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FABRICATION OF AUTOMOTIVE DOUBLE HACKSAW MACHINE

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ABSTRACT

These days automation is changing the world as we know. We need more and more automated system to make human tasks faster and easier. So here we automate another strenuous work of hacksaw cutting. Human hacksaw cutting is very strenuous and requires a lot of effort. This is not feasible large scale and accurate cutting. So our proposed system automates the hacksaw cutting with a double sided technique where we operate two hacksaws using a single mechanism. We here use a motor with the shaft attached. The motor and shaft are attached using appropriate mounts to hold it in position. Then we use a hacksaw frame and build mounting panels for it using metal structure. We also use a bed and holder to hold the work piece in place. Now we are driving the motor using a supply circuit to operate it and move the shaft. We attach the shaft to saw frames in a way that saw moves in a direction perpendicular to the work piece. Attaching two hacksaws in either direction enables us to operate hacksaw in both direction and operate both directions and operate both of them at the same time. Thus we put forth a smart and efficient hacksaw that can be used for accurate bulk production.

1. INTRODUCTION

In present condition many electrically operated power hacksaw machines of different

companies with different specifications are available for the use in the shop floor. These machines are so precise that they can cut metal bars with minimum time made up of different materials, but they have one and major disadvantage that those are able to cut two piece of bar at a time. For industries to achieve the mass production, it is impossible to depend upon conventional single frame power hacksaw machines and need the improvement in technology and design of such machines. With the help of this two-way power hacksaw machine the two metal bars can be cut simultaneously to get high speed cutting rates and to achieve mass production for maximum profit in related companies. Cutting is the separation of a physical object, into two or more portions, through the application of an acutely directed force. Implements commonly used for cutting are the knife and saw, or in medicine and science the scalpel and microtome.

The main aim objective of this work is cutting the rod with the help of a motor and using the crank and slotted mechanism.

1.1. Types of hacksaw

1.1.1. Manual

- Hand hacksaw
- Jig saw
- Pedal hacksaw

1.1.2. Automatic

- Power hacksaw
- Lathe machine and much more.

1.2. Manual

a. Hand hacksaw

Figure 1: Hand hacksaw.

A saw is a tool consisting of a tough blade, wire or chain with a hard toothed edge as shown in figure 1. It is used to cut through material, very often wood, though sometimes metal or stone. The cut is made by placing the toothed edge against the material and moving it forcefully forth and less forcefully back or continue forward.

b. Pedal hacksaw

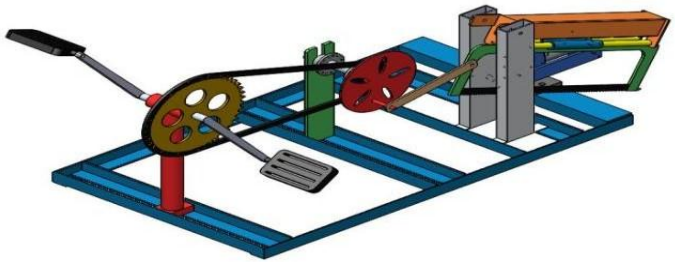

Figure 2: Pedal hacksaw.

Pedal power is converted into mechanical work. This circular motion of the pedal crank is converted into reciprocating or sometime oscillatory motion to drive hacksaw blade. General hacksaw is operated by manually, hydraulically, electrically motor or pulley commonly used in industries and workshop as shown in figure 2.

1.3. Automatic

a.Power hacksaw

Figure 3: Power hacksaw.

Power hacksaws are used to cut large sizes (selection) of metals such as steel. The heavy „arm" moves backwards and forwards, cutting on the backwards stroke. The metal to be cut is held in a machine vice which is an integral part of the base as shown in figure 3. Turning the handle tightens or loosens the vice.

1.4. Proposed of Work

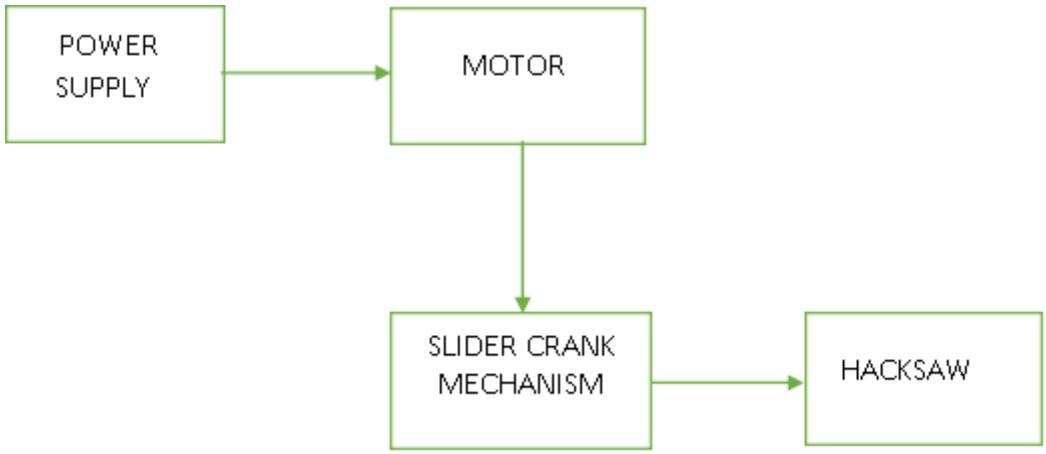

Figure 4: Working principle.

