Design & Fabrication Of Automated Portable Hammering Machine

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Abstract : **:** Hammering is the most widely used industrial as well as construction activity. Hammering or screws, metal sheets, parts etc requires a lot of time and effort. So here we propose an automated hammering system that allows for fully automatic hammering process. This allows for accurate, fast and automated hammering wherever and whenever needed using a 24V&25W dc motor..We can use Photo electric sensor for metal detection purpose at workpiece bed. The person just needs to insert workpeice and start the hammering machine. We are using dimmerstat for voltage control which is connected to dc motor so that we can control speed of the hammer motion.we are also adding spring so that we can increase the impact force of hammer on the workpiece i.e, spring force is also adding with hammer force.

***IndexTerms* – Dimmerstat,Photo electric sensor,Riveting,Forging,**

I. INTRODUCTION

In our college of engineering we are having mechanical workshops we are doing blacksmithy operation for making shapes of various metals like cast iron,mild steel etc.for that purpose we are using hammer for hitting purpose giving hitting force manually.It takes more time for shaping for hot and cold forging operations.Inorder to minimize these difficulties we fabricated Automated portable hammering machine by using this machine we can make shapes very easily and with in less time.We don’t require manual force and we also get acqurate shapes.By using dies we can also make different shapes we can also perform riveting and filleting operations.

Automatic portable hammering machine can be considered as the backbone of any hammering operation in mass production its principle function is to safely and preciously hammering work like to perform the punching operation, filleting operation, riveting operation and smithy operation i.e. upset forging etc for all designed operating conditions. This paper describes cad modeling, design and analysis of automatic portable hammering machine. A programmed hammering machine self-working machine going to assume an imperative part in the assembling procedure (hammering process).

Hammering machine utilized as a part of the generation of material extending from instruments, to pivots, car frame forming, molding of metal and so forth. The present development identified with metal squeezing machine and forming machine included certain outstanding challenges in regard of to drive nail, fit parts, forge metal and break separated question. The innovation has for its question cure this downside and to empower, by including helper implies, to drive nail, fit parts, manufacture metal and break separated protest the like. Hammering is the most generally utilized in mechanical operation and also development action. Hammering is the most widely used industrial as well as construction 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.In this prototype model we used 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, usually called a connecting rod (con rod).

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 which 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 usually a bar perpendicular to the other end of the arm, often with a freely rotatable handle or pedal attached.

Many applications require a machine with reciprocating, linear sliding motion of a component. Engines and com- pressors require a piston to move through a precise dis- tance, called the stroke, as a crank continuously rotates. Other applications such as sewing machines and power hacksaws require a similar, linear, reciprocating motion. A form of the slider-crank mechanism is used in virtually all these applications.

II. LITERATURE REVIEW:

V.L.Kolmogorov & S.P.Burkin all stated that, Modern science and industry have accumulated many efficient methods of forming by hammer forging, such as setting with shift or torsion, sectional forging, expansion by rolls etc. However, they are difficult for realization on forging equipment, what hampers their adoption in industry. Hence technological conservatism in forging. Even state-off-the-art forging complexes have brought no fundamental change into the hammer forging process.

Within the present work we have developed a new composition structure of a forging machine suitable for conventional operations of hammer forging as well as for new operations, unusual for hammer and press forging. The structure of the machine, hereinafter referred to as an automated forging center (AFC) permits to solve the problems of combining external forces, producing new shapes of deformation zones, efficient use of the tool magazine.

David H.Myaszk stated that, Hammering machine utilized as a part of the generation of material extending from instruments, to pivots, car frame forming, molding of metal and so forth. The present development identified with metal squeezing machine and forming machine included certain outstanding challenges in regard of to drive nail, fit parts, forge metal and break separated question.

The innovation has for its question cure this downside and to empower, by including helper implies, to drive nail, fit parts, manufacture metal and break separated protest the like. Hammering is the most generally utilized in mechanical operation and also development action.

K. Murofushi, S. Sakurai & K. Umegaki all stated that Hammer acceleration due to thrower and hammer movement patterns The displacements of the hammer head and the athletes' centres of mass were calculated using three-dimensional analysis procedures. The Asian record holder's centre of mass and the hammer head on the final two turns exhibited approximate conjunctions of the hammer high point and the thrower's low point and vice versa about the hammer's azimuth angle.

It is conjectured that the reason why the thrower's movement is asynchronous with the hammer's movement by approximately half a turn is to accelerate the hammer head in a manner similar to the way that the amplitude of a pendulum increases when it is pulled upward by a string against the downward movement of the swinging weight.

