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Fabrication of mini circular saw machine

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ABSTRACT

This research paper explores a Fabrication of a Mini Circular saw machine for cutting material like wood. A circular saw is a power-saw using a toothed or abrasive disc or blade to cut different materials using a rotary motion spinning around an arbor. It is a tool for cutting many materials such as wood, masonry, plastic, or metal and may be hand-held or mounted to a machine. In woodworking the term "circular saw" refers specifically to the hand-held type and the table saw and chop saw are other common forms of circular saws. Circular saw blades are specially designed for each particular material they are intended to cut and in cutting wood are specifically designed for making rip-cuts, cross-cuts, or a combination of both. Circular saws are commonly a powered by electricity.

Keywords— Circular Saw, Rotary Motion, Woodworking, Cutting, Rip & Cross Cuts

1. INTRODUCTION

A cutting tool (or cutter) is any tool that is used to remove material from the work piece by means of shear deformation. Cutting may be accomplished by single-point or multipoint tools. Single-point tools are used in turning, shaping, planing and similar operation, and remove material by means of one cutting edge. Milling and drilling tools are often multipoint tools. Grinding tools are also multipoint tools, each grain of abrasive function as a microscopic single-point cutting edge, shears a tiny chip.

Cutting tools must be made of a material harder than the material which is to be cut and the tool must be able to withstand the heat generated in the metal cutting process. Also, the tool must have a specific geometry, with clearance angles designed so that the cutting edge can contact the work piece without the rest of the tool dragging on the work piece surface. The angle of cutting face is also important as is the width, number of flutes or teeth, margin size, in order to have a long working life all of the above must be optimized, plus the speeds and feeds at which the tool is run.

1.1 PROBLEM STATEMENT

As mentioned earlier, the structure of the saw machine is too simple, that's why the cause of electric shock, ambient noise, blows caused by objects occurred. Bad, broken, or burnt internal wiring caused whole structure and damaged the internal parts. When cutting thin strips of wood on a table saw, they often fall into the extra space in the throat plate around the table. This can cause kickback, which can be dangerous. In today's modern industry, the production rate is high to keep up with the supply in the market. Majorly in wood industries, where at a time many types of product is made, with very minute changes. For Example: Home construction, Fencing and decorating garden, Artworks, Musical instrument, Wooden toys, Furniture, Ship building, Stationary, etc. create this different product in their respective industries. So, we can create mini bench saw machine itself, which will cut the wood for several applications and also minimalizing the chances of errors. This can be made possible, using DC motor, and battery. Hence, our project is based on creating a mini bench saw machine, which will help solving the problem mentioned above.

2. LITERATURE REVIEW

A circular saw machine is a woodworking tool consisting of a circular saw blade, mounted on an arbor, that is driven by an electric motor in turn the drive power from motor is passed to the blade either directly or by belt. The blade protrudes through the surface of a table top, which provides support for the wood being cut. The first record of patent for that machine was issued in 1777 to an English man, Samuel Miller. In a modern saw or table saw, the depth of the cut is varied by moving the blade up and down: the higher the blade protrudes above the table, the deeper the cut that is made in the material. In some early table saws, the blade and arbour were fixed, and the table was moved up and down to expose more or less of the blade. The angle of cut is controlled by adjusting the angle of blade.

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Wood has three planes of symmetry, axial, radial, and tangential. Corresponding to these planes of symmetry are the cutting directions by which machining processes can be described. When referring to a machining direction, the established labeling system employs two numbers separated by a hyphen. The first number denotes the orientation of the cutting edge to the wood grain direction; the second number denotes the movement of the tool with respect to the grain direction.

Analysis of the wood cutting process in the published literature (Franz 1958, Kivimaa 1950, Koch 1964, McKenzie 1961) examines these three effects, with publications investigating defects in the wood grain such as knots (Axelsson 1994).

In this review, fundamental wood machining research is evaluated to determine the general cutting mechanics of simple, orthogonal, and oblique cutting tools. Simple tool force trends and chip formation characteristics are identified here, along with the cause and effects of tool wear. In addition to this, specific methods of evaluating sawing processes have been investigated. These include the use of piezoelectric dynamometers to record tool forces and high-speed photography to evaluate chip formation. Furthermore, regression analysis has been previously used to identify tool force trends with respect to both tooth geometry parameters and work-piece properties.

