor Pulley - Diameter 3 Inch
2) Shaft Pulley – Diameter 9 Inch
3) Main Gear – Diameter 3 Inch
4) Driven gear – Diameter 9 Inch
5) Roller Cam
6) Spring Loaded Arm

7) Adjustable Spring for regulating tension
8) Fixed worktable
9) Hammer-100gm to 1kg

C. Materials

1) Cast iron
2) For gear
3) Pulley
4) Electric motor
5) Mild Steel
6) Nylon Bush
7) Spring
8) Wood

D. Applications

1) In manufacturing industries to perform different operations as follows:
2) To perform smithy operation i.e. upset forging. □
3) To perform the punching operation.
4) To perform filleting operation as torque force produce is sufficient for the operation.
5) To perform riveting operation etc.
6) Easily can Performed by Handicapped.
7) To Perform the Various Operation in Small Industries like Brass Industries, Bronze Industries.

II. LITERATURE REVIEW

A. Design, Cad Modelling & fabrication of automatic hammering machine
B. Development of an automated impact hammer for modal analysis of structures
C. Modification and fabrication of simple power hammer machine

III. METHODOLOGY

A. Evaluation Of Torque, Force

N1 = 1425 r.p.m.
D1 = 40 mm
D2 = 150 mm
N1D1 = N2D2
1425 * 40 = 150 *N2
N2 = 1425 * 40/ 150
N2 = 380 r.p.m.

According to the law of conversation of Energy, Kinetic Energy is converted in to Potential Energy. So, the Final velocity V = 0
Since the Law of Energy states that Energy must be conserved, so Potential Energy

$mgh = 1/2mv^2$
$\sqrt{2gh} = v$

Where g = Gravitational Acceleration
h = Height

$v = \sqrt{2} * 9.8 * 0.165$ (Height is considered when hammer is inclined at 90°)
= 2.28 m /s2

According to Newton's second law of motion,
F = ma
Where, a = v– u / t,
Where, u = 0 m/s

t = 21 sec (t = time required by the hammer to complete one stroke is equal to 21s)

$a \approx 10 m/s^2$

So the value of acceleration i.e. 0.10 m/s2

F = ma

=0.250 kg * 0.10 m/s2 (mass of hammer is approximately taken as 0.25 kg)

= 0.025 N

Here, Induced motor is used which have 0.25 HP. This motor has primary gear with diameter of 40 mm and rotates with 1425 r.p.m.

HP = T * r.p.m. / 5252

T = 0.25 * 5252 /1425

T = 0.921 N-m

This is Torque produced in Induced Motor

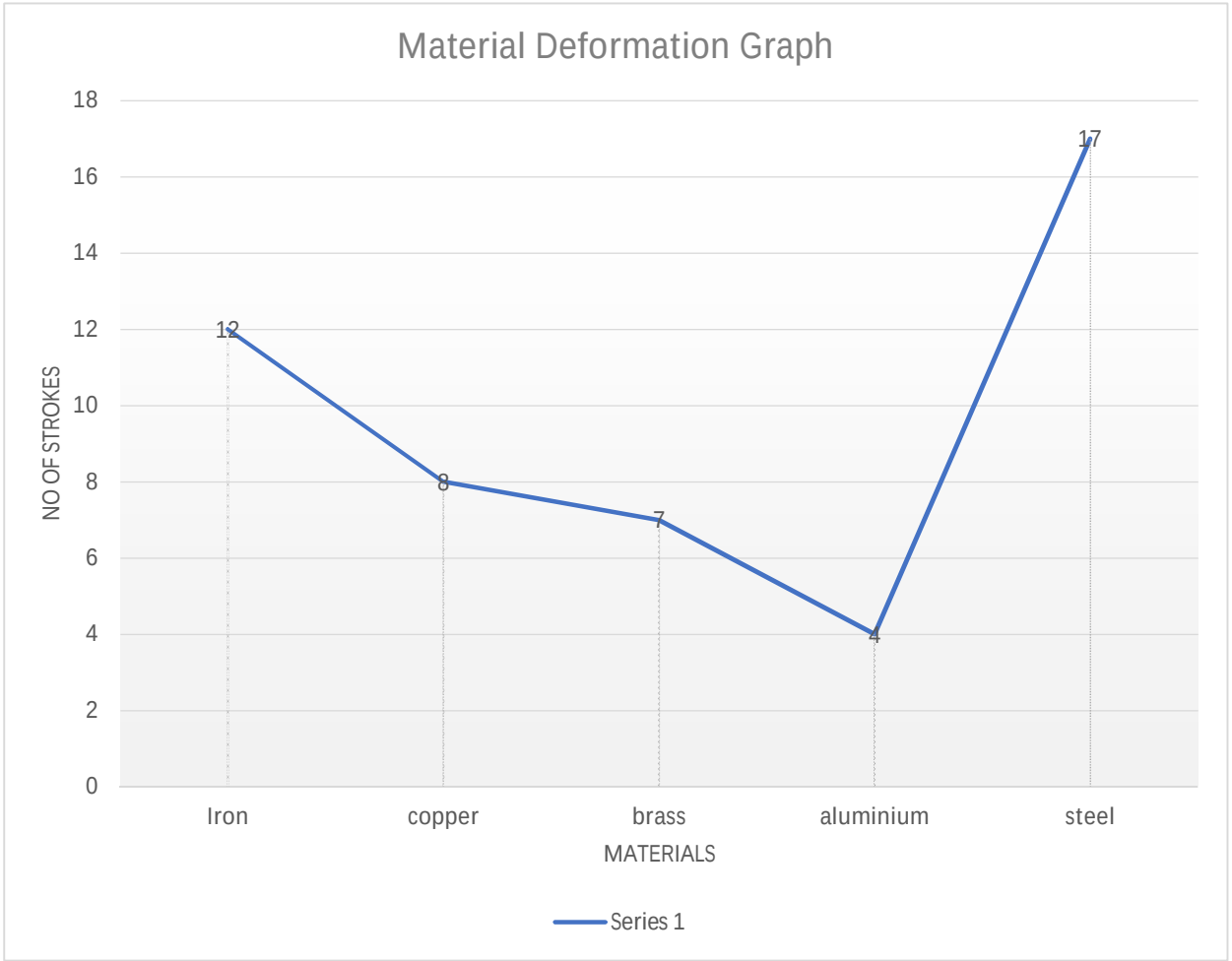
Now, the Torque produced in Hammering Operation

