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# DESIGN AND FABRICATION OF DRILLING CUM SAWING MACHINE

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## ABSTRACT

*Drilling saw cutting, grinding operation are the major useable operations in the production engineering. To perform drilling operation drilling machine is required and to perform sawing operation saw machine is required. It is necessary to reduce the investment to perform drilling and sawing operation. This paper provides guidelines to design and fabricate drilling cum saw machine to perform drilling and sawing operation.*

***Keywords: - Drilling, Sawing, Design, Fabrication.***

## I.INTRODUCTION

The portable drill is hand –supported, power –driven machine tool that rotates twist drills, reamers, counter bores, and similar cutting tools. The portable metal sawing machine describe in this section are those light weight and easily transportable saw that are used in a field or normal machine shop for maintenance personnel., this saw can be used to cut the stock that is too big or too long to move to a maintenance shop to cut. Apart from drilling and saw cutting some industries and any work shop department is required to sharpen the tool, and some sharp edges for cutting or performing any metal removal work. To perform this type of operation maintenance shop required a grinding wheel which is driven by the electric motor.

## II. LITERATURE REVIEW

In order to get an idea for design and fabrication the literature related design and fabrication is reviewed. Waghmare and Prabhavalkar (2013a) presented a new method to develop gravity assisted free energy pump by using two springs and two masses system, which runs without electricity. Gravity assisted free energy pump system is an innovative method that utilizes the concept of Free un-damped vibrations in two mass- two spring system. The gravity assisted free energy pump is operate manually and should have low initial and operating cost. Waghmare and Prabhavalkar (2013b) presented a new method to develop gravity assisted free energy pump by using two springs and two masses system, which runs without electricity. Gravity assisted free energy pump system is an innovative method that utilized the concept of Free un-damped vibrations in two mass- two spring system. The gravity assisted free energy pump is operated manually and should have low initial and operating cost. Waghmare et al. (2015b) designed a stretcher with shock absorber. The efforts were taken to make the stretcher lighter in weight and compact for easy travelling. The shock absorbers were used to reduce

vibration shocks and use of shock absorber reduced the intensity of vibration shocks produced during traveling of patient. Rubber shock absorbers were light in weight and less costly also mounting of rubber shock absorbers was easy; they can mount using any mechanical mechanism. They focused on the effective use of this shock absorbers in hand lifting stretcher. Waghmare et al. (2015a) proposed manually operated spiral tube water wheel pump. During study they found the 'spiral tube water wheel pump' was an effective method for pumping water or similar liquid without use of electric or fuel supply. Also it was totally eco-friendly method. The designed model is successfully giving the positive results. It pumps water to give desired discharge and for various heads and it can be used at different locations having geographical diversity. Waghmare et al. (2016a) proposed the restrictor geometry to achieve a maximum air flow with minimum pressure drop to improve engine performance of a FSAE car. Waghmare et al. (2016b) described about the mechanical design and analysis of mixer on the fluid that is to be stirred in the mixing vessel. The mixing is a very important processing any chemical, paints and food process industry. To attain the uniform mixing of the solution with the desired quality and in order to remove the drudgery of human folk this newly designed mixer is suggested.

## III.METHODOLOGY

The following steps are used for designing the machine.

- Study the drilling and saw machine operation.
- Combine both operations to operate these both in together.
- Convert the rotary motion into the reciprocating motion.
- List out the all component needed in these.
- Start to design all components.
- Fixed the position of Saw Cutter as per requirement.
- Direct the rotary motion via bevel gear then disc and connecting rod and then after finally to Saw cutter.

