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AUTOMATIC PORTABLE HAMMERING MACHINE

Sadik Iqbal[*1], Hemlal Mahto[*2], Nishikant Jena[*3], Chandan Kumar Das[*4], Rudra Prakash Sethi[*5]

[*1]Professor, Department Of Mechanical Engineering, Gandhi Institute For Technology, Bhubaneswar, Odisha, India.

[*2,3,4,5]Students, Department Of Mechanical Engineering, Gandhi Institute For Technology, Bhubaneswar, Odisha, India.

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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 12V battery. The person just needs to insert workpiece and start the hammering machine. This machine can be used for automatic hammering work as and when needed. We here 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 connectingrod attached to it. This rod is used to achieve lateral motion from the spinning shaft. We now 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. We now use a suitable bed where workpiece can be placed.

Keywords: Hammering, portable, swinging, construction,

I. INTRODUCTION

Automatic portable hammering machine can be considered as the backbone of any hammering operation in mass production its principal 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 Arduino Operated 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. Power hammers are mechanical forging hammers that use a non-muscular power source to raise the hammer preparatory to striking, and accelerate it onto the work being hammered. Also called "Open Die Power Forging Hammers." They have been used by blacksmiths, blade smiths, metal workers, and manufacturers since the late 1880s, having replaced trip hammers.

Julen Agirre,2020 worked on developing an automated forging machine. Forging is a similar process to hammering. **R. Mannens, 2018** His study states that, Industrial standard for introducing compressive residual stresses and improving the fatigue life of compressor blades in pumps, martensitic chromium-nickel stainless steel X3CrNiMo13-4is surface treated by means of shot peening. **A. A. Dyakonov,2017** In this work, the author has worked on developing an automated processing machine for testing the vibrations of the components. **Ingalkar,2017** This paper discusses about cad modeling, design and analysis of automatic hammering machine.

II. METHODOLOGY

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 purposes. Hammering is the most widely used industrialas 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 andeffort here you are going to build an automated hammering system.

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In this project we proposed to make a working model of a Arduino operated portable hammering machine which will be installed in small scale industries. A main frame and work surface can be fabricated by welding I beams/ C channels with each other. Stepper motor and pulley mounting can be welded to the main frame. Then Arduino can be codded and connected to the motor to control its speed. According to the diagram connecting link can be used to attach and transmit circular motion of the pulley to the oscillating motion of the hammer head. Rotation of the pulley will cause the movement of the hammer head. This can be used to perform hammering task on any object placed on the working surface. By providing electric power to the stepper motor, we receive the circular motion for the pulley. Arduino chip is used to control the speed of the stepper motor. The attached links will cause the hammer head to oscillate creating the hammering effect over the work surface.

PMDC MOTOR

Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it.

Motor Specifications

- Type – Permanent Magnet DC motor(PMDC MOTOR)
- Gear type – Worm gear
- Material – Cast aluminum(CA)
- Voltage – 12V DC
- Power – 180 Watt
- RPM – 60 RPM, Torque – 21 lbs-ft

A traditional hand-held hammer consists of a separate head and a handle, which can be fastened together by means of a special wedge made for the purpose, or by glue, or both. This two-piece design is often used to combine a dense metallic striking head with a non-metallic mechanical-shock-absorbing handle (to reduce user fatigue from repeated strikes). The amount of energy delivered to the target by the hammer-blow is equivalent to one half the mass of the head times the square of the head's speed at the time of impact. While the energy delivered to the target increases linearly with mass, it increases quadratically with the speed (see the effect of the handle, below). High tech titanium heads are lighter and allow for longer handles, thus increasing velocity and delivering the same energy with less arm fatigue than that of a heavier steel head hammer.A titanium head has about 3% recoil energy and can result in greater efficiency and less fatigue when compared to a steel head with up to 30% recoil. Dead blow hammers use special rubber or steel shot to absorb recoil energy, rather than bouncing the hammer head after impact.

Effort in the middle: the resistance (or load) is on one side of the effort and the fulcrum is located on the other side, for example, a pair of tweezers, a hammer, or the jaw. The effort arm is smaller than the load arm. Mechanical advantage is always less than 1. It is also called speed multiplier lever.