J.Dapena stated that, Hammer speed at release is one of the most important factors contributing to the distance of a hammer throw. Hammer speed follows a generally increasing trend during the throw, with one fluctuation per turn. The purpose of the present paper was to quantify the influence of gravity on the speed fluctuations. Eight experienced hammer throwers were studied with three-dimensional filming methods. Instantaneous values of hammer velocity and speed were calculated from the film data.

The rate of change of hammer speed due to the tangential component of gravity was computed, and integrated to calculate the accumulated contribution of gravity to hammer speed at all instants of the throw. These values were subtracted from the corresponding values of hammer speed. The amplitude of the fluctuations was reduced in the corrected speed functions, indicating a contribution of gravity to the original fluctuations. However, the fluctuations were still clearly present in the corrected speed functions, indicating the existence of other causal factors.

III.METHODS AND CALCULATIONS

i) $F = Ma$

Where, M = Mass (kg)
a = Acceleration (m/s^2)
F = Force (N)

ii) $\Delta l = \frac{Pl}{AE}$

Where, Δl = Change in length of bar (m)
P = the applied load in newtons (N)
L = length of the bar (in m)
A = cross sectional area of bar (in m2)
E = Modulus of elasticity (N/m^2)

iii) $F = K\Delta x$

Where, F = force on the body
K = stiffness factor
$\Delta x = displacement$(extension of spring)

iv) $K = \frac{Gd^4}{8D^3N}$

Where, G = shear modulus of spring material (s.s)
D = mean diameter
d = wire diameter
N = no.of turns

S.no	Mass	Vf	Vi	Δd	Δt
1	5 kg	133.3	0	200mm	1.5 sec

i) **Force (F)** = Ma

= 5×88.8

= 444 N

ii) $\Delta \mathbf{l} = \frac{\mathbf{Pl}}{\mathbf{AE}}$

$= 444 \times \frac{960}{8820 \times 21 \times 10^3}$

= 0.023 mm

iii) Helical spring

a) F = KΔX

b) Compression Spring

$K = \frac{Gd^4}{8D^3N}$

$= 79.3 \times 10^9 \times \frac{(0.035)^4}{8 \times 0.365^3 \times 15}$

$= 20393.206 \ \frac{lbs}{in}$

$= 3571.39 \ \frac{n}{mm}$

$444 = 3571.39 \times \Delta x$

$\Delta x = 0.124 \ mm$

c) Extension Spring

$K = 79.3 \times 10^9 \times \frac{0.044^4}{8 \times 0.3811^3 \times 15}$

$= 44749.25 \ lbs/in$

$= 7836.79 \ N/mm$

$444 = 7836.79 \times \Delta x$

$\Delta x = 0.056 \ mm$

IV. EXPERIMENT:

Software:

1. Relay
2. Photoelectric sensor

Hardware:

1. 24 volts & 25 watts DC motor
2. Sprockets and chain
3. Dimmerstat
4. Helical spring
5. Drive shaft

V. Result and Conclusions:

Our project has demonstrated the automated hammering by using Dc motor so that it is quick process and saving man power.We increased the impact force of hammer so that max deflection of metal is occurred. More no.of operations are performed i.e, forging,punching,filleting and riveting etc.Varrying the speeds of hammer motion depending upon type of metal used.It is portable machine so that we can carry easily.

In our automated portable hammering machine project showed the automatic operation of hammer by using ac motor we can perform shaping,punching operations,filleting and riveting operations.We performed on both cold and hot metals we found that deflection on cold work piece is very less when compared to hot workpiece.we are using both cast iron and mild steel workpieces in our project For forging operation.

We increased impact force by using helical spring which is connected in b/w hammer and frame and also using max stroke length and max weight of hammer i.e, 5 kg. Consumption of power is decreased by using object sensor(Hammer motion is started whenever w/p is placed only).Speed variation is done by using dimmerstat.

S.no	Material	Dimensions	Deflection	No.of strokes	Time
1	Mild steel	L=10cm d=1.5cm	Δ L=1cm, Δ d=0.5cm	90	180sec
2	Cast iron	L=12cm d=2cm	Δ L=1.2cm Δ d=0.7cm	90	180sec
3	Aluminium	L=15cm d=2cm	Δ L=2cm Δ d=1.1cm	90	180sec

VI. Future Scope:

According to our purpose of our project We can also add another hammer i.e,Double hammer so that we can operate 2 hammers at a time by using a single mechanism (slider crank mechanism).But we have to increase the capacity of motor.By using different types of Dies at the workpiece bed we can get different die shapes of metal component.

By fixing cycle wheel to dc motor to generate electric power by giving manual force externally to the cycle pedal to rotate the wheel.So that we can generate power parallely use this power to dc motor indirectly for hammer motion.

VII.References:

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