Multiple Automatic Alternate Hammering Machine

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Abstract- *The project is concerned about design and fabrication of automatic hammering machine. In the project, we have used torque to perform various manufacturing operation in industries like shearing, drawing, piercing etc. Time required for operation would be less so it may be useful in mass production. The project aims at developing a cost effective multiple hammering which would cater the needs of the people of the rural society or small/medium scale industries. It can be easily customized as per the requirement so it will be portable too. It should be user friendly to work without any risk in work compared to manual effort done by the workers*

The project was made to achieve instant hammering, accurate repetition and impacting. The project can be modify by replacing the hammer with punching tool or any other. So this project can be used for multipurpose application in wide variety of areas

Keywords- Hammering Machine, Impact force, Torque Force

I. INTRODUCTION

The project is about the process and assembling of compact hammering machine. Power will be used to rotate the shaft on which the pair of work (hammer) is installed. As the shaft rotates, it raises the works along with it during its rise period. The job along with the required die is kept on the table and impact force is exerted on the job, deforming it to the desired shape.

Automatic portable hammering machine can be considered as the backbone of any hammering operation in mass production, its principle function is to precisely perform the punching operation, filleting operation, riveting operation and alike under all operating conditions. Hammering machine utilizes as a part of a generation of material extending from pivoting to car frame forming, modeling of metal and so on. A wide range of hammer energy correction factors has been applied to automatic hammers worldwide. It is very difficult to do manual hammering over the forging metal manually or by hand further there is always a risk while handling such type of high temperature base metals or wok piece, so automatic hammer neglects this type of problems in industry. This machine uses power source for swinging the hammer to being hammered any parts or components. They have been used by blacksmiths since 1880s, by replacing trip hammers.

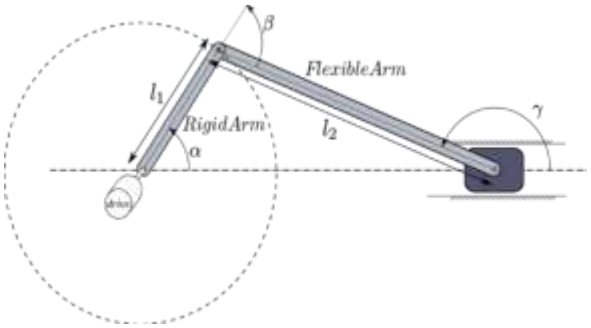

Fig 1: Slider crank mechanism

II. PROBLEM DEFINITION

In today's generation, automation plays an important role in all industrial and commercial application for proper and accurate result. We still lack in getting high efficiency for any work done. The reason may be either the accuracy, time taken, unavailability of the resources etc. but still as the years pass by we try to make the product as good as possible. The goal of the project is to provide a simple design and a portable automatic hammering machine, which may overcome the problems related to accuracy, repeatability & continuity of the work.

Considering the above issues/problems, the project gives a wide variety of working condition under different areas. The portability and changeability of the tools can make it easier and user friendly. The title of the project itself describes the working of it i.e.

"Multiple Automatic Alternate Hammering Machine"

To design the proposed paraphernalia in order to use it in a more efficient and in a simple manner and also to control the above mentioned issues, some design parameters are to be considered and also the capacity and sustainability has to be fixed in order to achieve the goal.

III. LITERATURE SURVEY

ChiteshThakre , Kalyan Mandal, Chandrakant Ghormare, Abhijeet Biswas, Laxman Dongre, Roshan Bhoyar, Bhushan Gondekar, Gourav Nagdeve showed the usage of

Advance Cam Operated Hammer to replace the manual work required in a large scale and in an accurate manner. They all proposed that in many industries various types of machines and equipment have been used for various operations such as forging, hammering, cutting etc. but different problems such as low power supply, less man power and also heavy laborious work force, safety etc. always occur, so this projects relates to operation performed, by this the issues can be achieved by either using electric motor power or by manually by means of simply rotating a hand lever attached to the shaft and hammering action can be provided. If there is good power supply, it can be run automatically. For automatic operation A.C. motor is provided. Chain drive, belt drive, governor are also provided for speed control purposes so that the suitable speed can be achieved. When no electric power supply is there the advance cam operated hammer can be used manually by simply rotating the hand lever. Also the handling is simple and maintenance is easy of the project.

