Automated Pottery Wheel For The Village Community To Manufacture Earthen Pots

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Abstract: This article aims to develop the pottery wheel machine which is operated by sewing machine pedal and also electrical motor. Based on the problems in the conventional method, it is understood that there is a scope for pedal operated pottery wheel and alternatively with electric motor operated pottery wheel. So, this machine can be work with the pedal mechanism as well as by an electric motor. The human effort and work is more in traditional methods. By implementing this mechanism, the manpower required will be reduced. This design proffered an efficient method of doing forming of an earthen pot and reducing the human work. Its purpose is to efficiently transfer human foot motion through a pedal mechanism and a bevel gear setup to rotate the potter’s wheel. When the pedal is operated, the flywheel transfer the mechanical energy to the horizontal shaft through the belt drive mechanism. After that the horizontal rotation is converted in to vertical rotation by using the bevel gear for the rotary motion of pottery wheel. This device reduces the time needed to produce the earthen pot. So that it is suitable for mass production. In addition to that by using the electric motor, the manual work will be reduced.

Keywords: Design, Manufacturing, Pottery wheel, Sewing machine Pedal Mechanism, Electric pottery wheel, Gear ratio calculations.

1. INTRODUCTION

India is a vast country with 68% of the population living in rural areas and majority of the rural people are still practicing their family jobs like creating art in wood, stone sculpture, earthenware and pottery. As per the survey, it has been estimated that over 150 lakh potters are presently practicing the traditional art of pottery making (Shivanand et al. 2015). In pottery wheel The first pull is started at full or near full speed to thin the walls. For right-handed potters working on a wheel going counter-clockwise the left hand is on the inside of the ring on the right hand on the outside at the right tangent of the wheel. The second and third pulls establish the thickness and shape. In traditional method there is a need of more man power to produce the pots. Several devices are using cycle pedal mechanism to help the pottery people. Also few devices have been carried out on the electric motor based pottery wheel. The people in rural areas where electricity is not available will be affected in the pottery manufacturing. Hence it is understood that there is a scope for pedal operated pottery wheel which produces electricity using electric motor as a generator.

LITERATURE REVIEW Okewu Ebute Jonathan – (2014) reviewed how effective the manual wheel have been put into use for optimum productivity in the face epileptic power supply in the country. It examines the art of throwing, disadvantages of each types of wheels and how convenient their uses are is also examined. The central issue is the rate of power supply in Nigeria and the need to encourage less emphasis on the electric wheels that might not be working well for a depressed economy. Types of wheels used in the specialization for production. Etuokwu Anthony Obiy & Uzzi Festus Osarumwense - (2016) reviewed serve as a call as well as a challenge to interested studio potters to pick up interest in the fabrication of vital equipment for their own studio use, rather than resorting to purchasing from the market at exorbitant rate. It is hoped that this axel kick wheel will aid in the development of functional and practical knowledge of ceramics as well as be an eye opener to researchers in other research areas of machinery fabrication and acquisition. It will also encourage effective learning program for ceramic enthusiasts. This paper documents an illustrated step -by-step approach in the designing and fabrication of a simple potter’s kick wheel using the motor axel at a minimum of cost. Umoru-
MATERIALS AND METHODOLOGY

MATERIALS
An electric motor is an electrical machine that converts electrical energy into mechanical energy. The motor is rotated with a constant speed of 2400 rpm which is having 1/2- horse power and it is attached with the frame. A V-Pulley is fixed with the electrical motor to transfer the mechanical energy produced by the motor to the pottery wheel shaft. The Sewing machine frame is used for the purpose of withstanding all the parts for the pottery making machine. It consists of a pedal for driving the pottery wheel by means of belt drive power transfer. And also it is having the wheel which is made of cast steel to transfer the power from the pedal to the pottery wheel. The sewing machine pedal is connected with the power transferring wheel by using the connecting link. The steel angles are used for holding the shaft and bevel gear setup. And it connects the sewing machine base frame. The steel angles are made up of mild steel. The mild steel is a type of a carbon steel with low amount of carbon. It is also known as low carbon steel. It consists of iron alloyed with less than 0.3 percent carbon, most commonly between 0.1to0.25 percent. It is cost effective steel compare to other steels. The power which is produced by the sewing machine pedal is converted to the rotary motion of the pottery wheel by using this bevel gear setup. Set of two bevel gears are used for this pottery making process. The bevel gears are taken by considering the required speed for the pottery wheel. The smaller bevel gear called pinion has 17 teeth and the larger bevel gear called wheel is having 85 teeth by considering the required speed for pottery making. The shaft is made up of mild steel. It is used as energy transferring medium between the sewing machine pedal and the pottery wheel. By considering the required torque for pottery making process, the shaft of 25mm diameter and 600 mm of length was selected. The Pulley is made up of steel-aluminium alloys. The motor pulley is used for transferring the mechanical energy produced by the electrical motor to the rotating shaft through V-Belt. The pulley is connected with the electric motor by fasteners. The high torque operation, the smaller motor pulley was selected in order to increase the torque. The pulley having 50 mm diameter was selected by considering the required speed of the pottery wheel. Plummer block is a pedestal used to provide support for a rotating shaft with help of compatible bearings & various accessories. Housing material for Plummer block is typically made of cast iron or cast steel. The Plummer block having 25 mm inner diameter was selected for carrying the rotating shaft. The wooden wheel is selected as the wheel for making the pots by using clay. The wheel is used during the process of trimming the excess body from dried ware, and for applying incised decoration or rings of colour. The 40 mm wooden wheel is selected for pottery making process. V-belt is used for transmitting the power. A belt drive offers smooth transmission of power between shafts at a considerable distance. V-belt system also called as friction belt. The belt is made up of rubber. V-belts need larger pulleys for their thicker cross-section than flat belts. The fasteners are used to connect the plummer blocks, the steel angles and the base. The various sizes of bolts, nuts and washers are used for corresponding parts.