Naylor, A., and Hackney, P. (2013). "A review of wood machining literature with a special focus on sawing," BioRes. 8(2), 3122-3135.

3. DESIGN OF THE PROJECT

In this project we design the assembly or disassembly diagram as shown in fig. There are many parts with different dimensions like Saw blade, cardboard, wooden frame, End cup PVC pipe etc. and some electrical components like DC motor, Push button, battery.

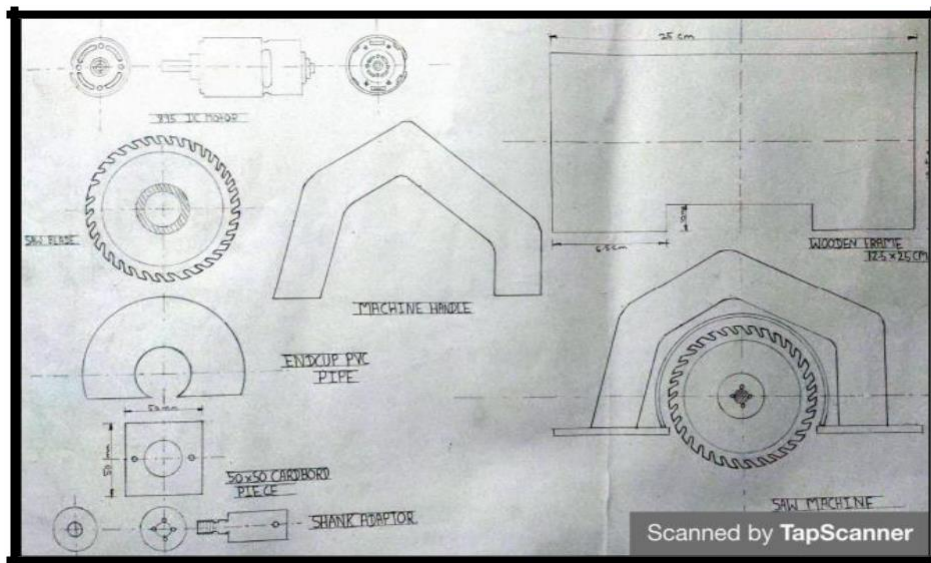


Fig. 1: Design of Proposed Project

4. METHODOLOGY PROCESS

- For making circular Saw Machine we took 12.5 cm by 25 cm cardboard and then we marked 7 centimeter from each end of one side of the cardboard then we polish the middle part from the center by the polish paper to make edge slot for placing blade. We polished up to 10 mm.
- Then we took a 50mm by 50mm small cardboard and we joined the diagonals of that square cardboard and we drill the center part of the cardboard by drilling machine this was done for the DC motor which was to be placed in the Centre of that cardboard then we took the measures of the screw points of the DC motor and then placed it on that small cardboard by the help of divider and drill it of the screw size then we took the big cardboard mark some measures to place the small 50 mm by 50mm cardboard vertically on that so we can Mount DC motor on it so we used solution to stick the cardboard base and v placed the DC motor through the drilled slot and join the DC motor by the screws then we mounted the shank adaptor on the top of the DC Motors output rod then we took a pipe end cap and cut it into half by hacksaw and made a small circle on that cap .
- Mounted the cap on dc motor by using solution making sure that it works as the shell of motor and cutter blade.
- Then we took another cardboard sheet and made sure that it was thick enough and cut it into the shape of handle for circular saw cutter then we drilled through to the top of the handle so that we can pass the wire in it.

- We connected both ends of wires to a button to operate the circular saw cutter and the another and to the DC motor. Then we mounted the circular blade on the shaft adaptor and we fixed it by the help of screw. And it's done!
- Here we completed the assembly of every part of Circular saw machine and it's ready to cut down any wooden blocks, sheets, plywood etc.

