

AN ATTEMPT TO IMPROVE SAFETY SYSTEM OF BENCH SAW

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ENGINEERING COLLEGE



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INTRODUCTION

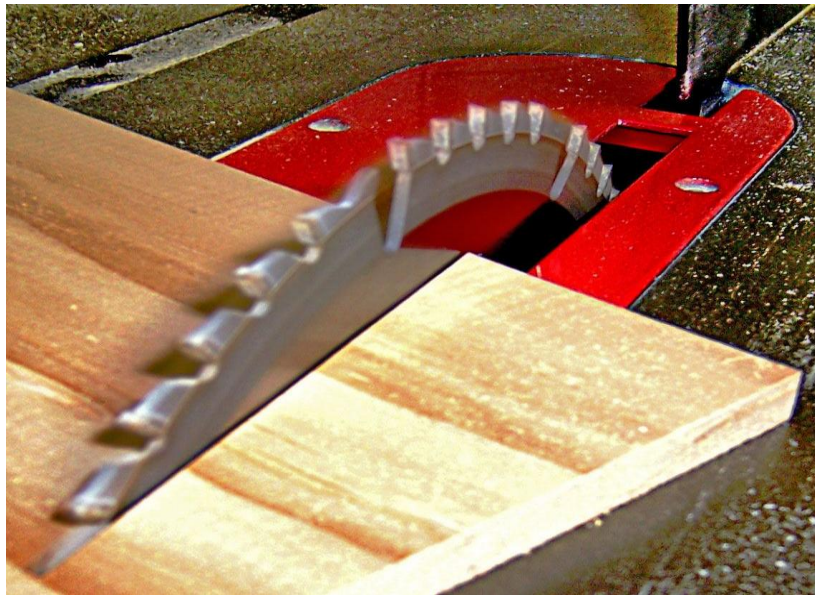


❖ WHAT IS BENCH SAW ?

- A table saw or saw bench is a woodworking tool consisting of a saw blade, mounted on an arbor, that is driven by an electric motor (either directly, by belt, or by gears).
- The blade protrudes through the surface of a table, which provides support for the material, usually wood, being cut.
- In a modern 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 arbor 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. Some earlier saws angled the table to control the cut angle.



PROBLEM SUMMARY :

- Now a days we can see that table saw and bench saw is very commonly used machines for cutting and other purpose. And while using this machine we can see that there are many accidents while working on it.
- Because a cutter which is used in this machine is very Sharp and rotates at very high speed. so while man working on this machine many time some body parts comes in contact with this cutter and major accidents will occurs like cutting of thumb and cutting of hand of human.
- So we have to find some solution for overcome from this problem.





- According to one survey in one year 30,000-60,000 accidents occurs because of table saw and bench saw. so we have to find some solution for this type of accidents. So with the help of this model we will solving solution for this kind major accidents.



OVERVIEW OF PROJECT :

- A Bench Saw is a one of the common cutting machines that are widely adopted to cut woods and thin boards. However ,even a slight incautious operations easily leads to the injury of the fingers.
- In light of the statistics of national occupational accidents from The Council Of The Labour Affairs (CLA) in2011, the proportion of the injury to fingers is 37.46%.
- Now a days we can see that many accidents occurs while working on table saw or bench saw. So, to overcome from this type of accident we have made this project.



- In this project when human skin comes in contact with cutter then immediately saw cutter will fall down. This process is very accurate and cutter falls down maximum in 10 milliseconds.
- So, as discussed above we can save our selves from major accident like cutting of hand, thumb or other part of body. This is very useful system for bench saw.
- And with the help of this system we can stop many accidents and save many people from injuries.



LITERATURE REVIEW



SR. NO.

AUTHOR

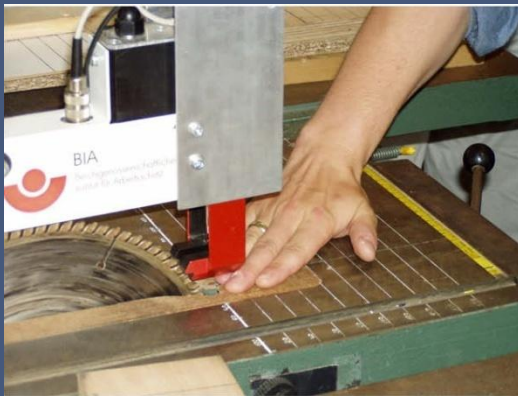
TITLE

CONCLUSION

1. Dietmar Reinert ,
Oliver
Schwaneberg ,
Norbert Jung ,
Sven Ullmann ,
Wilfried Olbert ,
Dieter Kamin ,
Rudolf Kohler

Finger and hand
protection on
circular table and
panel saws

In this paper a reliable protective device with functional diversity has been developed using a passive infrared sensor in combination with a capacitive field sensor. Second the distinction between skin and wood or other material is done by dedicated kind of spectral analysis in the near infrared region. With a kind of light curtain the intrusion into the dangerous zone near the blade can be prevented. The safety guard protects the operator's hand within 50 ms.



**SR.
NO.**

AUTHOR

TITLE

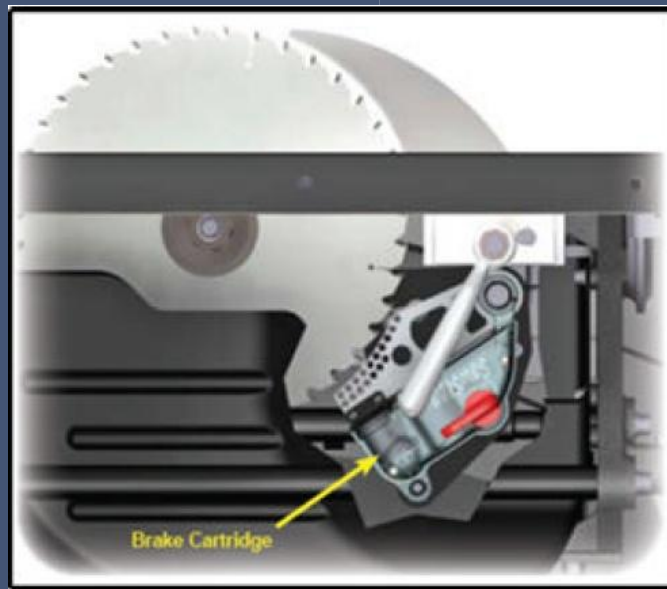
CONCLUSION

2.

Robert J. Howell's

Detection and blade
stopping reaction
system

The SawStop detection and reaction system includes two components: an electronic detection unit, and a brake. The system induces a small electrical signal onto the saw blade. When human skin contacts the blade, the person's body absorbs part of this signal. The system detects the signal reduction and engages brake. The brake consists of an aluminum pawl that is pushed into the teeth of the spinning blade, stopping it in milliseconds.



