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Design and Fabrication of Pedal Operated Pottery Wheel

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Abstract
The wheel machine was designed to be easy, cheap, sturdy and simply maintained. The mean of electricity in the rural area is very limited and because of that we cannot make a Pottery wheel with a motor and it due to that we make the pottery wheel as pedal-operated Pottery wheel and sitting arrangement gives comfort to the Potter maker and pain in the knee and neck also reduce significantly. Its purpose is to expeditiously transfer pedal extremity motion but the pedal mechanism and sprocket-chain change of magnitude to rotate the wheel. A pedal operating pottery machine pedal mechanism operational drive converts vertical rotation into horizontal rotation by exploitation bevel gear during this machine sprocket associate degreed freewheel is employed to take care of the speed of potter wheel at the time of creating a material pot.

Keywords: *wheel, pedal mechanism, bevel gear, flywheel, freewheel, splash pan and chain.*

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I. INTRODUCTION

In pottery, a wheel could also be a the tool employed within the shaping of round ceramic wares. The wheel is also used during the tactic of trimming excess body from dried wares and for applying incised decoration or rings of color. Use of the wheel became widespread throughout the Old World, but was unknown within the Pre Columbian New World, where pottery was hand-made by methods that included coiling and beating. The wheel could often be observed as a "potter's lathe". but the term is healthier used for an additional style of machine that's used for a distinct shaping method, turning, kind of like that used for the shaping of metal and wood articles. The techniques of jiggering and jollying will be seen to be an extension of the Potter's wheel: in jiggering a formed tool is slowly brought down onto plastic clay body that has been placed on prime of a rotating plaster mold. The jigger tool shapes one face while the mold the opposite. The term is restricted to shaping of flatware, plates, while an analogous technique, jolleying, refers to the assembly of hollowware like cups.

II. METHODOLOGY

We are going to make a pedal-operated pottery wheel that is very easy to use as compared to the ancient method used. Foot provided the force required to rotate the shaft to make a pot

Problem statement

This potter's wheel can be driven at a constant speed only by moving the feet at a constant rate. This might prove irritating for the thrower. Also this potter's wheel doesn't eliminate the need for human force application; it just reduces it. Using other systems like electrical motors etc., we might be able to achieve constant speed and minimal effort.

Why need for modification

Existing potter's wheels in rural areas work on the principle of the worker spinning the wheel with his hands. This implies that the potter has to stop shaping the clay with his hands to spin the wheel. This results in unnecessary fatigue of the potter and time wastage in completing a given job. This in turn directly affects the economic welfare of the potter. Also the speed of the wheel should be constant for quality production. Smart finishing and desired widths at completely different components will be achieved solely by constant speeds. This is often not gift in existing potter's wheels. Pottery is slowly however sure changing into a dying art. one {in all |one amongst one in every of} the most reasons is that the inability to make a lot of pottery in a short time. A basic wheel can't be accustomed manufacture pottery on an outsized scale. With enhancements in

science coming back in leaps and bounds, most of the western nations have already enforced numerous modifications to stay alive the enjoyment of pottery. In India, modifications area unit still vapour ware. We as engineer's area unit forever trying to extend the potency in any system. It's obvious the present model of wheel will be created approach higher by exploitation it in bike with mechanical devices like all bearings etc. We, as model masses, have an interest within the prosperity of others around United States additionally. We have a tendency to believe our model of wheel can facilitate potters living in rural areas.

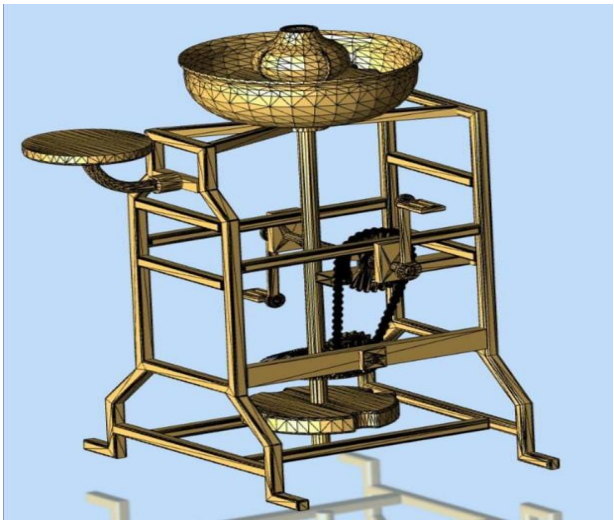

Figure 1: 3D CAD Model

III. MODELING AND ANALYSIS

(A) Design Calculation

Bearing:

Bearing could be a machine element which supports another moving machine element known as journal. it permits a relative motion b/w thee contact surfaces of members while carrying the masses. so as to scale back frictional resistance and wear and in some cases to hold away the warmth generated lubricant is also provided.

Bearing Material : High carbon chromium bearing steel specified is used as a general material in bearing rings and rolling elements (rollers).