METHODOLOGY

- Planning of the project.
- Selection of the materials
- Designing the parts and assembly
- Fabrication of the parts
- Assembling the parts
- Final Experimental setup

3D DESIGN

Design calculation of a motor, pottery wheel and gear ratio of bevel gears are calculated as per the requirements.

**CALCULATION OF GEAR RATIO FOR BEVEL GEARS**

\[ \text{No. of teeth on gear wheel (larger) } (Z1) = \left( \frac{N1 \times d1}{100} \right) \]  
\[ \text{No. of teeth on pinion (smaller) } (Z2) = 17 \text{ (Assumed)} \]

**CALCULATION OF REQUIRED TORQUE FOR POTTERY WHEEL**

\[ \text{Radius of the shaft } (r) = 12.5 \text{ mm} \]
\[ \text{Load on pottery wheel } = 10 \text{kg (approx.)} \]
\[ \text{Torque } (T) = \text{Force} \times \text{Radius} \]
\[ = 100 \times 12.5 \]
\[ T = 1250 \text{ N-mm} \]
\[ \text{Required torque } (T) = 1.25 \text{ Nm} \]

**CALCULATION OF MOTOR**

- Motor Speed (N) = 2400 rpm
- Motor Power (P) = 382 watts
- Horse Power = 0.5 hp
Power=(2*3.14*NT)/60 ...(5)
Torque = (60*3382)/(2*3.14*2400)
Torque = 1.62Nm
Hence 0.5HP motor is selected.

EXPERIMENTAL SETUP
The pedal is placed between the two frame columns of sewing machine table. The pedal of the sewing machine is connected to the base frame by arranging both frame and the pedal in same axis. When the hole in the pedal meets the frame hole, both are connected by the fasteners with washers. The wheel is also fixed perfectly by using the fasteners. The connecting link which connects the sewing machine pedal and the wheel is fixed by using the fasteners between the wheel and the pedal. The electric motor is fixed with the separate mild steel angle which is welded with the base frame in order to carry the motor. The steel angle is drilled for holding the motor. The fasteners are used to fix the motor into the mild steel angle. The larger bevel gear which is having 85 teeth is fixed with the horizontal shaft. And the smaller bevel gear called pinion which is having 17 teeth is fixed with vertical shaft for pottery wheel's rotary motion. Both the bevel gears are fixed with the shafts by using the hex-key or allen key. The angle between both the bevel gears is fixed with 90 degrees. After all the arrangements the wooden wheel which is used for pottery making process is fixed by using fasteners. All the components are arranged according to the 3D model.

EXPERIMENTAL RESULT
The results obtained by the use of this multi operational pottery wheel is very satisfactory for the people who do the pottery making process. The pottery people can work with sewing pedal mechanism of pottery making as well as the electrical motor used pottery making process. Generally, the time taken to produce a single pot is approximately 40 to 45 minutes. But, by using this multi operational pottery wheel, the time taken for producing a single pot is reduced to 20 to 30 minutes. The electric motor reduces and eliminates the manual work needed for pottery wheel rotation. When there is availability of electrical energy, the electric motor can use for pottery making process. In rural or remote areas, where the electricity is not available, the sewing machine pedal mechanism plays major role. In that situation, the sewing machine pedal mechanism is used for pottery making process. By using this multi operational pottery wheel, The rate of pottery production is increased. Thus, the whole product is fabricated as per the requirements and needs of the pottery making people. It uses electrical energy to producing pottery items. So it reduces and eliminates the manual work and effort required for the process. It is having electrical motor and the sewing machine pedal mechanism, the people can work with any one of this methods with their convenient and makes the pottery items at higher rate of production.

CONCLUSION
The main aim of the multi operational pottery wheel is to reduce the manual effort required for making the pottery items. The human power required is reduced and time consumption is reduced for making the pottery things such as flower pots, water pots and cooking pots. It is cost effective and easy operating mechanism compare to other pottery making instruments and machines. It is eco-friendly and energy efficient and does not cause any pollution to the society. By using this simple instrument, we can easily produce the pottery items with lesser time and lesser manual work and effort.

REFERENCES