4.2 MATERIALS REQUIRED

Sr. No	Component	Qty.	Specification
1	775 DC Motor	1	7000 RPM
2	Saw Blade	1	100 mm Dia.
3	Wooden Frame	1	12.5 cm × 25 cm
4	Small Cardboard	1	50 × 50 mm
5	Shank Adaptor	1	Drillpro 5mm M10
6	PVC Endcup	1	110 mm
7	Push Switch	1	-
8	Electric Wire	2	18 AWG
9	Adapter	1	12V,2A

4.3 DESIGN OF PROTOTYPE

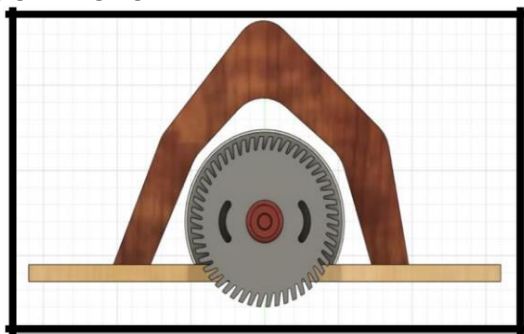


Fig. 2 Front View of the Model

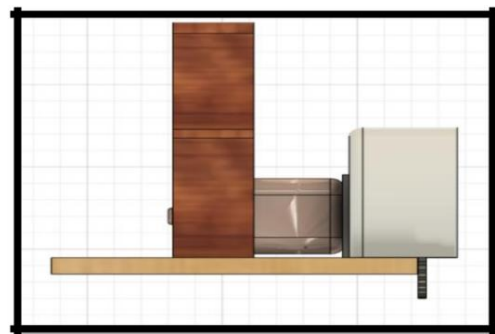


Fig. 2 Side view of the Model

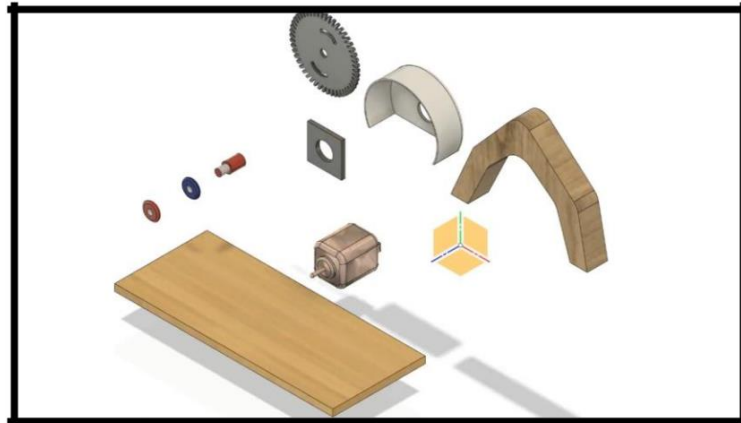


Fig. 4: Exploded View of the Model

4.4 COMPONENTS OF THE MODEL

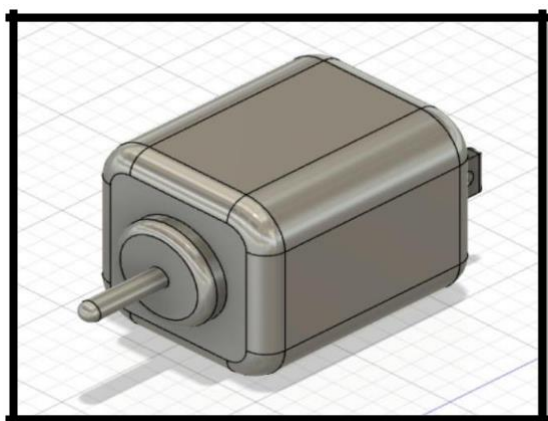


Fig. 5: 775 DC Motor

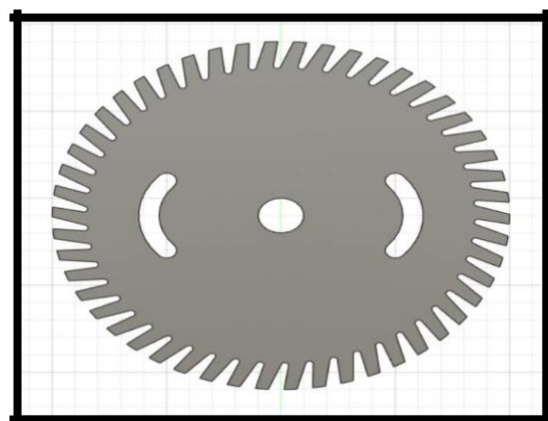


Fig. 6 : Saw Blade



Fig. 7: Shank Adapter

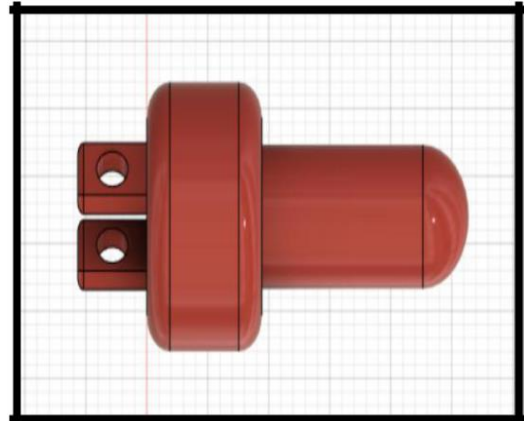


Fig. 8: Push Button

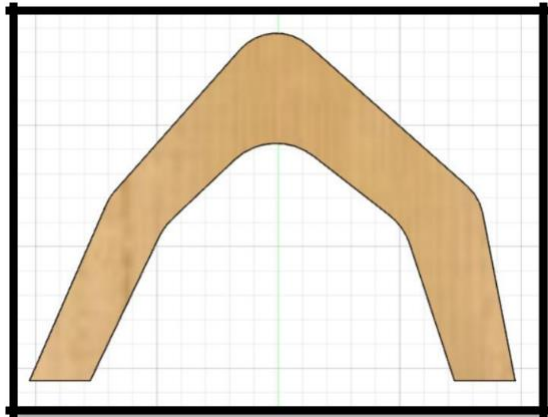


Fig. 9: Handle