SR. NO.	AUTHOR	TITLE	CONCLUSION
3.	Segun R. Bello, Yahaya Mijinyawa	—	Finally it was observed that none of the companies had focus should be on these challenges in practical terms to form a safety legislation, comprehensive systems approach and monitoring group in the industry to guide the management in the implementation order to reduce or eliminate workplace hazards.

SR. NO.	AUTHOR	TITLE	CONCLUSION
4.	Kuo Yi - Li	—	<p>The goal of the prevent invention is to design a safety protection device which applies a transparent safety guard and the spring to form a protection space around a cutting tool of the saw. The operator clearly sees the processing procedures via LED unit and the transparent safety guard and prevent hands from touching the cutting tool.</p>

SR. NO.	AUTHOR	TITLE	CONCLUSION
5.	Graham and Joice Chang	—	<p>In this paper safety devices that are optional in the same way that safety belt use is a matter of choice for motorists. At least one manufacturer now offers an automatic blade-stopping device, and others are in the experimental stage. Using sensors to detect skin in a danger zone, they protect woodworkers by moving the blade out of harm's way and can't be easily disengaged.</p>

METHODOLOGY



Research on project



Selection of Material



Selection of Process Parameter



Design Plan & Circuit Plan



Selection of Mechanism & Equipment



Run Experiment According To Design Plan



Result Analysis Discussion



Conformation Test



Create Software Tool Based Model



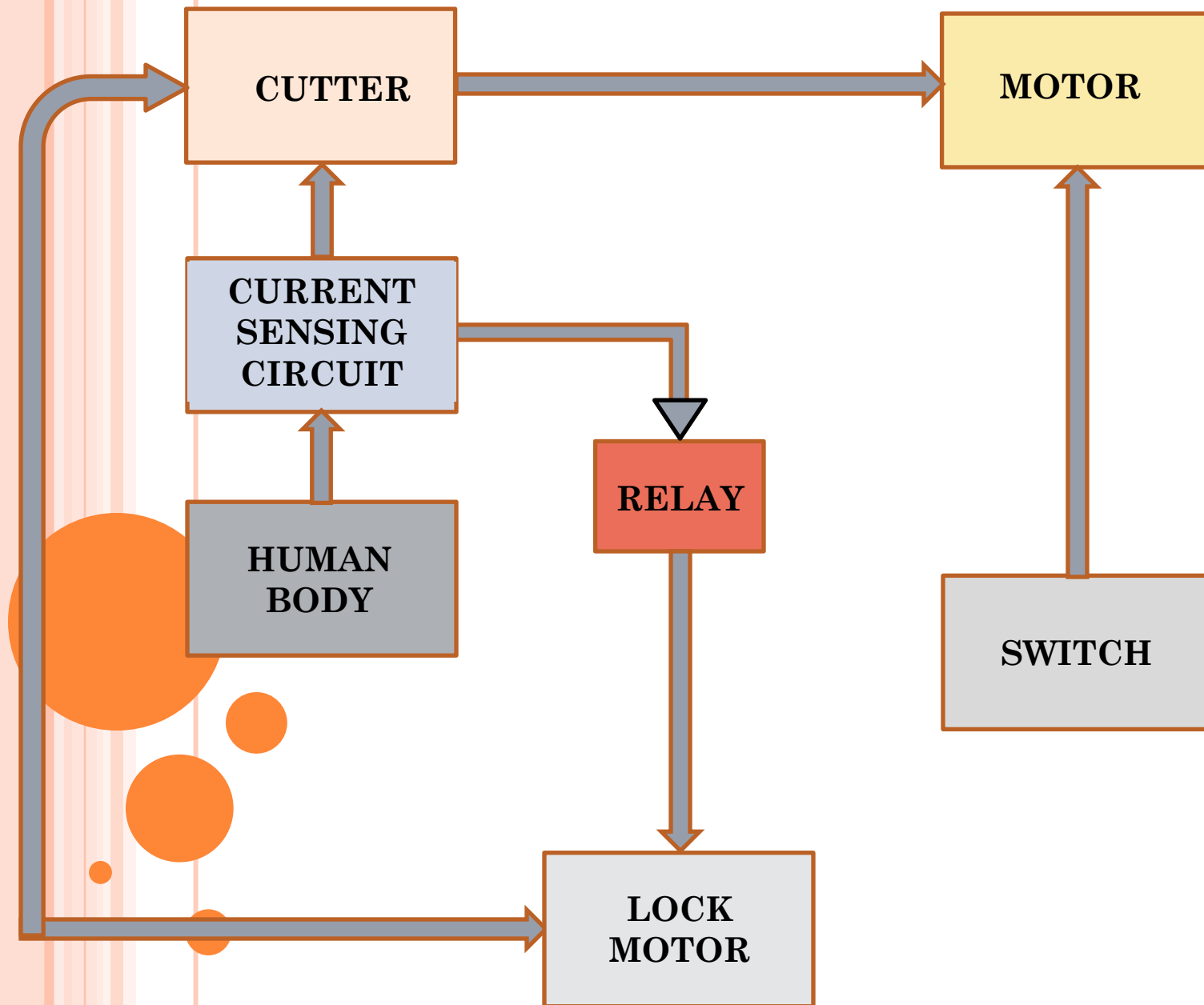
Conclusion



END

EXPERIMENTAL SETUP





WORKING :

- As discussed earlier save over salves from this kind of major accidents we are making this project named bench saw safety system.
- In this project for protect over salves we had put one system in which whenever human skin touches to cutter imminently cutter falls down and any injure to human will not occurs.
- fall down of blade apply a small amount of electric voltage to the blade of the saw. The current through the blade is continuously monitored.



- If the saw detects a change in this current (as would occur if a hand or other body part came into contact with the blade) an automatic fall down system is activated, through rotating motor.
- The falls down within ten milliseconds.. The operator suffers a small nick instead of an amputation or other more serious injury.
- The design takes advantage of the difference in "electrical conductivity" (similar to a GFI circuit) between wood and flesh.



HARDWARE USED :

- ❑ DC MOTOR
- ❑ CUTTER BLADE
- ❑ WOODEN BOARD
- ❑ TRANSFORMER
- ❑ CURENT SENSING CIRCUIT



❖ DC GEARED MOTOR :-

- A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.

