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Design and Fabrication of Pedal Assisted Pottery Wheel Using Hypoid Bevel Gear Mechanism

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A B S T R A C T

It is sometimes necessary to use additional rotating action when creating pots on pottery wheels.This makes it more difficult for a Potter to spin the wheel with more effort before manufacturing pots.

Traditional pottery production processes are time demanding and can only produce a small number of pots with greater effort. There is a need to develop an alternative mechanism to assist potters in easily spinning the wheel with less effort. This project proposes the design and fabrication of a pedal-assisted pottery wheel using a hypoid bevel gear mechanism, and the proposed project is used for rotation of the baseplate for pottery making with less effort by using a hypoid bevel gear mechanism that is subjected to pedals, which can help in making a larger number of pottery wheels.

Keywords: Pottery wheel, Hypoidal Bevel gears,Flywheel, Sprocket and freewheel.

1. Introduction

Making pots is the oldest and most widely practiced type of art.Because of the difficulty in manufacturing clay pots, potters are now rarely seen in rural areas. Pottery producers in remote areas have numerous challenges while creating pots.Many projects have proposed answers to these challenges, but these solutions were too expensive for rural potters to use for manufacturing pots, and these pottery production instruments that run on electricity require more electricity and are costly to purchase.So, in order to make these pottery wheels independent of power and sustainable, hypoid bevel gear mechanisms that are helped by pedaling mechanisms can be employed to manufacture pots with ease.

2. LITERATURE REVIEW

Olusola Joseph Ajayi, Yinusa Daniel Lamidi, and OlulopeSayoToludare of the Global Journal of Engineering and Technology Advances conducted research on the design and construction of a potter's kick wheel for the production of ceramic goods. Earlier publications: Received on January 12, 2021, edited January 20, 2021, and accepted January 22, 2021

Design and Fabrication of Pedal Operated Pottery Wheel by Abhishek Ramteke, Jayant Moon, Hitesh Hedau, Nitin Baghele, Prajwal sarnaik, Sumitvighne, and Mrsseemarewatkar from Department Of Mechanical Engineering, G.H Raisoni Institute Of Engineering And Technology, Nagpur, Maharashtra,India.

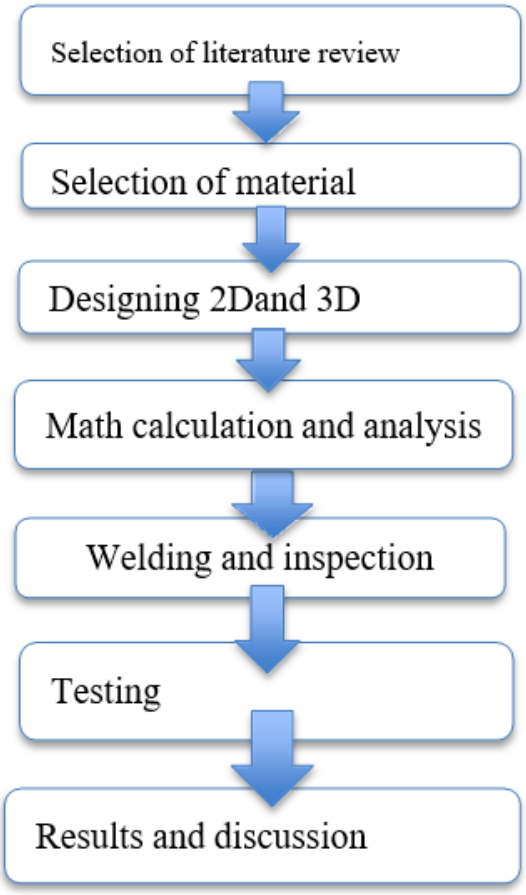
Literature review on Murugan P C, Tamilarasu V, Tharani Dharan N P, SreeNithiyanandan R S, Vivek Raj S's Automated Pottery Wheel For The Village Community To Manufacture Earthen Pots Nandkishor M. Sawai, Dr. V. G. Arajpure, and Dr. C. C. Handa, three Ph.D. research scholars from mechanical engineering in Nagpur, India, studied the design and fabrication of a manually operated pottery wheel using sewing machine pedal mechanism at Godavari College of Engineering in Jalgaon, India.

3. OBJECTIVES

- To gather the materials needed to construct this system (weld iron, hypoidal bevel gears, gearbox shafts, flywheel, sprocket and freewheel, among other things).