## IV.PROPOSED MODEL

Drills are held in the drill chuck mounted on the drill spindle. Generally drills under ½"° diameter are having straight shanks. These drills are mounted in the chuck. The chuck is tightened using chuck. If can operated without key also. This type of chuck is used for holding tools having straight shanks. Three slots are cut 120 Ø apart in the chuck body which houses three jaw & having threads cut at the back that meshes with a ring nut. The ring nut is attached to the sleeve bevel test cut on its face which meshed with the bevel teeth on the sleeve. The rotation of the sleeve causes the ring not to rotate in a fixed position and all the three jaws closed & opened by the same amount from the centre closing or releasing the shank of a tool. The component to be drilled is marked using scriber. Then the drill point is punched using centre punch. The component is clamped on the work table using clamping device. While doing this the punched mark is matched with the drill held in the chuck. The drill is hold in the chuck using chuck key. The drill should be hold tightly in the chuck. The required step is selected. A drill is a tool with rotating drill bit used for drilling holes in various materials. Drills are commonly used in wood working and metalworking. The drill bit is gripped by a chuck at one end of the drill, and is pressed against the target material and rotated. The tip of the drill bit does the work of cutting into the

target material, slicing off thin shavings (twist drills or auger bits) or grinding of small particles. The proposed model is shown in figure 1.

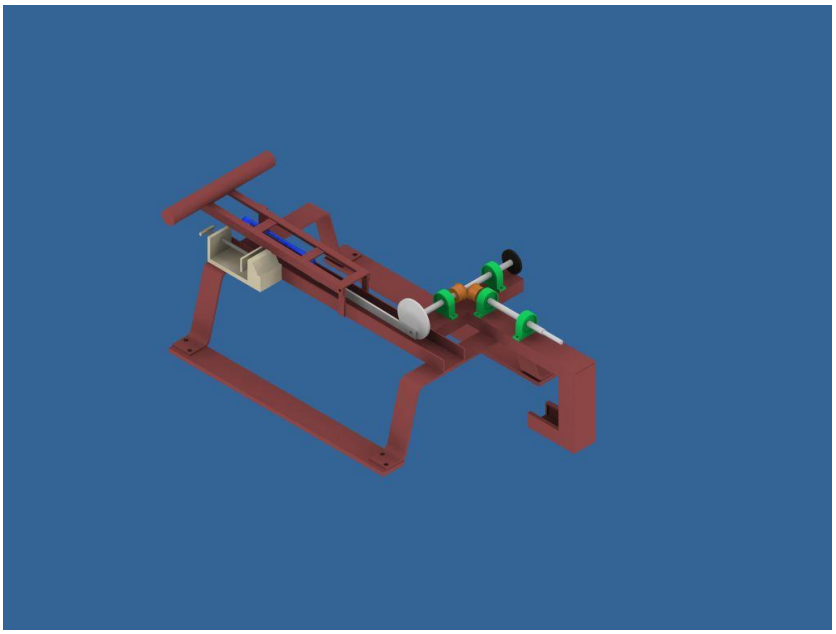

**Figure 1: Proposed Model**

## V.DESIGN DETAILS

**Table 1: Design Details**

| *Sr. No.* | *Name of Parts* | *Dimensions* | *Allowable* | *Induced* | *Remark* |
|---|---|---|---|---|---|
| 1 | Bevel Gears | V = 1.09 m/s<br>L = 50 mm | σ allow = 85 N/mm2<br>$W_T$ = 343.716 N | Tangential Force<br>$W_T$ = 220 N | Safe |
| 2 | Shafts | D = 20 mm | $W_N$ = 230 N | $W_R$ = 80 N | Safe |
| 3 | Connecting Rod | Eccentricity = 88 mm | Fb = 100 N/mm$^2$ | Fb = 80.65 N/mm$^2$ | Safe |
| 4 | Bearing | d = 5 mm<br>B = 14 mm<br>D = 47 mm | Lb = 12000 hrs | C = 8862 N | Safe |
| 5 | Welding | S = 5 mm<br>L = 130 mm | Ft = 56 N/mm$^2$ | Ft = 56 N/mm$^2$ | Safe |
| 6 | Bolt & Nut | M8 | Fs = 38 N/mm$^2$ | Fs = 8.462 N/mm$^2$ | Safe |
| 7 | Motor (Standard) | 475W, 2.3 Amp, 220V, 1φ, 700 rpm. | …. | …. | Safe |