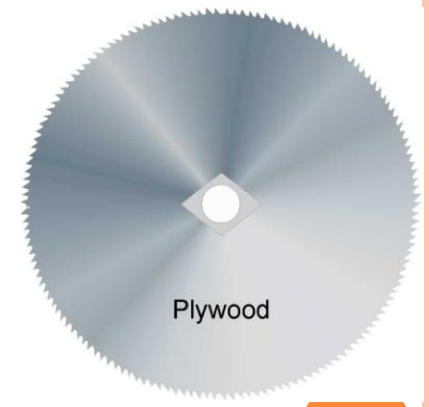
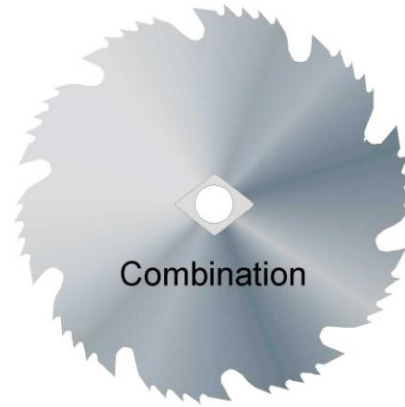
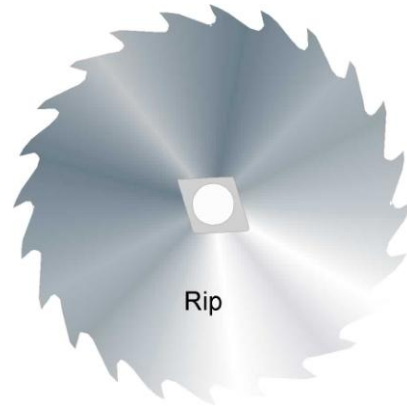
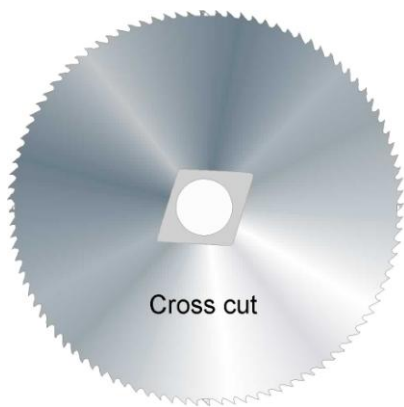


WOODEN CUTTER BLADE

- Manufactured from High Carbon Steel. Available in Mirror and Satin Finish. Our Wood Cutting Circular Saw Blade is one of the fastest and safest wood cutting tool, as compared to the other types available in the marketplace. The aesthetic qualities and long term durability of the wood cutting circular saw blade offered by us is simply incomparable.



- A wide variety of blades sizes and teeth configurations are available for different cuts and finishes.
- Blades are classified by the type of teeth.
 - a. Cross cut
 - b. Ripping
 - c. Combination
 - d. Plywood
- Most blades are available with carbide teeth.



❖ TRANSFORMER :-

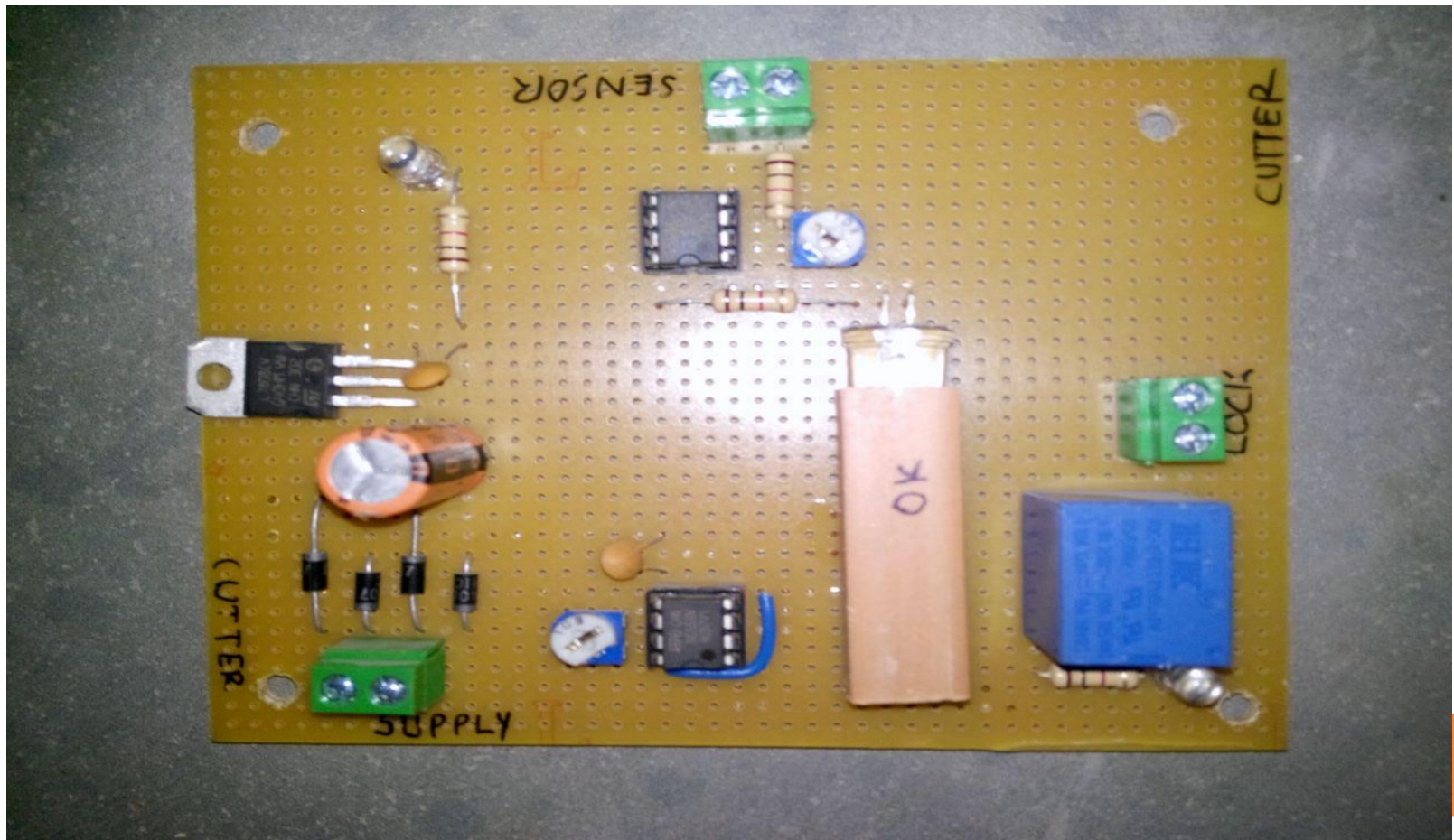


- A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors.
- A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a changing voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other.

