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Fabrication of Cam Mechanism Operated Hammer

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ABSTRACT:
In many industries used varies types of machines and instruments to perform different types of operations. Such as forging, hammering, cutting etc. But different problems to face such as low power supply, less man power and also heavy labors work force etc., this project relates to operations performed by this can be achieved by either using elective motor power or manually by measure of the rotate the head lower attached to the shaft and hammering action can be run automatically to use AC motor, chain drive (or) bolt drive, chain, governor is also provided for speed control purposes so that suitable speed can be achieved when no electrical power supply the cam operated hammer can be used manually by simply rotating the hand lever. Also, the handing is simple and maintained is easy.

KEYWORDS:*Cam profile, electric motor, shell bearings, shaft, pulley, belt.*

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I. INTRODUCTION:

In many industries used varies types of machines and instruments to perform different types of operations. Such as forging, hammering, cutting etc. But different problems to face such as low power supply, less man power and also heavy labors work force etc.

Forging is the most common process in mechanical engineering and is also a business option for many people in India. The blacksmiths face problems like unavailability of workers and high machine cost & less income etc.

The advance cam operated hammer device which can be used for multi-purpose operations by either automatically or manually. It is mainly used for hammering of work piece. It can also be used for various purposes such as punching, forging, bending, etc. This advance cam operated hammer is very essential for doing number of such operations like crushing, riveting, hammering of larger work piece and cutting of metal.

As in forging industry, the temperature of forging operation is very much higher and it is very difficult to do manual hammering over the forging metal by manually or hand and also there is always a risk while handling such type of high temperature base metals or wok piece. So advance cam operated hammer neglects this type of problems in industry.

The size of machine is compact and easy to operated &less skilled is required the machine maintains is also less.

Different type of operations to perform in the same machine and time consumption of the operation performed.

Heavy labor is not required to perform the operations and less pollution and less power is taken. This prototype machine is mostly used in small scale industries and mostly forging hammers.

The crank operated hammering machine is the hammering machine in which the translation motion to the hammer is given using crank mechanism. The crank is attached to the motor, a connecting rod connecting the crank end and extreme tip of hammer rod.

When motor rotates, the crank gives reciprocating motion to the hammer rod which is pivoted in middle. The only disadvantage of the machine was when size of the object subjected to forging changes; jerks are created which can break the crank or crank and connecting rod joints. Hence to eliminate this limitation of

machine we decided to implement cam mechanism to provide the reciprocating motion to the hammer rod as show in fig .1.

The Cam Operated Manual Hammering Machine is used in forging of light to medium jobs. The purpose of the machine is to provide a solution for forging workers to make forging convenient, less burdensome and superior. Currently this industrialization and the rapid growth in it have allowed the rich and wealthy producers to get ahead but the local level blacksmiths are highly affected by this growth. It also helps in reducing heating cycles since it completes the forging of given object in less time than by regular method of hand forging to boost their production and improve the quality of the forged components. The machine consists of a cam so designed to provide impact motion at regular intervals. A chain & sprocket is attached to cam and the cam is rotated using legs like one does cycling. This imparts rotary motion to cam and hammer moves up and down. The speed of the impact cycles can be easily controlled by controlling speed of pedaling.

Figure 1: Cam Mechanism Hammering Machine

II. METHODOLOGY AND MATERIALS:

During literature survey we found various research papers in which we found various methods which are been used to provide strong impact force to the work piece and our aim is to take that review for using as guidance of make "Cam mechanism operated hammer machine".

Selection of material

↓

Estimating the cost

↓

Buy all materials

↓

Process the planning

↓

Assemble all the parts

WORKING PRINCIPLE:

The long shaft connected to bearings on both sides of the frame. This rod is attached to the snail type cam on it and it is produced lateral motion from the spinning shaft. We connect the other end of hammer to this connecting rod through a mid-swinging arrangement in order to achieve desired hammer motion with enough torque. And the shaft is connected to handle it is use to move the shaft and motion is transmitted to that cam and it is hit the hammer support rod the hammer moves up and down the operation is performed.

The speed is depending up on the movement of the handle to move. And it is also worked by use electric motor. To use electric motor the working efficiency is improved to compared the handle movement.

FABRICATION OF FRAME:

LIST OF PARTS TO ASSEMBLE THE BODY FRAME

1. Iron pipe (square pipe)
2. 1inch wheel
3. Bearing (dodge bearing)
4. Mild steel shaft
5. Snail type cam
6. Hammer.

The specifications of iron pipe:

Thickness of the pipe- 2mm

2mm iron pipe is used to construct the body of the machine.

The specifications of wheel:

Dimensions of the 1inch wheel- 3mmthickness and $2^{1/2}$inch width

The specifications of dodge bearing:

Ball bearings are used to provide smooth and less friction motion in rotary applications and the diameter is 25mm.

Snail type cam:

The base circle diameter is 60mm and outer diameter is 70mm and center shaft diameter is 24mm, the snail type cam produces a required sudden impact used for forging operation. The value of the impact force is depends upon the height of fall of hammer.

Hammer specifications:

The weight of the hammer is 2lb and the length is 75mm.

CALCULATION:

Impact (F) = W/L

Where,

Impact (F) = Impact force generated in Newton;

W= Work done by free falling weight in Joules; L=recoil displacement after impact in meters.

Kinetic energy & Potential energy attained by weight Kinetic Energy = ½ mv2.

Potential Energy = mgh

Where,

m = Mass of free-falling weight in kg

V = Velocity attained by free falling weight in m/s g = Acceleration due to gravity in m/s2

h = Height of free fall of weight in meter

Required impact force for forging is approximately 100N to 200N.

Calculations for impact force developed by 1.3 kg hammer: For hand forging, required impact force is approximately 100 to 200 N.

Using conservation of energy theorem, we calculate impact force and energy of free falling object.
Considering,

m= 1.3 kg,
h= 0.5m (1.2 ft) (drop height)
V= √2gh = √2*9.81*0.5= 3.13 m/s
P.E = m gh
K. E= 0 Impact velocity= √2gh
K.E = ½ mv2 P.E = 0
P. E= m gh = 1.3 X 9.81 X 0.5= 6.37 J
K. E= ½ mv2= 0.5 X 1.3 X 9.79= 6.36 J
Considering recoil distance= 0.1m by work energy theorem,
W= ½ mv2 (final) – ½ mv2 (initial) W= ½ X 71.3X 9.79= 6.36J
W= F X L
F= W/L = 6.36/0.3 = 1.90 N.

Hence impact force of 1.90 N is developed.

TEST RESULTS:

The trail is taken with the help of a local blacksmith on weed hook. After completing the test, we concluded that our machine was much effective and easy to operate also it saved time. The raw material is of 25cm long and 5mm in thickness. The blacksmiths need to reduce the thickness up to 2mm. The test results are as follows shown in Table no 1.

Table -1 test results

Parameter	With a Hand	With a Machine
No. of strokes	45	28
Time	45sec	28sec
Reduction in thickness	3mm	3mm

CONSLATION:

After reviewing much solution and optimizing each one we were successful in designing and fabricating a hammering machine that would work as per our predictions in given set of conditions and environment. The solution worked well in forging light components in less time as compared to hand forging with good quality and less defects. The reduction of fatigue of worker has been the biggest outcome of our project.

FUTURE SCOPE OF THE WORK:

The machine can be designed for industrial operations performed. The same design can be used to convert the machine as a multipurpose. The machine can be made to be powered by an electric motor or manual effort. The research work helps to properly understand different methods. The research work helps in better understanding of different operations involved in forging process. The research work concentrates on design based on low budget for small scale industries.

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