Figure 2: Bearing

Bearing Dimension: Inside diameter 25mm, Outside diameter 47mm, Width 12mm
Basic load ratings: Dynamic 11.9 KN, Static 6.55 KN
Reference speed: 32000 r/min, Limiting speed 20000 r/min
Teeth on flywheel = 18
Teeth on sprocket = 52
Teeth on driven bevel gear = 20
Teeth on driver bevel gear = 25
Gear ratio GR1= 25/20 = 1.25
Gear ratio GR2 = 52/18 = 2.89
Overall gear ratio = GR=GR1×GR2 GR =1.25×2.89 GR=3.6125

Shaft: Length, Ls = 18″ = 457.2 mm
Diameter, Ds = 27 mm
Modulus of Elasticity of Steel, E = 200 kN/mm2
Modulus of Rigidity of Steel, G = 80kN/mm2
Mass of wheel head, Mh = 2.5 kg and the acceleration due to gravity can be taken as g = 9.81 m/s2.
Compressive Stress on shaft (σ)= weight of wheel head(w)

$$x = \frac{\text{weight of wheel head}(w)}{Cross\ sectional\ area\ of\ the\ shaft(A)}$$

$\sigma = \frac{W}{A}$
M = 2.5 Kg. and acceleration due to gravity taken as g = 9.81 $\frac{m}{s^2}$
W = M_h g = 2.5× 9.81 = $24.525N$
But, A = 490.87 mm^2
$\sigma = \frac{W}{A} = \frac{24.525}{490.87} = 0.04996\ \frac{N}{mm^2}$
$\sigma \cong 0.05\ \frac{N}{mm^2} = 50\ \frac{KN}{m^2}$
Strain Energy stored in the Shaft
$W = \frac{\sigma.v}{2E}$
$v = volume\ of\ steel\ shaft$
$\sigma = \frac{\pi D^2 L}{4} = \pi\ \frac{25^2 \times 457.2}{4} = 224427.53\ mm^2$
$W = \frac{0.05 \times 224427.53}{2 \times 200 \times 10^3} = 1.403 \times 10^3$mm
$J = \frac{\pi D^4}{32} = \frac{\pi 25^4}{32} = 38849.52 mm^4$
$R = \frac{D}{2} = \frac{25}{2} = 12.5$mm
$G = 80\frac{KN}{mm^2} = 80 \times 10^3\ \frac{N}{mm^2}$
L = 457.2mm
$\emptyset = 1^\circ = 0.0175$ radians
$\frac{T}{J} = \frac{G.\emptyset}{L}$
$T = \frac{G.\emptyset}{L} \times J$
$T = 80 \times 10^3 \times 0.0175 \times \frac{38349.52}{457.2}$
T =117430.73N.mm
Tortional shear stress on the shaft
$\frac{\tau}{r} = \frac{T}{J}$
$\tau = \frac{T}{J} \times r$
$\tau = \frac{117430.73 \times 12.5}{38349.52} = 38.28\ \frac{N}{mm^2}$
Moment Of Inertia = I = $\frac{MD^2}{8}$
$I = \frac{2.5 \times 254^2}{8} = 20161.25\ kgmm^2$
$I = I + m\ (\frac{D^2}{2}) = \frac{MD^2}{8} + \frac{MD^2}{4}$
$I = \frac{3MD^2}{8} = \frac{3 \times 2.5 \times 254^2}{8} = 60483.75 kg\ mm^2$
Compressive Stress on shaft = 0.05 N/mm2
Strain Energy stored in the shaft=0.001403mm
Twisting moment or torque of the shaft =117430.73 N.mm
Frame: Construction of the Frame is made up of mild steel of angle size 30 x 50 5 mm, its height is 600 mm of four corners. Length of the frame as per dimension of pedal mechanism to fit in the frame is 600 mm and also width of the frame to maintain as per the pedal mechanism is 500 mm. The dimensions of potter's wheel table,

along with the amount of lateral and vertical clearance needed, in the planning and design of potter's wheel table facilities are taken into account to ensure the safety of the user and promote efficient pedaling. The dimensions of the potter's wheel table at height of 0.60m, width of 0 60m, length of 0.50 m.

(B) Working : We comes with a pedal that turns the wheel quicker once pressure is placed on it. The wheel is placed in a very frame and is concerning waist high. You sit ahead of the wheel and lean forward to figure with the clay. The wheel can flip non-stop as long as there's pressure on the pedal. because it is turning, the potter is molding the clay into the piece he desires to create. every step in creating the piece would force a definite speed for the wheel to show. The potter can have it flip comparatively slowly as he centers the clay, and far quicker as he makes the clay taller. All the whereas, he's wetting the clay or sponging the clay. He could even be employing a special tool to chop lines into the piece. this can be what the splash guard is for. because the potter is functioning on the piece, he does not got to worry concerning the clay obtaining thrown everywhere the area.

IV. RESULTS

The results obtained by the utilization of this pedal operational Pottery wheel is extremely satisfactory for those who do the pottery creating method.The pottery folks will work with pedal mechanism of pottery creating. Generally, the time taken to provide one pot is just about forty to forty five minutes. But, by exploitation this pedal operational pottery wheel, the time taken for manufacturing one pot is reduced to twenty to half-hour.In rural or remote areas, wherever the electricity isn't out there, that where, pedal mechanism plays major role in this scenario, the pedal mechanism is employed for pottery creating method. By exploitation this pedal operational pottery wheel, the speed of pottery production is multiplied.Thus, the complete product is fictitious as per the necessities and desires of the pottery creating folks. It reduces and eliminates the manual work and energy needed for the method. Beacuse having pedal mechanism, the folks will work with anybody of this strategies with their convenient and makes the pottery pots,bowls,etc at higher rate of production.

V. CONCLUSION

In conclusion, the above project is done considering different factors like the ergonomic design of the potter's wheel as well as considering factors like the efficiency, technology and the geographical limitations and advantages. The machine can be used efficiently used in urban as well as rural areas, since the device is manually operated. The device can be operated by the unskilled workers provided with its quality metal frame and its dimensions giving it an ergonomic design. The manual operated device can alter the speed of the wheel efficiently as well. This device reduces time greatly needed to create the potter's wheel. Finally, all the components and their calculations are done to greatly increase the efficiency of the device producing great result.

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