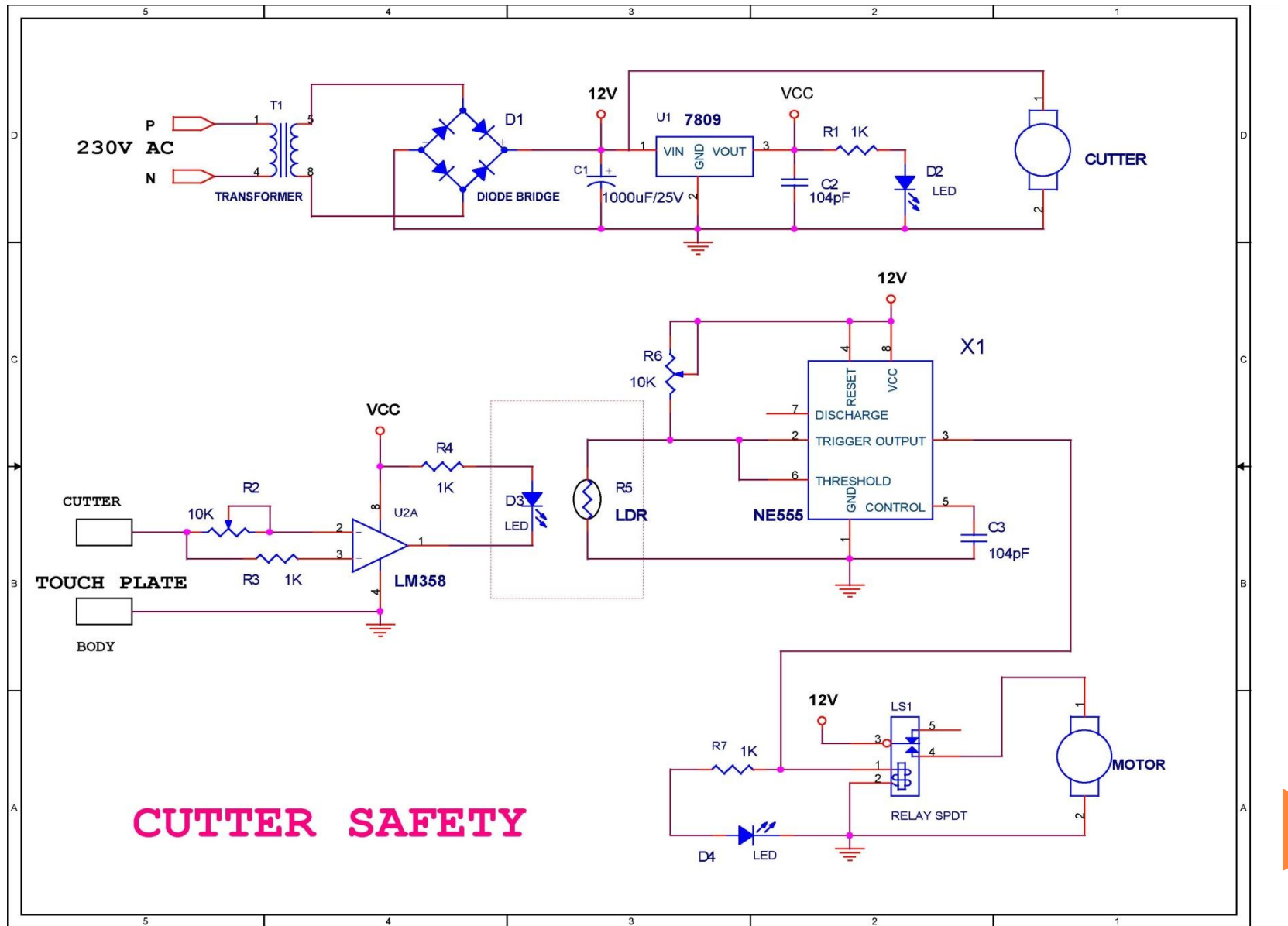


❖ CUTTER SENSING CIRCUIT :

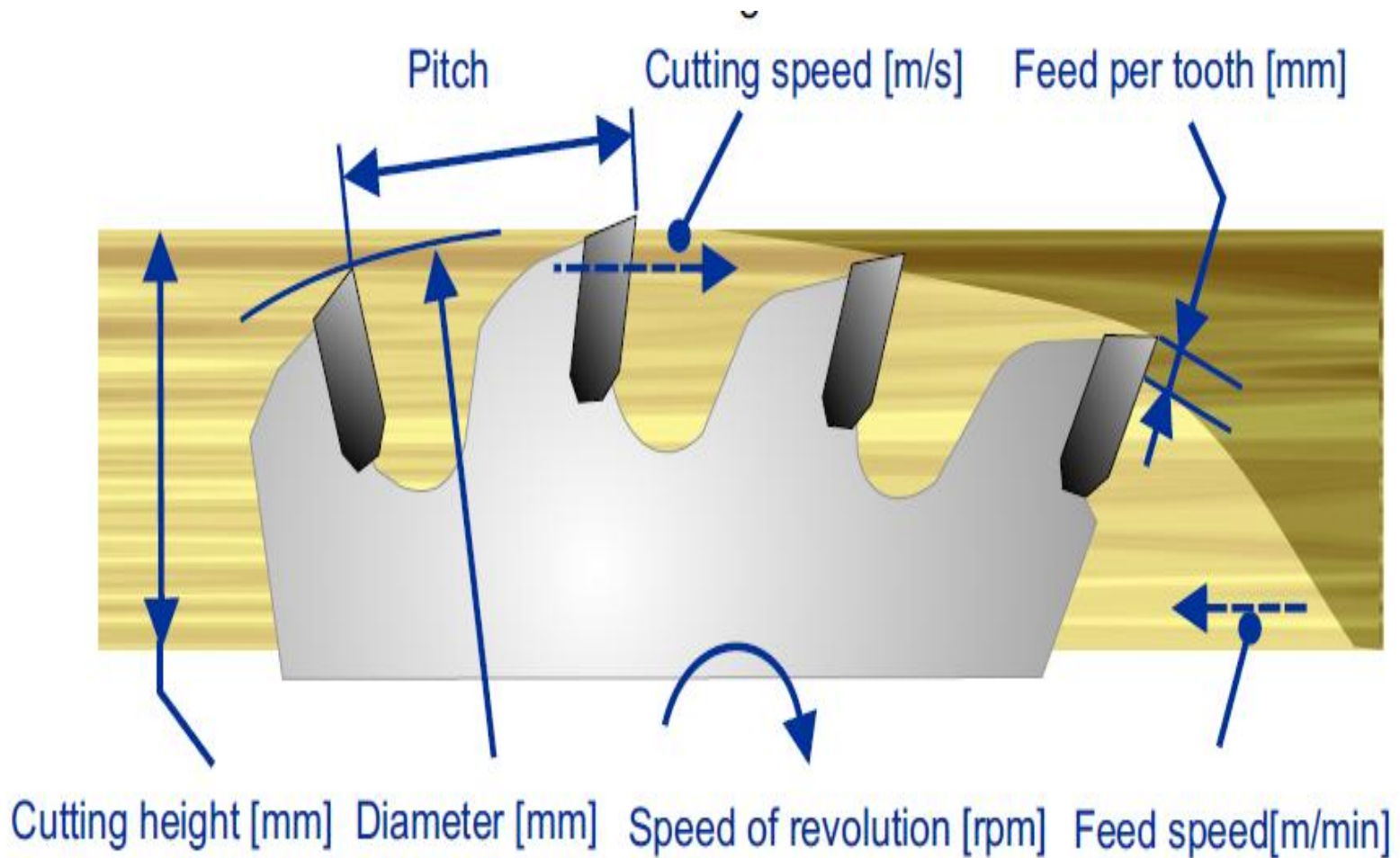
- The touch sensor is a circuit which amplifies the small potential associated our body .