Sagar Makvana, Nishith Lashkari, Kalpesh Ram proposed an idea of Modification and Fabrication of Simple Power Hammer Machine. According to them in the present scenario due to the technologies advancement there are lots of demands of the products in the market for production of many components. This invention is relates to fabricate a simple power hammer machine having low cost, compact, easy to operate, and having less power requirement for a forging operation performed by blacksmiths. More particularly this invention is relates use of power hammer by small scale industries or workshops having less force requirement in forging than the other hammer machines available in the market to produce or manufacture a small parts like knives, medical equipments, sockets, hooks, clips, dental equipments, rings, manifolds, couplings, etc.

Varun hegde, Naveen Kumar D, Dr. Vijendra Kumar, Dr. K. S Badrinarayanexplained Electrical Forging Machine. They fabricated the automated forging machine. According to them, it was an innovative concept. They proposed that forging is the term for shaping metal by using localized compressive forces, this machine has been mainly developed for a metal forming to required shape and size. The aim of their project was to eliminate the manual method of forging into automated forging machine to overcome the problems like inaccuracy and manual errors.

IV. METHODOLOGY

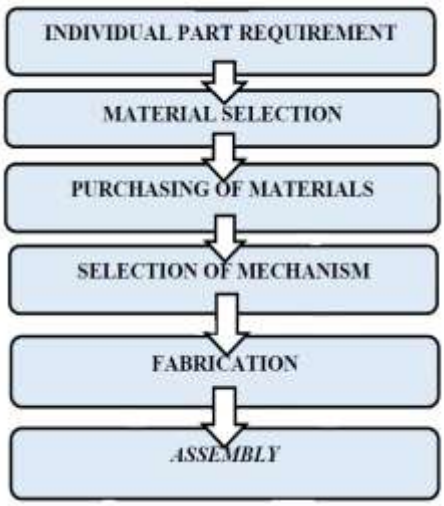

Fig 2: Methodology

The project has various different design paths to complete the requirement of the products while meeting the objectives. This means we have to implement and compare different designs to insure the best product on our set of objectives. The basic design for Multiple Automatic Alternate Hammering machine is to have motors fixed on stand at each ends and then motor shaft is inserted in center hole of the discs. Discs are connected to the hammer rod with the link rod when we supply the dc current to the dc motor by using adopter then the motor shaft start rotating further transmit the spinning motion to the disc by using shaft, the first decision is to create an impact force for the respective operation, this will help to determine product affordability. A more efficient yet expensive design would be to have battery instead of adopter. There may be various obstacles while progressing towards the project assembly, which are to be observed and recorded for the future reference and safety.

V. COMPONENTS

1. DC MOTOR

The motor used is 12V dc Motor. The motor is a permanent magnetic motor that operates on the 12V battery, which gives the motor enough power to turn the hammer link to produce enough impact force required for the process.

Fig 3: DC Motor

2. HAMMER

In the project, we have usedhammer having weight around 0.2-0.5kg for various operations such as punching, forging, riveting, etc., these types of manufacturing operations are used in manufacturing industries.

Fig 4: Hammer

3. DISC

A disc is a wheel on a hub or shaft that is intended to help development and alter the rigid link or belt to swing the hammer. The disc has eccentric holes in which bolts are fitted to connect linkages.

Fig 5: Discs

4. MOTOR DRIVE SHAFT

A drive shaft is a mechanical part to transmit torque and power. The shaft is connected to eccentric disc and transfers rotational motion from motor to hammer rod.

5. CHAIN AND SPROCKET

Chain drive is a method for transmitting mechanical power starting with one place then onto the next. It is frequently used to pass on energy to the wheels of a vehicle, especially cycles and bikes. It is likewise utilized as a part of a wide assortment of machines other than vehicles.