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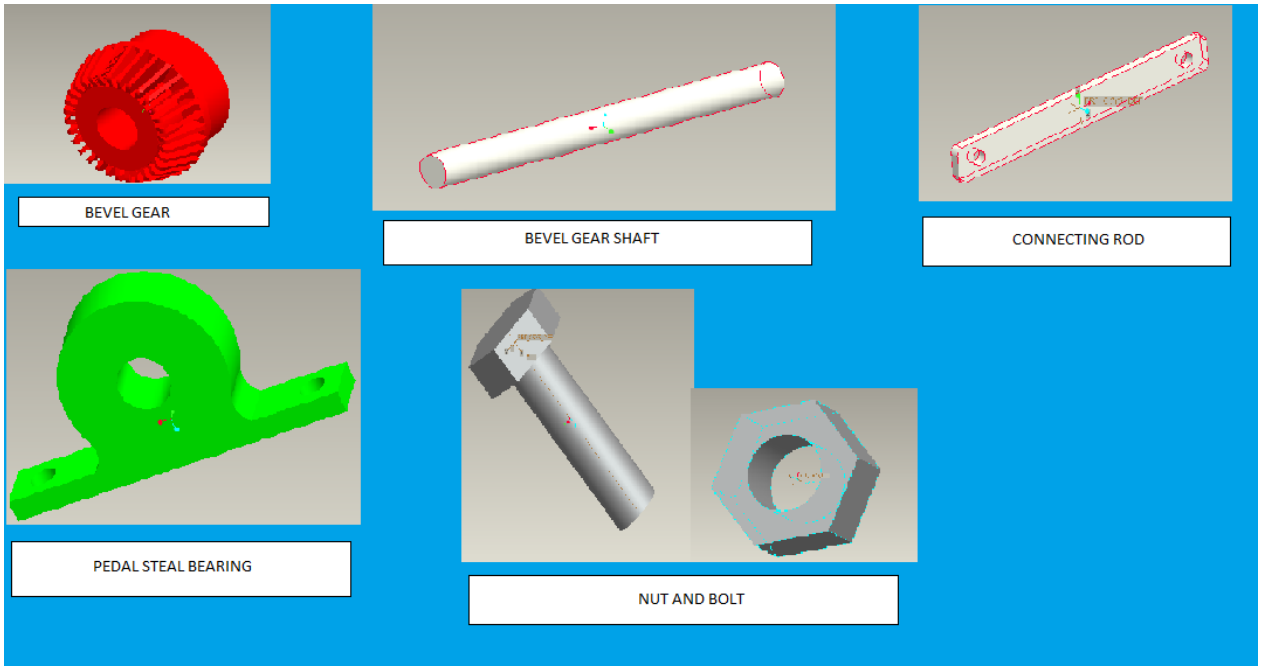


**Figure 2: Parts Details**

## VI.WORKING OF MACHINE

This project basically attachment of the grinding, saw with the drilling motor. The power of drilling machine is used to drive the other operations. First the power is transmitted to the bevel gear, which will functionally adjust with the other operations. The bevel gear having a shaft known as bevel shaft one end is welded to bevel gear to transmit the power. The actual constructed machine is shown in figure 3.

**Figure 3: Actual Constructed Machine**

## VII. RESULTS AND DISCUSSION

The following results are recorded.

1. The sawing machine can cut maximum about 30 mm solid M.S. rod in 70 seconds.
2. The sawing machine can cut maximum about 30 mm solid aluminum rod in 35 seconds.
3. The sawing machine can cut maximum about 60 mm solid wooden rod in 70 seconds.
4. The sawing machine can cut maximum about 30 mm thick acrylic sheet in 26 seconds.
5. The drilling machine can drill maximum about 12 mm diameter hole into 5 mm thick M.S. sheet in 140 seconds.
6. The drilling machine can drill maximum about 12 mm diameter hole into 5 mm thick aluminum sheet in 40 seconds.
7. The drilling machine can drill maximum about 12 mm diameter hole into 5 mm thick Acrylic sheet in 10 seconds.