❖ CIRCUIT DIAGRAM :



CALCULATION OF CUTTING DATA :



- Saw Blade Diameter :

Proper selection of the saw blade size can be guided by considering the surface feet/minute (SFM) of the blade in the saw. The SFM of the blade is the actual speed at which the teeth are moving. For acrylic, it should be between 6,000 --14,000 ft/min. To determine the SFM of the blade use the following formula:

$$\text{SFM} = \text{Diameter (inches)} \times \text{RPM} \times 0.262$$

$$\begin{aligned}\text{SFM} &= 10 \times 3450 \times 0.263 \\ &= 9,000\end{aligned}$$

- The 10” blade size is suitable because the SFM is between 6,000 and 14,000.



SAW BLADE SPEED :

$$\text{Cutting speed} = \frac{\text{Diameter} * \text{RPM} * \pi}{60 * 1000}$$

$$[\text{m/sek}] = \frac{[\text{mm}] * [\text{rpm}] * \pi}{60 * 1000}$$

$$= \frac{125 * 1000 * \pi}{60 * 1000}$$

$$V_c = 6.55 \text{ m/sec.}$$

Where,

D = Wheel diameter [m]

V_c = Cutting speed [m/s]

n = Wheel revolution speed [min]



Material	Cutting speed [m/sec]
Wood: cross-cutting	50-80
ripping dry	60-100
ripping green	60-100
saw mill	60-100
Veneered and laminated board	60-80
Fibre board	70-80
Plaster- and chipboard, plywood	50-80
Veneers, cardboard rolls (tubes)	50-80
Hard plastic	50-75
Plexiglas, PVC, bakelite	50-85
Plastic laminates	50-75
Soft plastics	15-50
Aluminium	60-80
Copper	50-70
Brass	50-70
Light concrete	40-60
Steel (not hardened - mild)	5-30

NO. OF TEETH ON BLADE :

- The optimum number of teeth per blade can vary depending on the blade size, blade rotation speed and application, such as gang or single sheet cutting. Common blade diameters and tooth selections used for cutting acrylic sheet include:
- 10” diameter, 40,60 and 80 tooth
- 12” diameter, 60, 80 and 100 tooth
- 14” diameter 60, 80 and 100 tooth



FEED PER TOOTH :

- To optimize the saw blade service life and cutting performance the usage of a correct feed per tooth is required.
- We can calculate feed per tooth using the formula below,

$$\text{Feed per tooth} = \frac{\text{Feed speed} * 1000}{\text{Speed of revolution} * \text{no. of teeth}}$$
$$[\text{mm}] = \frac{[\text{m/min}] * 1000}{[\text{rpm}] * z}$$

$$\begin{aligned} & \frac{(6.55/60) * 1000}{1000 * 40} \\ & = \\ & = \mathbf{2.73 \text{ mm}} \end{aligned}$$



FEED SPEED :

- The feed speed (S) is determined by the speed of revolution (n), number of teeth (z) and feed per tooth (Sz).
- To calculate these figures we can use formula below,

$$\text{Feed speed} = \frac{\text{Feed per tooth} * \text{No of teeth} * \text{Speed of revolution}}{1000}$$
$$[\text{m/min}] = \frac{[\text{mm}] * z * [\text{rpm}]}{1000}$$