Fig 6: Chain and Sprocket

PROTOTYPE OF MULTIPLE AUTOMATIC ALTERNATE HAMMERING MACHINE

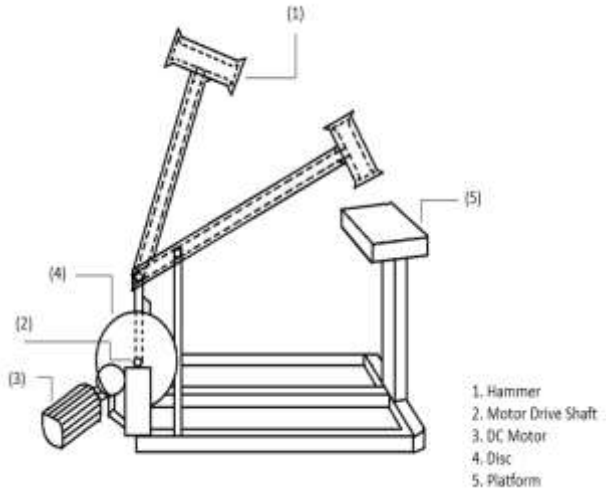

Fig 7: Prototype of Multiple Automatic AlternateHammering Machine

Fig 8: Fabricated Multiple Automatic Alternate Hammering Machine

VI. OBSERVATION

- Hammer Weight (w) = 0.54 kg
- Hammer length (l)=400mm.
- Hammer stroke height (h)= 100 mm.
- Width of frame (B) = 200 mm.
- Height of frame (H) = 120 mm.
- Length of frame (L) = 300 mm.
- Disc thickness (t) = 3 mm.

- Battery (supply voltage) =24V and 7.5A
- Motor (N) = 30 rpm, 12V dc motor, 2 motors each

VII. CALCULATIONS

A) To calculate maximum torque by motor

Motor rating:
Given Data:-
N = 30 rpm, I = 7.5 A

Power Transmitted by Motor:
P = V × I = 24 × 7.5
P = 180 W
Then, P = 2 πNT/60
180 = (2π×30×T)/60
Therefore,
T= 57.29 N-m

B) To find torque force transmitted we have two cases

CASE 1: When Hammer Moves Downward:
Given: h = 100 mm
Maximum torque = 57.29 N-m
= 57.29 × 10^3 N-mm
Length of hammer rod (h) = 400 mm
= 0.4 m
Torque Force = (T_{max}/H) × l
T_f = (57.29/0.12) × 0.4
T_f = 190.96 N-m

CASE 2: When hammer moves upwards, torque force will be decreased

Torque Force = (T_{max}/H) × l – weight of hammer
T_f = (57.29/0.12) × 0.4 – 34.37
T_f = 156.58 N-m

C) To find the Impact Velocity of hammer

Given:
H =120 mm = 0.12 m
T (time required per revolution of Disc) = 2 sec.
So, V = H × T
V = 0.12 × 2
V = 0.24 m/s

D) To find the Impact Force (I.F)

Impact Force = K.E / Height of fall
So, IF = (½ ×m×v^2)/ h
I.F = (½ × 0.54×0.24^2)/0.1 N
I.F = 0.15 N

VIII. CONCLUSION

We have successfully calculated the torque force of the motor. The impact velocity and torque force is calculated accurately. We gained a lot of practical knowledge regarding planning, perching, assembling and machining. We are proud that we have completed the work with limited time successfully. Multiple Automatic Alternate Hammering Machine is working with satisfactory condition.

IX. FUTURE SCOPE

The concept ofMultiple Automatic Alternate Hammering Machine in this paper has shown to have a place in the actual market and to fill a need demanded by potential customer. This project has a wide scope like to help in production line where many workers are used for the material handling purpose, it also reduce the cost and threshing time requirement of more number of worker that will completely eliminate. The efficiency will be more as compared to a single operation hammer machine.

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