We have found out the earlier existing machines of drilling, hack saw machine. These three machines are operating at different power source and performing at different location in the work shop, which wills ultimately increases the manufacturing time and cost of the product. So we all have decided to make one machine which is operating on the one power and performing the all three operation. So by discussing the all parameter we have decided to make our project "DRILLING CUM SAW MACHINE". So by taking the motor of the drilling machine we have run the bevel gear shaft , the power from bevel gear to then transmitted to the one side of the bevel gear by connecting it slider crank mechanism we operated the saw cutter. And on another side by connecting it with grinding wheels we done 2$^{nd}$ operation. And by removing the drilling machine, we too perfume drilling at required position by using it. This the over view of our project idea. Now on further discussion we find that we can remove the grinding wheel and replace it with the cutter disc which is used to cut metal sheet, plane surfaces.

## VIII.CONCLUSIONS

By having trial on 'DRILLING CUM SAWING MACHINE' following conclusions are made.

- Testing, trial was done on the machine, the performance and the efficiency of the machine is satisfactory. We can drill and one piece of mild steel material per minute.
- The operating voltage of the motor is 250VA.C. and have power consumption of 380W/hr. The operating safe rpm of the drill is 700 rpm and the safe operating rpm by having trial on it for the performance.
- The maximum diameter of work piece to be cut is about 30 mm thickness and drilled is 12mm diameter. The maximum travel of the saw over the job is 25mm, which is very safe.
- The maximum travel of the grinder on the job is 7 mm, which is suitable for small knife and tool.

## IX.FUTURE SCOPE

There is always more and more scope towards whatever he has Created and put in the report the following future modifications:-

- The drive pulleys can be replaced by worm and worm or bevel gear drives with the speed reversing with the reversal of the motor rpm arrangement.
- Table actuation can be made hydraulic operated type by replacing the hand tie rod and rack and pinion arrangement by hydraulic cylinder and the pneumatic cylinder along with the ratchet and Paul arrangement. It can be made hydraulically power operated by installing the gear oil pump at the place of air compressor and pneumatic cylinder arrangement.
- It can be made pneumatically operated or spring and tie rod operated, by replacing the rack and pinion arrangement by pneumatic circuit-Arrangement along with the 5/2 direction control valve and the compressed air.
- The place where there is scare city of the electricity the electric motor drive is replaced by an I.C. Engine installation.
- By installing the multipoint cutting edge tool called, it can be used as reaming machine for boring the engine cylinder block.
- We can make this project more effective in terms of cutting by replacing the grinder tool with the cutter for cutting the sheet and wood.

Thus in future there are so many modifications, which we can make to survive the huge global world of competition.

## REFERENCES

1] Sadhu Shingh (2006) , *THEORY OF MACHINE , Pearson Jalandhar India.*,Sahapur.

2] Pandya and Shah (2005), MACHINE DESIGN, Charotar House, India.

3] R.S. Khurmi and Gupta (2008) , MACHINE DESIGN, S.Chand ,New Delhi, India.

4] P.C. Sharma (2008) , PRODUCTION TECHNOLOGY , S. Chand ,New Delhi , India.

5] Hazra and Choudhary (2010), PRODUCTION TECHNOLOGY (vol.2), media promoters, Mumbai, India.

6] Waghmare, S. N., Karekar, N. S., Karande, P. P., & Pandhare, S. B. (2016a), Intake System of Formula SAE Car: A Proposed Model.

7] Waghmare, S. N., Mail, S. P., Mohite, D. A., Nalawade, P. S., & Salunke, P. D. (2016b), Electrically Operated Bi-directional Mixer: A Proposed Work.

8] Waghmare, S. N., Sawant, N., Dhumal, S., Patil, N. K. P., & Dambe, P. R. (2015b). DESIGN AND ANALYSIS OF COMPACT STRETCHER WITH RUBBER SHOCK ABSORBERS.

9] Waghmare, S. N., Mestri, M. M., Lavekar, P. V., Misal, T. S., & Nalawade, P. C. (2015a). MANUALLY OPERATED SPIRAL TUBE WATER WHEEL PUMP.

10] Prabhavalkar, Mr, and Mr Waghmare SN. (2013b) "Optimization of Machining Parameters of MS in Vortex Tube Cooling."

11] Waghmare, S. N., & Prabhavalkar, M. S. (2013a) DESIGN AND FABRICATION OF GRAVITY ASSISTED FREE ENERGY PUMP.

**BIOGRAPHICAL NOTES**

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