The proposed work of motorized hacksaw is designed with slider crank mechanism as shown in figure 4. The slider crank mechanism converts rotating motion into reciprocating motion. The DC motor is fed with the power supply. Due to this crank mechanism the hacksaw operates and the material is cut. A hacksaw machine is working on the principle of rotary motion of the shaft is to be converted into the reciprocating motion of hacksaw frame. Working principle of hacksaw machine is very simple. First of all the hacksaw machines is put on the ground and after that whatever metal, wood, PVC is cut is fixed on vice at required length, after that the electric motor is connected to electricity.

1.4.1. Frame base

We want to give stability, our prototype model of two way hacksaw machine doesn't get lot vibration the machine in running condition.

1.4.2. Connecting rod

A hole on at the end of this rod is made for joints and link connections. We have used two of these shafts for two side hack saw. Together with the crank, it forms a simple mechanism that converts reciprocating motion.

1.4.3.Vice

Figure 5: Vice.

A vice is a mechanical apparatus used to secure an object to allow work to be performed on it as shown in figure 5. Vises have two parallel jaws, one fixed and the other movable, threaded in and out by a screw and lever.

1.4.5. Pulley

Figure 6: Pulley.

A pulley is a wheel with a groove along its edge, which holds rope or cable. Usually, two or more pulleys are used together as shown in figure 6. When pulleys are used together in this way, they reduce the amount of force needed to lift a load. A crane uses pulleys to help it lift heavy loads.

1.4.6.V belt

Figure 7: V-belt.

They are commonly used in automobile engines to drive accessories, such as the power steering pump, the air conditioning compressor, the fan and the alternator as shown in figure 7. They are replaced with toothed or grooved flat belts in many applications.

1.4.7. Hacksaw frame

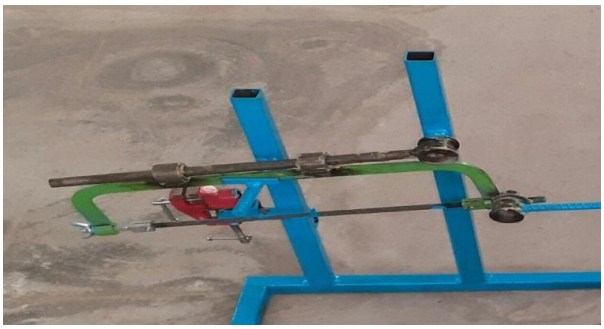

Figure 8: Hacksaw frame.

The blade can be mounted with the teeth facing toward or away from the handle, resulting in cutting. In normal use, cutting vertically downloads with work held in a bench vice; hacksaw blade should be set to be facing forward as shown in figure 8.

1.4.8. Hacksaw

The blade can be mounted with the teeth facing toward or away from the handle, resulting in cutting as shown in figure 9. In normal use, cutting vertically downloads with work held in a bench vice; hacksaw blade should be set to be facing forward.

There are three types of cutters available in the market:

- Simple hacksaw which can be used for hand cutting things.
- Small Electrically Hacksaw for personal uses.

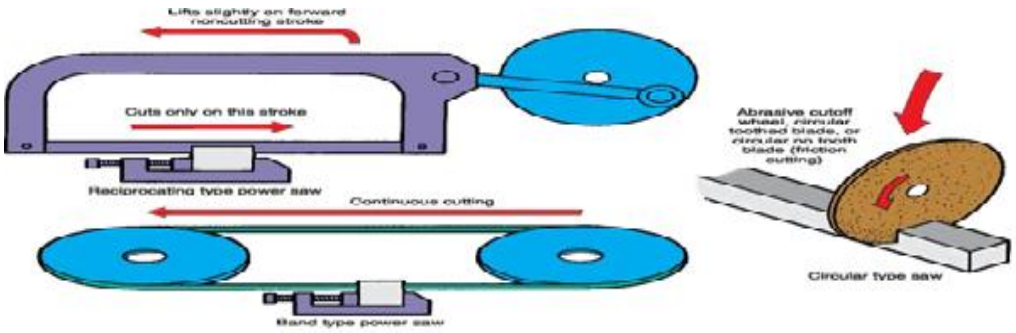

Figure 9: Pedal power hacksaw cutting system.

1.5. A reciprocating Power Hacksaw

A reciprocating saw is a type of saw in which the cutting actions is achieved through a push and pull reciprocating motion of the blade. The term reciprocating saw is commonly assigned to a type of saw used in construction and demolition work. That of a jigsaw and a handle oriented to allow the saw to be used comfortably on vertical surfaces. The typical style of this saw has a foot at the base of the blade, also similar to a jigsaw. The user rests this foot against the surface being cut so that the tendency of the blade to push away from or pull towards the cut as the blade travels through its cycle can be countered.