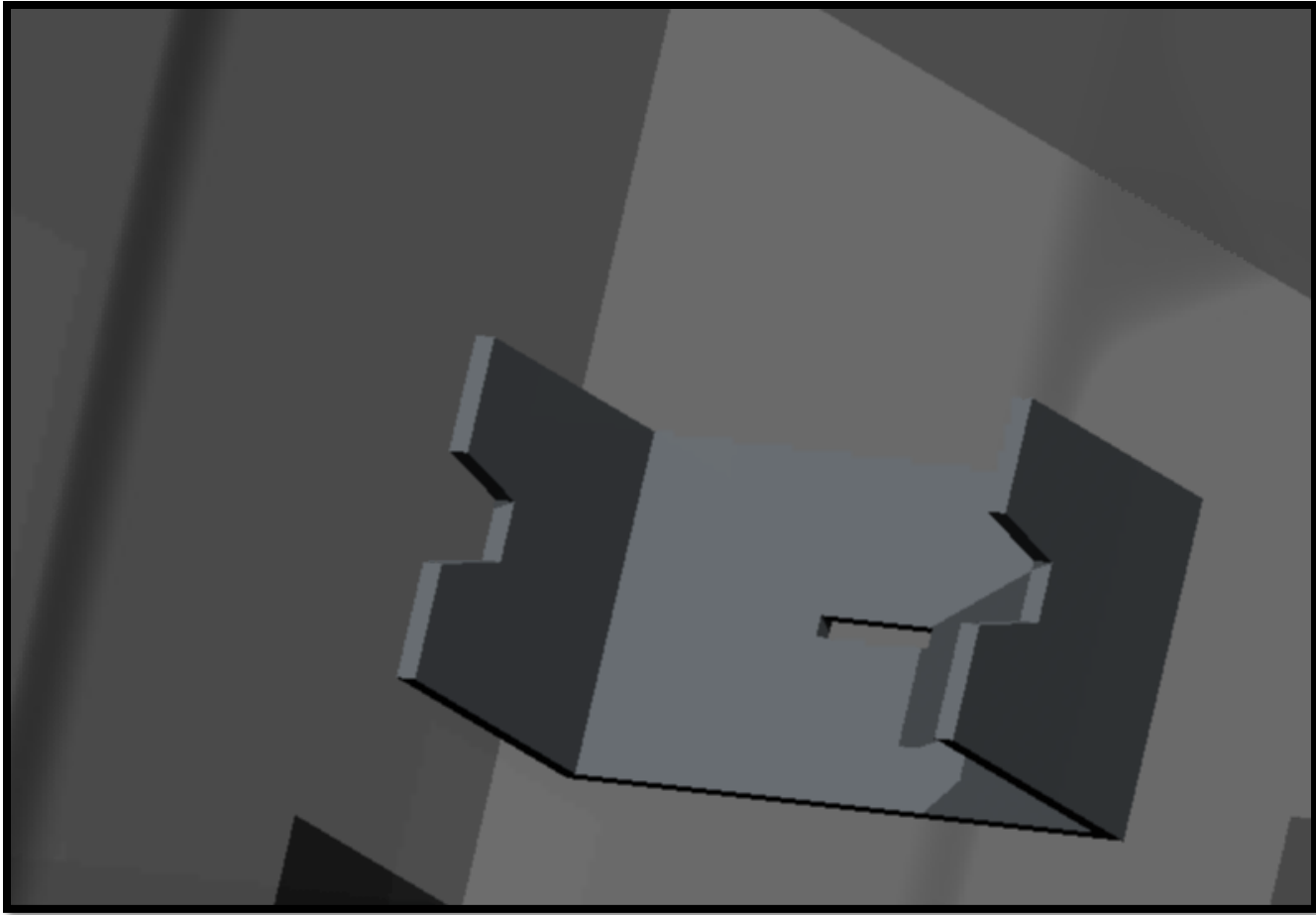
$$= \frac{2.73 * 40 * 1000}{1000}$$

$$= \mathbf{0.110 \text{ m/min}}$$

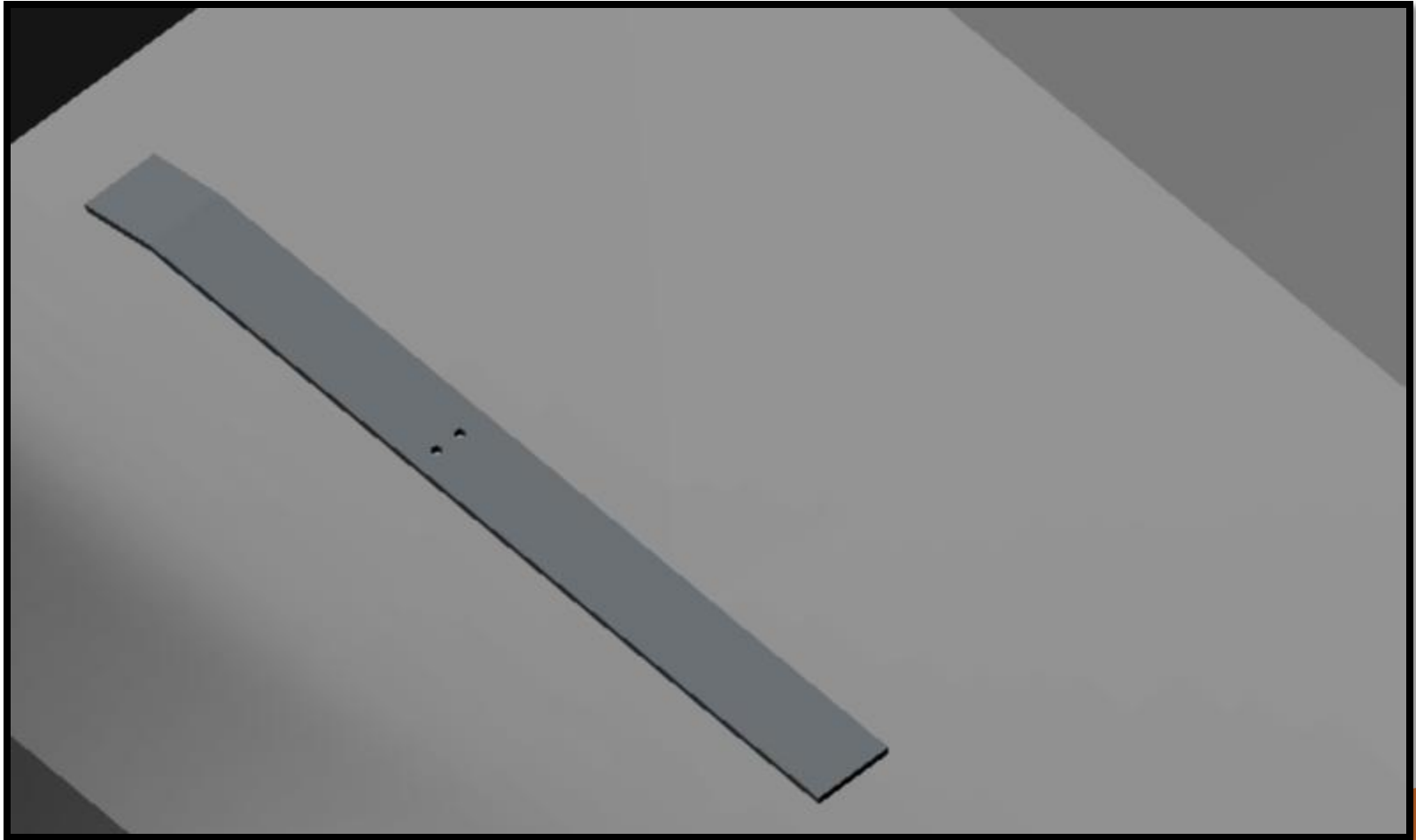


3D DRAWING OF PARTS :

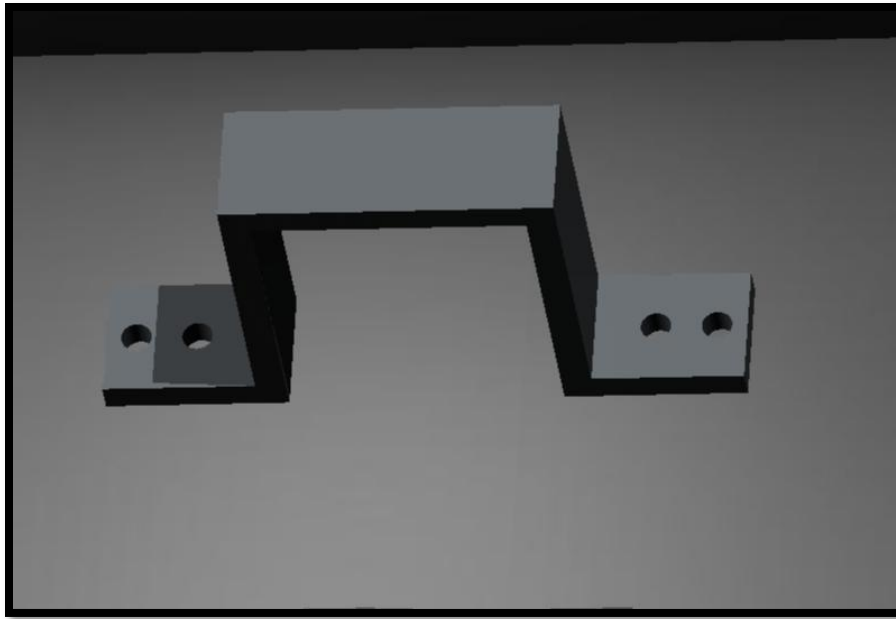
- Wooden Table :



