Application of Infrared Sensors to Improve Safety in Saw Mill

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***Abstract*— Wood is natural organic material which is obtained from tree stem; it is used for various purpose, and sawmill is the place where wood is brought into required shape and size, with the help of rotating saw blades. Worker's during giving feed to the saw blade, accidents are prone to occur, if their hands are moving near the saw blade, which may result in hand amputation, and to avoid the consequence this design of saw blade assembly which include IR sensors comes handy and increases safety, these sensors are placed near the saw blade, if unknowingly, worker's hands come close to the blade while feeding wood, it recognises the human hand and stops the rotating saw blade immediately and avoids accidents.**

***Keywords*— wood, sawmill, IR sensors, hazardous.**

I. INTRODUCTION

Wood is the most common and natural organic material which plays very important role in our life, wood, which is brought to proper size and shape is used for various purpose like building automobile bodies, furniture's, bridge construction, domestic constructions etc., and India is the place where we are still finding manual method to feed the wood to saw blade.

Figure 1 Rotating Saw Blade.

And during the literature survey around Mangalore rural areas, we came to know that workers during giving feed to saw blades they have lost their hands, fingers and serious accidents had happened due to their negligence and due to this permanent damage on the body, they have to suffer till the end of their life. Even though many precautions has been taken to improve the Safety, but still it is very difficult to avoid accidents because most of the workers are uneducated and lacks skill. Even after proper instructions given by trained higher authority to workers, some workers fails to follow it, so we have adopted a new method to improve the safety by using infrared sensors. And in the future, if introduced in sawmills, workers will be having safety during working with the saw blade.

Figure 2 Workers working in sawmill.

II. COMPONENTS USED IN THE PROJECTS

- *Wooden frame to demonstrate concept:* The design includes preparing a model, and demonstrate how safety can be improved in the sawmill, to make the model setup we are using wooden framework and therefore, saw blade, motor, IR sensor, relay is arranged in the wood framework[1]. The length of the frame is 1.5 feet, width of the frame is 1.5 feet and height of the frame is 2 feet.
- *Infrared sensor:* IR sensor mainly consists of emitter and receiver, emitter emits radiation and receiver receives it, these type of sensor is used to detect object, heat, detect motions etc[2].,
  If any object is found between emitter and receiver radiations of the signal will be broken and the signal will be sent to control unit.

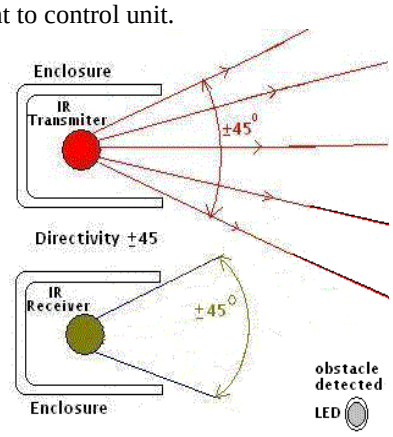

Figure 3Working of IR Sensor.

Saw blade: In this project circular saw blade is used for the demonstration purpose, as these blades are used to cut the wood according to the required shape and size, the diameter of the saw blade is 184mm.

Figure 4 saw blade.

*0.5HP DC Motor***:** In this model 12v 0.5 HP DC motor is used to rotate the circular blade with the required speed. The maximum speed of the motor is 4800 rpm.

Figure 5 0.5 HP DC Motor.

Rack and pinion: The main purpose of using rack and pinion to stop the rotating blade immediately during an emergency situation.

Figure 6 Rack and Pinion.

Flat Belt Drive: This belt is used to connect the motor and saw blade.The thickness of the belt is 2.5mm, the width of belt 180mm.

Figure 7 Flat Belt Drive

Magnet: The neodymium magnet is attached at the end of the rack, when the rack is moved with the help of pinion hits the saw blade and stops the rotating blade immediately.

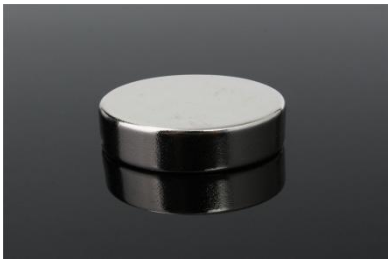

Figure 8 Neodymium Magnet

III. METHODOLOGY

Infrared sensors are placed near rotating saw blades at certain distance, this saw blade are made to rotate with the help of belt drive which is connected to 0.5 HP DC motor, When the worker's hand moves in between infrared sensors which are placed near saw blade the continuity of the IR signal is broken which is passing between emitter and receiver, this discontinuity sends the signal from the sensor to the relay.

The main function of the relay is to receive the signal and send the proper output signal, once the signal is received from the sensor, the current which is passing to DC motor will be broken, and circuit of rack and pinion is turned ON, as the rack is moved from its mean position and hits the slow-moving saw blade to stop, Neodymium magnets, which is placed at the end of rack, stops the saw blade immediately.

The main purpose of using rack and pinion is to ensure that the saw blade stops suddenly as soon as the sensor detects the human hand.

Figure 9 working model**.**

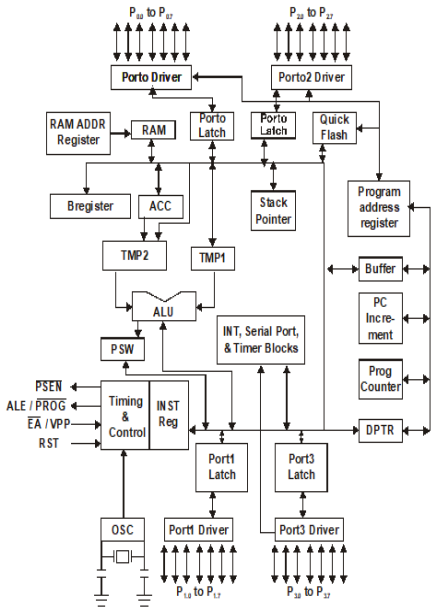

Figure 10 Block Diagram of 89C51

IV. CONCLUSIONS

Infrared sensors are used in many areas as to detect heat, object and in different other application it is one of the great inventions of all time, in this project use of infrared sensor with microcontroller 89C51is used to detect the human hands, as it is detects the signal, the circuit breaks the current supply to the motor and stops the saw blade immediately.

An attempt is made to increase the safety in sawmill; in our country, many sawmill owners are still using old method for processing, the workers who are working in such industries and uneducated and least bothered about safety. A small amount has to be invested from sawmill owners to install this setup which will provide great safeest to the workers.

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