HP= T*r.p.m/5252

T= HP * 5252/ 380

= 3.455 N- m (Thus, Torque is increased by 3.75 times)

B. Analysis



IV. CONCLUSION

The entire modelling of the project is done with the help of Solid works. In this addition to this. The project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding. Planning, Perching, assembling and machining while doing this feel that the project work is good solution to bridge the gates project work. We between institutions and industries. We are proud that we have completed the work with limited time successfully. We have done to our ability and skill making work.

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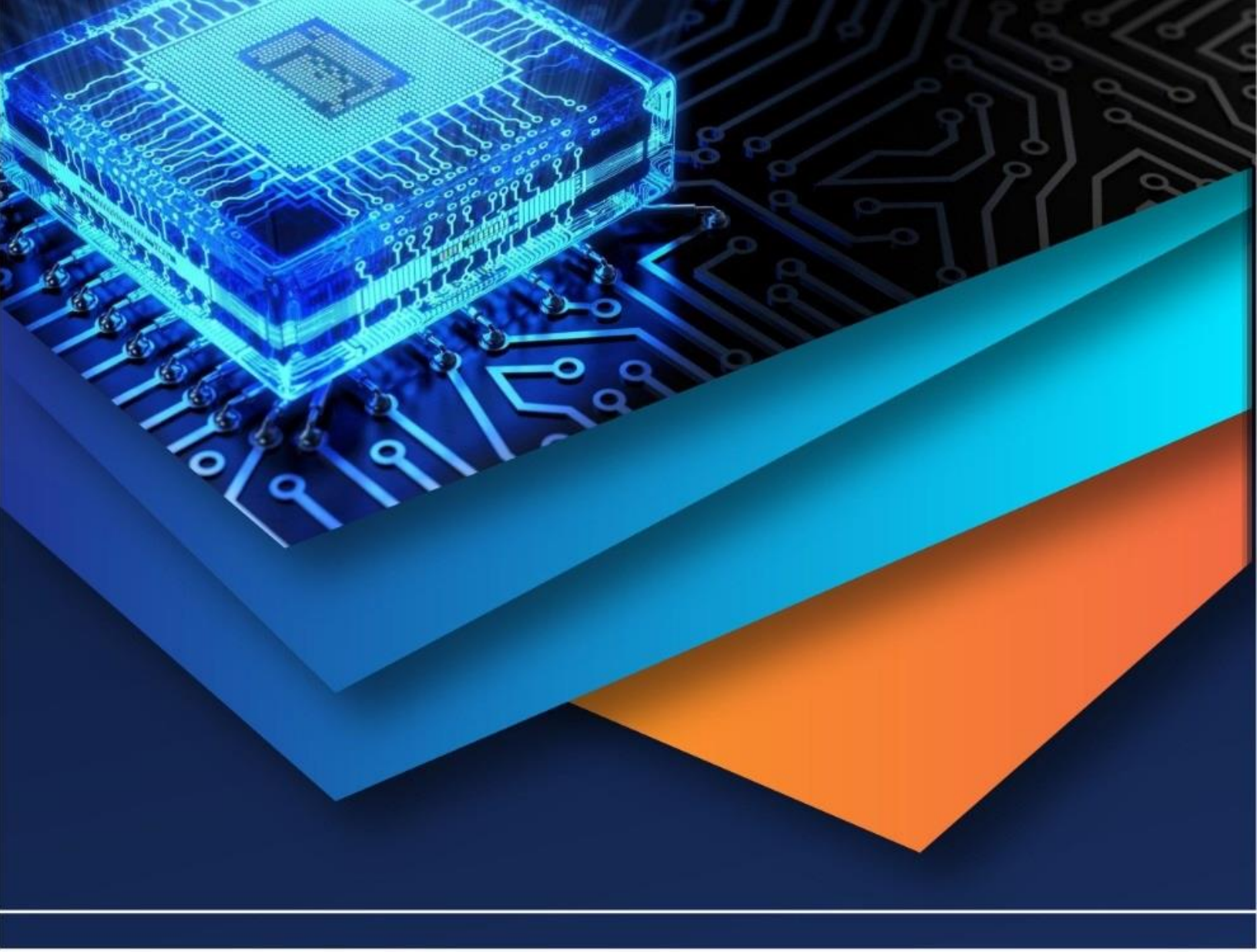

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