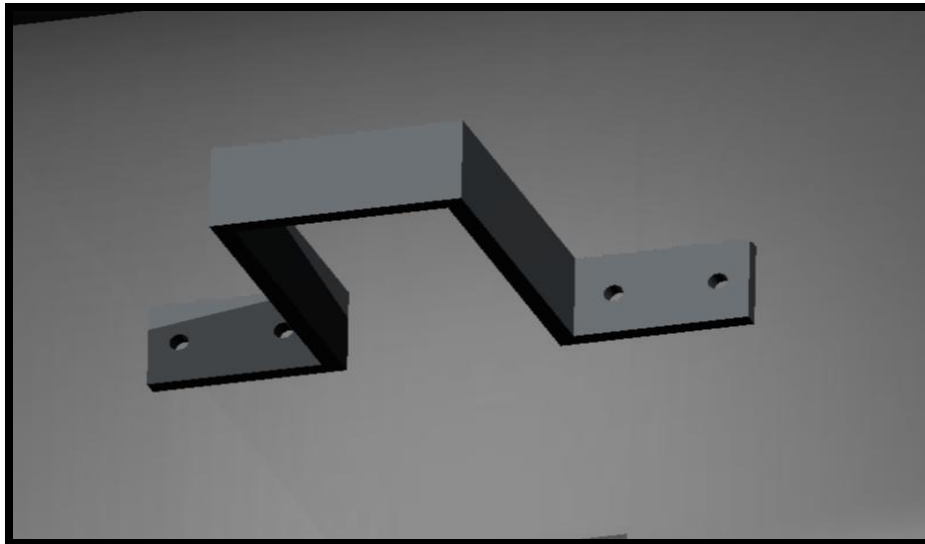
- Aluminum Strip :



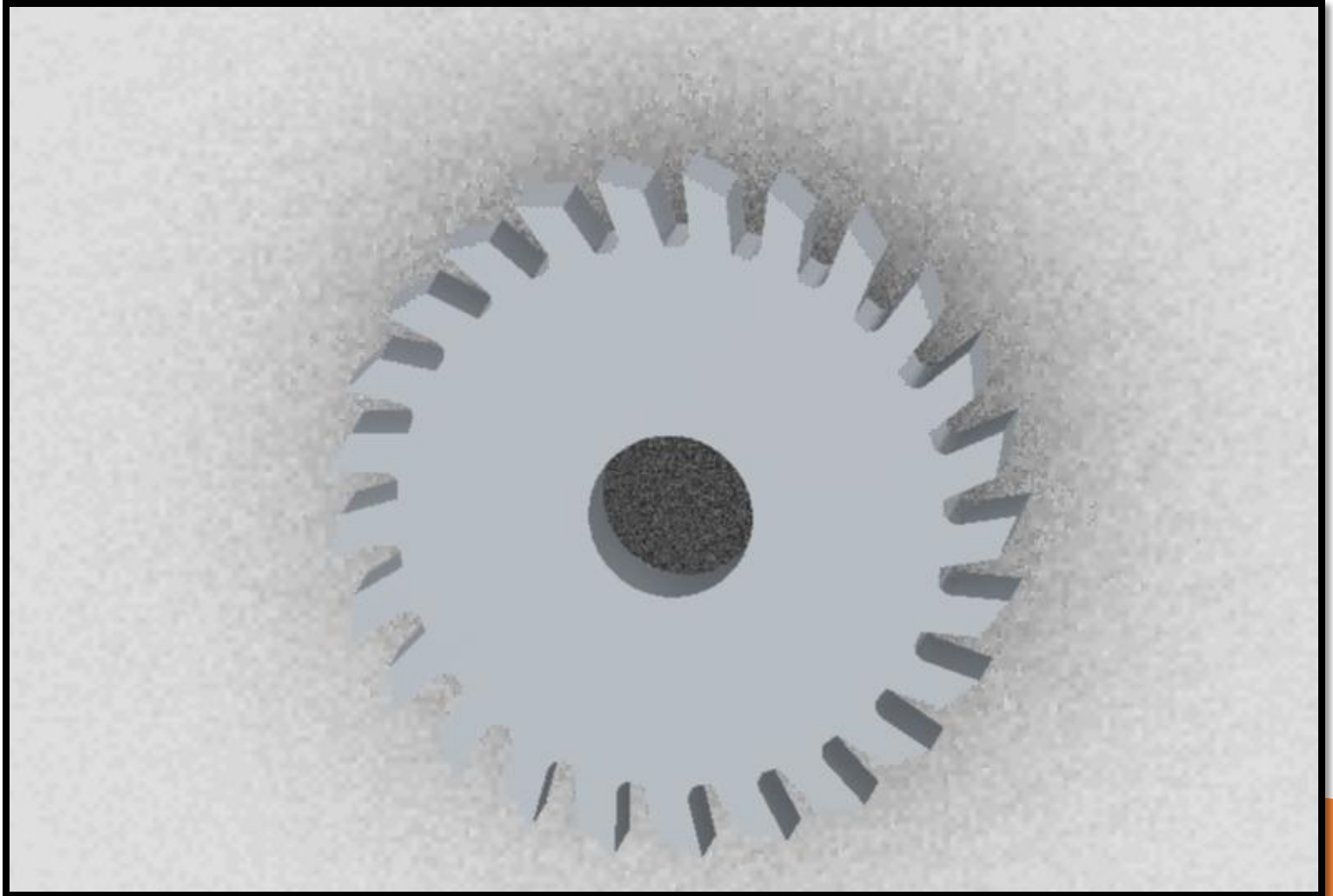
○ Big C-clamp :



○ Small clamp :