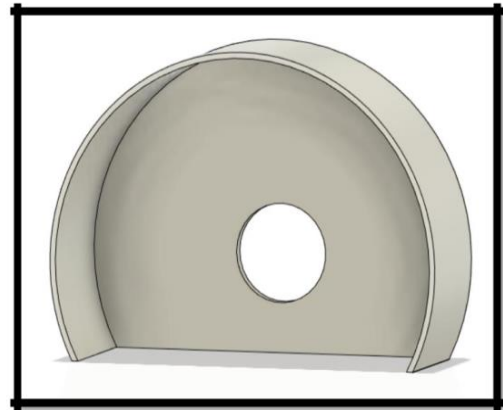


Fig. 10: PVC End-cup

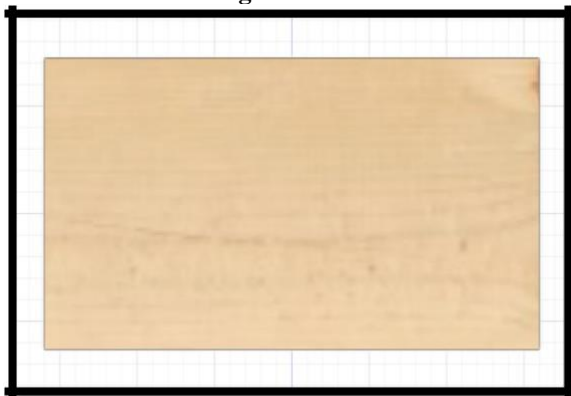


Fig. 11: Wooden Frame

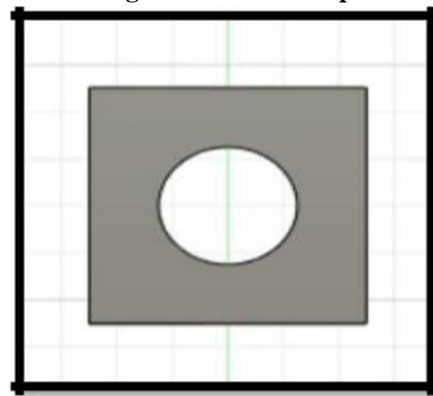


Fig. 12: Wooden Block

5. APPLICATIONS

- a. It can be used in small scale cutting operations like in household & workshops.
- b. Furniture making purposes.
- c. In sawmills, to cut large size timbers.
- d. Cutting logs into firewood.
- e. For straight cutting & cross cutting.

6. CONCLUSION

This Setup can be used for working small objects. By using this mini bench saw machine we can perform cutting operation quickly. The setup is very portable and easy to use. It can be used where cutting of small wooden parts is required. Thus we can conclude that in near future we may see the use of such bench saws in many small scale industries.

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