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DESIGN AND DEVELOPMENT OF WOOD CUTTING AND DRILLING MECHANISM USING SEWING MACHINE

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Abstract

Energy is the most vital aspect in the development of modern technological civilization. Day life every task have been made quicker and fast due to technology advancement but this advancement also demands huge investments and expenditure, every industry desires to make high productivity rate maintaining the quality and standard of the product at low average cost. In paper we focused in the above problem we give the solution by this manually operated drilling and cutting mechanism.

We have developed a conceptual model of a machine which would be capable of performing different operation simultaneously, and it should be economically efficient .This machine can be used in remote places where electricity is irregular or insufficient. This machine can handle easy and transport for cutting in various places. It can be used for operating on materials like wood .The material can be cut without any external energy like fuel or current. Since machine uses no electric power and fuel, this is very cheap. In the present work, a human powered multipurpose machine is developed which can perform two types of operations drilling, cutting.

Keywords:- *Wood cutter, Shafts, Bushes, Drill bit, Sewing machine, Bevel gears etc.*

1. Introduction:

In this energy crises days It is important to manufacture the product which minimum cost and energy with maximum quality. By using this machine we can cut wood and drills small holes easily and in minimum cost. It is manually operated mechanism on the same set up perform cutting and drilling operation. So in this paper we have a proposed a machine which can perform operations like drilling, cutting some lathe operations at different working centers simultaneously which implies that industrialist have not to pay for machine performing above tasks individually for operating operation simultaneously. By using this mechanism get following advantages.

2. Literature survey

The surveys of the literature regarding the Pedal driven machines are listed:
Designed and developed a multipurpose machine which does not require electricity for several operations like cutting, grinding etc. This is a human powered machine runs on chain drives mainly with human efforts. But if you wanted to operate this machine by electric power this machine can also does that. It has some special attachment so use both human power as well as electric power. The design is ideal for use in the developing world because it doesn't require electricity and can be built using metal base, chain, pulley ,rubber belt, grinding wheel, saw, bearing, foot pedal (for operated by human) ,electric motor,chain socket.[1].
Designed and fabricated a pedal powered multipurpose machine. It is a human powered machine wich is developed for lifting the water to a height 10 meter and generates 14 Volt, 4 ampere of electricity in most effective way. Power required for pedaling is well below the capacity of an average healthy human being. The system is also useful for the work out purpose because pedaling will act as a health exercise and also doing a useful work.[2].
Designed and developed an automatically reciprocating pedal powered electricity generator (ARPPEG) in conjunction with the management and control over harvesting the kinetic energy, electricity generation, electric storage and the output of electricity. According to the operation testing results, this

system has been proved to effective in power generation. In view of the simple structure and low costs of this system without territory and time limits, the application of ARPPEG designed by them could open a new path to saving the energy and helping build a new energy society.[3].

A motor is 1/3 HP and 1750 RPM. The center distance on machine (the distance between the center of the pulley on the motor and the center of the pulley on the sewing head is about 16.5″. Pulley 1 (on the motor) is about 3.8″. Pulley 2 (on the hand wheel of the sewing machine) is 74mm according to the manual, which translates to 2.9″. Common roller bearings use cylinders of slightly greater length than diameter. Roller bearings typically have higher load capacity than ball bearings, but a lower capacity and higher friction under loads perpendicular to the primary supported direction. If the inner and outer races are misaligned, the bearing capacity often drops quickly compared to either a ball bearing or a spherical roller bearing.

3. Problem Identification

From the above literature survey we found that:

- The machines are run on electricity and required more power.
- When various attachments are attached to machine so cost is more and machine is bulky.

So yet there no other machine developed which consider cutting and drilling operation in one set up, so we selected this problem for our research work.

" Design and Development of wood cutting and drilling mechanism using sewing machine .