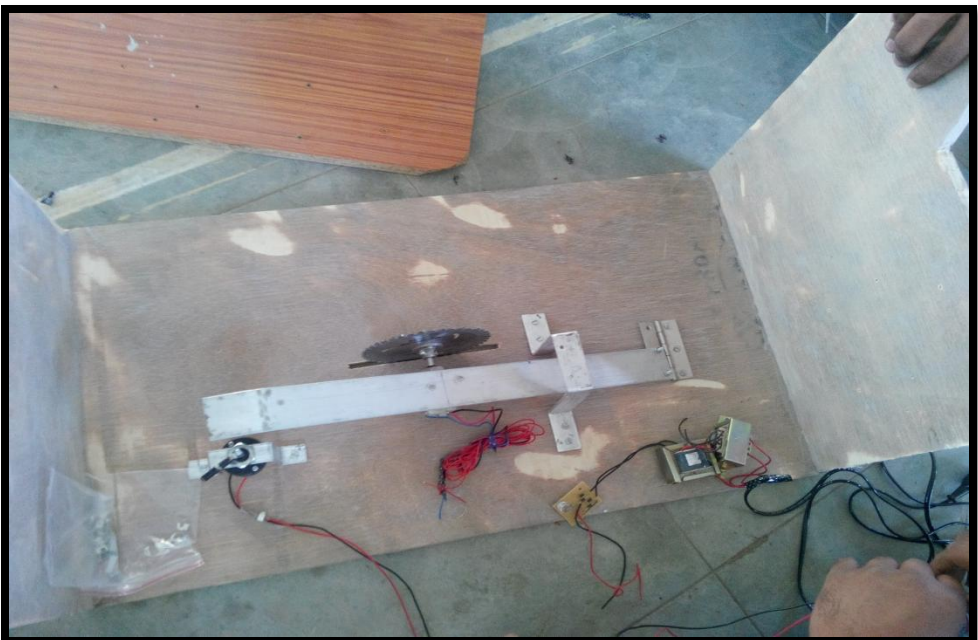
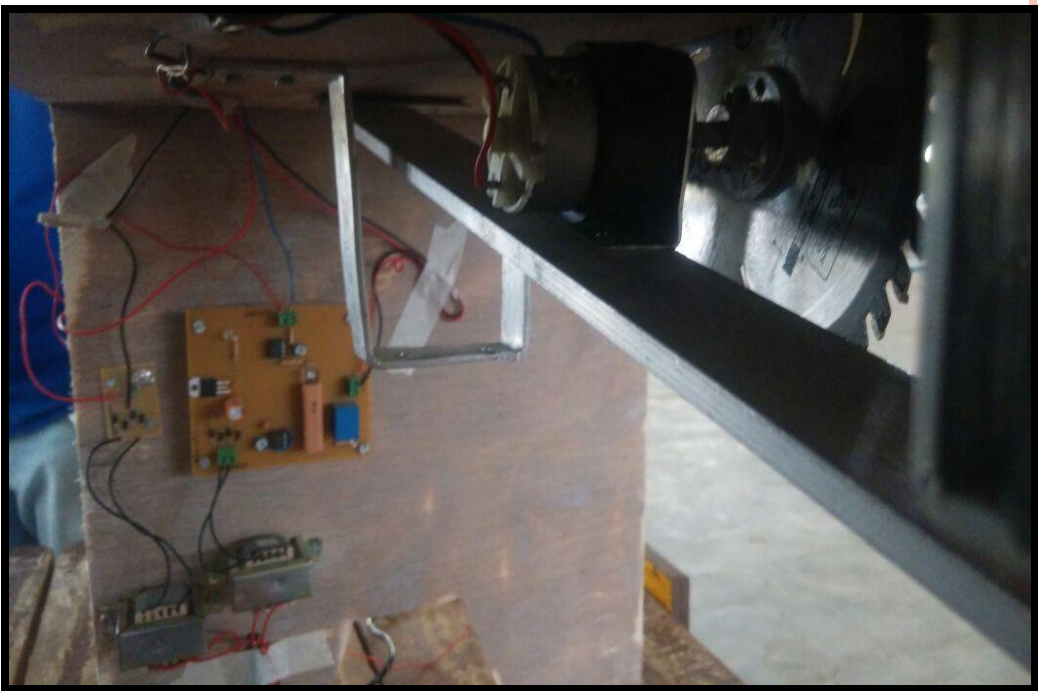


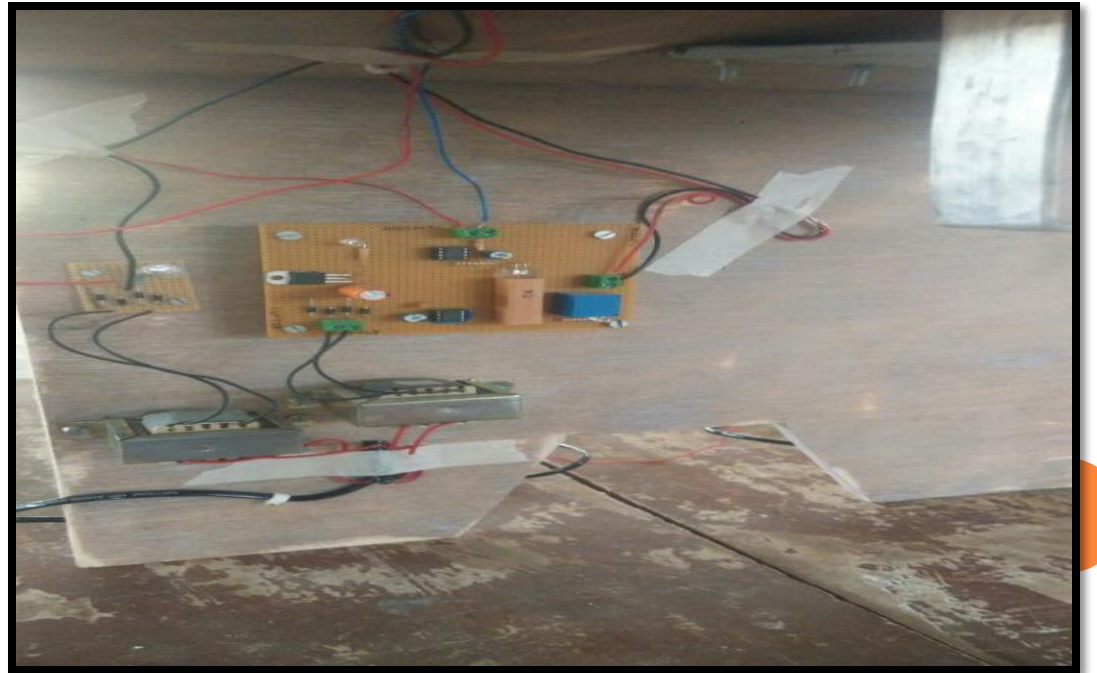
- Saw Blade Cutter :



ASSEMBLY OF PARTS:







CONCLUSION:-

- Now a day's table saw is very useful and popular machine. This machine has many advantages but also it has many disadvantages. Because of Sharpe high rotating cutter there are many accident occurs like cutting of thumb hand and many times death of worker also occurs. With the help of this project we can stop this accident and save workers injuries and their lives.
- If a hand or other body part came into contact with the blade then it will automatically stopped means cutter blade will goes down and it will be stopped automatically. so with using this Table saw safety device you can save ourselves from the injuries.



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THANK YOU