- To develop the model, create design considerations and design parameters.
- Designing the model and analyzing it to ensure that it meets the requirements
- Performing mathematical calculations to obtain additional torque in order to construct the model and parts as required in order to assemble the entire system using weldments
- To derive the torque values for the model in order to compare the cost,working, and advantages of the newly suggested system with existing systems.

4. METHODOLOGY



4.1 MATERIAL CONSIDERATIONS

MATERIAL	TYPE	QUANTITY
Hypoid bevel gears	steel	2
Transmission shafts	cast iron	900mm,230mm
pedals	plastic	2
flywheel	cast iron	1
support frame	cast iron	1
ball bearings	chrome steel	5
pottery plate	cast iron	1 disc

Materials are collected as per the requirements.

4.2 MATERIAL SELECTION Hypoid bevel gears

A hypoid is a spiral bevel gear with an axis that does not cross the axis of the meshing gear. A

hypoid gear has a revolving hyperboloid shape (that is, its pitch surface is a hyperbolic surface), whereas a spiral bevel gear has a conical shape.

Transmission shafts

Transmission shafts are spinning members that transfer power and torque from one location to another, whereas spindles and axles are non rotating shafts. Solid or hollow shafts are both possible.

Ball bearings

A ball bearing is a form of rolling-element bearing that uses balls to keep the bearing races apart. A ball bearing's purpose is to reduce rotational friction and to support radial and axial loads.

Sprocket and freewheel

A profiled wheel with teeth that mesh with a chain, track, or other perforated or indented material is known as a sprocket, sprocket-wheel, or chainwheel.

Flywheel

A flywheel is a mechanical device that stores energy as spinning momentum. A flywheel can be spun by applying torque to it, increasing its rotational momentum. This accumulated momentum can then be applied to any rotating object, most typically machinery or motor vehicles.

Pedals

the part of a bicycle or other machine that you push with your foot in order to make it move or work

4.3 DESIGN PROCEDURE FOLLOWED

- Drafted the system model in Autodesk inventor pro 2023
- Created a part modeling and assembly modeling for the 2D design
- performed analysis for the 3D design
- final draft of the model for fabrication

4.4 MATH CALCULATIONS AND ANALYSIS Frame Dimensions

- Height of the frame = 900mm = 0.90m
- Width of the frame = 220mm = 0.22m
- Length of the frame = 550mm = 0.55m

Shaft Dimensions

- Length of the shaft(I) = 990mm = 0.99m
- Length of the shaft(II) = 350mm = 0.35m

Hypoid Bevel Gear pair Dimensions

- No.of Gear teeth for Bevel Gear(Driving member) = 23
- No.of Gear teeth for Bevel Gear(Driven member) = 13
- Reduction ratio = 1.5
- module = 1

Ball bearings dimensions

Ball bearing 6209

Bore diameter = 45mm Outside diameter = 85mm

Width = 19 mm

4.4 RESULTS AND DISCUSSION

4.4.1 INPUT PARAMETERS FOR ANALYSIS

S.N O	PARAMETER	VALUE	UNIT
1	Input Rotation Speed	75	RPM
2	Number of teeth on Driving hypoid Bevel Gear	23	
3	Number of teeth on Driven hypoid Bevel Gear	13	
4	Number of teeth on Sprocket	48	
5	Number of teeth on Freewheel	18	
6	Avg. WEIGHT of potters	40-50	kgs
7	Operational time	45	mins

4.4.2 OUTPUT PARAMETERS AFTER COMPLETING THE ANALYSIS

S.NO	PARAMETER	VALUE	UNITS
1	Force given	0.12982	N
2	speed of bevel gear	80	RPM
3	speed of sprocket	80	RPM
4	speed of flywheel	255.85	RPM
5	speed ratio	0.9	
6	Gear ratio	3.2	
7	Chain center length	147	mm
8	Chain length	743.3	mm

5. CONCLUSIONS

From the test results, the following conclusions:

1) According to the model prepared and tests performed, it is observed that there is a remarkable increment in thesmooth transmission for making pots
2) speed ratio is increased for hypoid bevel gears
3) It can be concluded that the change in length of the chain loop can increase the toque and efficiency the system
4) As compared to existing methods this pottery model has improved working conditions within the less costs

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