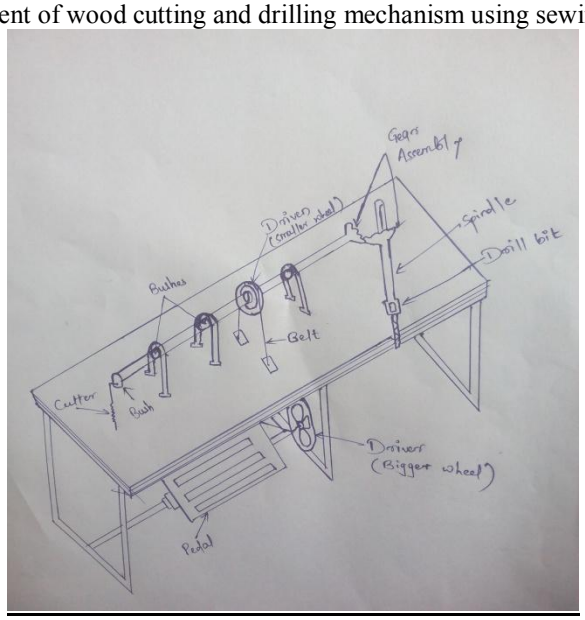


Fig.No-1 Mechanism of wood cutting and drilling machine.

4. Construction

It consist of shaft, bevel gear, bearings, cutter, drill bit, rope etc.

Sewing machine used to cutting and drilling on wood material. In this machine using pedal system is connected to driver(bigger wheel of machine) of sewing machine. This driver is connected to driven (smaller wheel of machine) with the help of rope. A horizontal shaft is connected to driven for cutting the wood. On this shaft one more shaft is mounted for drilling purpose.

Fig shows : It consisting

1. Drill beat
2. Shaft
3. Belt
4. Gear

5. Cutter
6. Bed
7. Swing machine base

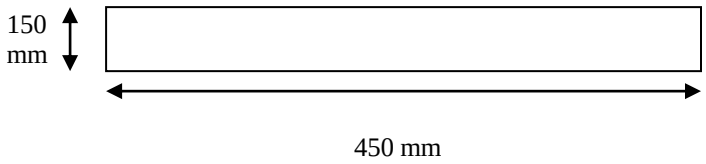
In this assembly shaft is connected to pulley is connected to wheel by using belt. Gear is mount on the shaft, cutter is also mounted on the shaft

5. Design:-

- **Design of the shaft:-**

1)Selection of shaft:- Transmission shaft

a) This shaft carry machine part such as pulley and gears.
b) These shafts are subjected to bending in addition to twisting.
c) From design data book value of shear stress= 96 Mpa for mild steel.



1. $\sigma_b=S_{ut}/3$
   $=210/3$
   $\sigma_b=70$ N/mm^2……..(1)

2. $\zeta max=1/2\sqrt{(\sigma_b)^2+4\zeta^2}$
   $=1/2\sqrt{(70)^2+4\times(96)^2}$

   $\zeta max=102.18$ N/mm^2…….(2)

where,

ζ= shear stress induced due to twisting moment
σ_b=Bending stress (Tensile or compressive) induced due to bending.

3. $T_e=\pi/16\times\zeta\times d^3$
   $=\pi/16\times96\times(15)^3$
   $T_e=63.61$ N-m (T_e= Equivalent twisting moment)……(3)

4. Equivalent bending moment (M_e)=

   $M_e=\pi/32\times\sigma_b\times d^3$
   $=23.19\times10^3$N-mm
   $M_e=23.19$ N-m……(4)

- **Design of the bevel gears:-**
-

1. selection of bevel gear.

The power transmission is about 90 degree exactly perpendicular. Here miter gear used because equal teeth & equal pitch angel.Dia78mm, Material:Mildsteel

Power required for cutting and drilling:- Manual power is given through machine pedaling.

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6. Working

When operator start pedaling, the driver wheel (bigger wheel) start rotating. As driver wheel rotate the driven wheel also rotate with the help of rope. The horizontal shaft is connected to driven wheel because of this shaft will rotate. By this rotating shaft the cutter will attached to another small shaft at the bottom of the machine for cutter holding.
The another shaft is attached for drilling operation exactly opposite to the cutter shaft. Here the bevel gear arrangement is used for carrying out the operation. Bevel gear is used to perpendicular power transmission. One of the bevel gear is connected with the shaft and another one with the drill chuck hence when the shaft is rotated drill chuck also rotated. We use a rack and pinion type mechanism which convert rotational motion into linear motion. A circular gear called the pinion engages teeth on a linear gear bar called as rack. Rotational motion applied to the pinion causes the rack to move relative to the pinion, there by translating the rotational motion of the pinion into linear motion.

7. Advantages:-

- The cost of machine is minimum.
- This mechanism is manually operated so electricity supply or external energy not required.
- Peddling is usefull for human exercise.
- Multiple operation can be done.

8. Conclusion

- By using this machine multiple operations can perform
- cost is reduced .
- suitable for small work.

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