Figure-1 SMPS

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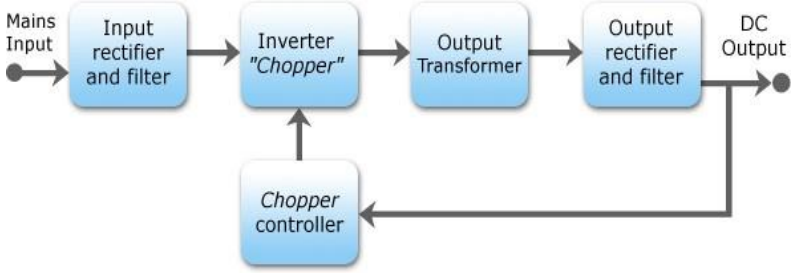
A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power) to DC loads, such as a personal computer, while converting voltage and current characteristics. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. Ideally, a switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of on-to-off time. In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor. This higher power conversion efficiency is an important advantage of a switched-mode power supply. Switched-mode power supplies may also be substantially smaller and lighter than a linear supply due to the smaller transformer size and weight.

A linear regulator provides the desired output voltage by dissipating excess power in ohmic losses (e.g., in a resistor or in the collector–emitter region ofa pass transistor in its active mode). A linear regulator regulates either output voltage or current by dissipating the excess electric power in the form of heat, and hence its maximum power efficiency is voltage-out/voltage-in since the volt difference is wasted.

In contrast, a switched-mode power supply changes output voltage and current by switching ideally lossless storage elements, such as inductors and capacitors, between different electrical configurations. Ideal switching elements (approximated by transistors operated outside of their active mode) have no resistance when "on" and carry no current when "off", and so converters with ideal components would operate with 100% efficiency (i.e., all input power is delivered to the load; no power is wasted asdissipated heat).



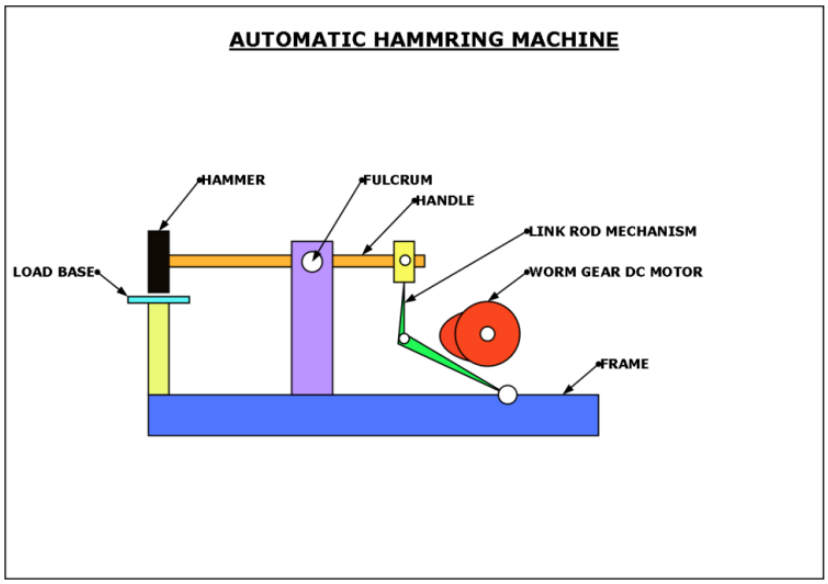


Figure 2: Schematic diagram of automatic hammering machine

III. CONCLUSION

In this project, an automatic hammering machine is to be designed andmanufactured. All the components of the machine were designed on Autodesk Inventor and a prototype was manufactured. The materials were selected for each component on the basis of the engineering standards. Machine is a unique machine because of its

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Arduino operation and no other automatic hammering machine of this design exists. This machine can be controlled and operated for the required number of strokes per minute. Previously designed automatic hammering machines did not involve variablespeed or variable strokes.

The experience of designing an automatic hammering machine and then fabricating it was fascinating. From this project, we have learned the selection of materials for different components and we learned about different machining processes that can be used for manufacturing a specific component. The project taught us regarding economic constraints that how can we manage a project under a given budget. Moreover, if this product is manufactured on a commercial basis, it can be proved as a useful product for the industry.

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