Standard reciprocating metal cutting saws are available in sizes from 3 to 4 Diameter (400 mm to 500 mm). The saws can be fitted with many accessories, including quick-acting vises, power stock feed, power clamping of work, and automatic cycling of the cutting operation.

The term reciprocating saw (also oscillating saw) is also applied generically to any saw which cuts with a back and forth motion. These include:

- Jig saw
- Scroll saw
- Sabre saw
- Rotary reciprocating saw

Eccentric cam, crank and scotch yoke drives need balance weights to reduce vibration in the plane of the rotating element, and may still exhibit vibration that is objectionable to a user of a handheld saw and can lead to difficulty in controlling a cut. The swash plate drive has the advantage that there is little rotational out of balance, so the principal vibration is in line with the blade. This is generally controllable by keeping the foot of a handheld tool against the work.

1.6. Selecting a Power Hacksaw blade

Proper blade selection is important. Use the three-tooth rule three teeth must be in con-tact with the work. Large sections and soft materials require a coarse-tooth blade. Small or thin work and hard materials require a fine-tooth blade as shown in figure 10.

- **Flexible-back blades** -should be used where safety requirements demand a shatterproof blade. These blades should also be used for cutting odd-shaped work if there is a possibility of the work coming loose in the vise.
- **All-hard blade** -For a majority of cutting jobs, the all-hard blade is best for straight,

accurate cutting under a variety of conditions. When starting a cut with an all-hard blade, be sure the blade does not drop on the work when cutting starts.

- If it falls, the blade could shatter and flying pieces cause injuries.

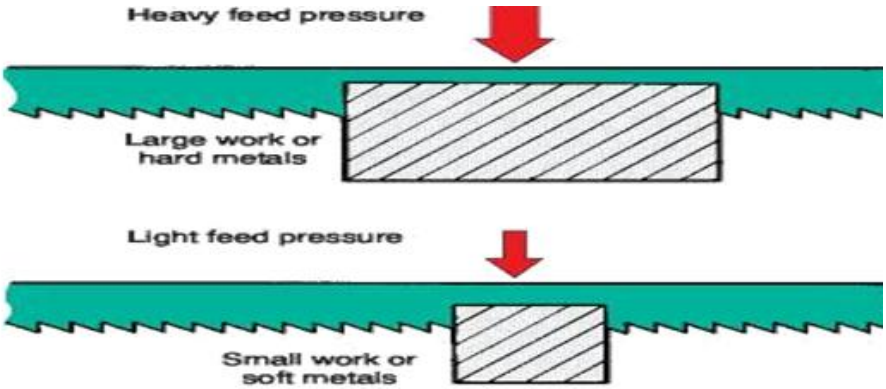

Figure 10: Hacksaw blade.

1.7. Power Hacksaw blade

Blades are also made from tungsten and molybdenum steels, and with tungsten carbide teeth on steel alloy backs. The following "rule-of- thumb" can be followed in selecting the correct blade:

Use a 4-tooth blade for cutting large sections or readily machined metals.

Use a 6-tooth blade for cutting harder alloys and miscellaneous cutting. Use 10- and 14-tooth blades primarily on light duty machines where work is limited to small sections requiring moderate or light feed pressure.

1.8. Mounting a Power Hacksaw blade

The blade must be mounted to cut on the power (back) stroke. The blade must also lie perfectly flat against the mounting plates. If long life and accurate cuts are to be achieved, the blade must be properly tensioned.

Many techniques have been developed for proper mounting and tensioning blades. Use a torque wrench and consult the manufacturer"s literature.

1.9. Selecting a Band Saw Blade

Band saw blades are made with teeth or wavy teeth. Most manufacturers also make variations of these sets. This is preferred for general use. Tooth pattern determines the efficiency of a

blade in various materials. The standard tooth blade pattern is best suited for cutting most ferrous metals. A skip tooth blade pattern is preferred for cutting aluminium, magnesium, copper, and soft brasses. The blade pattern also is recommended for most nonferrous metallic materials. For best results, consult the blade manufacturer¨s chart or manual for the proper blade characteristics (set, pattern, and number of teeth per inch) for the particular material being cut.

1.10. Installing a Band Saw Blade

If the saw is to work at top efficiency, the blade must be installed carefully. Wear heavy leather gloves to protect your hands when installing a band saw blade a shown in figure 11. Blade guides should be adjusted to provide adequate support, Proper blade support is required to cut true and square with the holding device. Follow the manufacturer¨s instructions for adjusting blade tension. Improper blade tension ruins blades and can cause premature failure of bearings in the drive and idler wheels. Cutting problems encountered with the band saw are similar to those of the reciprocating hack saw. Most problems are caused by the poor machine condition. They can be kept to a minimum if a maintenance program is followed on a regular basis. This typically includes checking wheel alignment, guide alignment, feed pressure, and hydraulic systems.

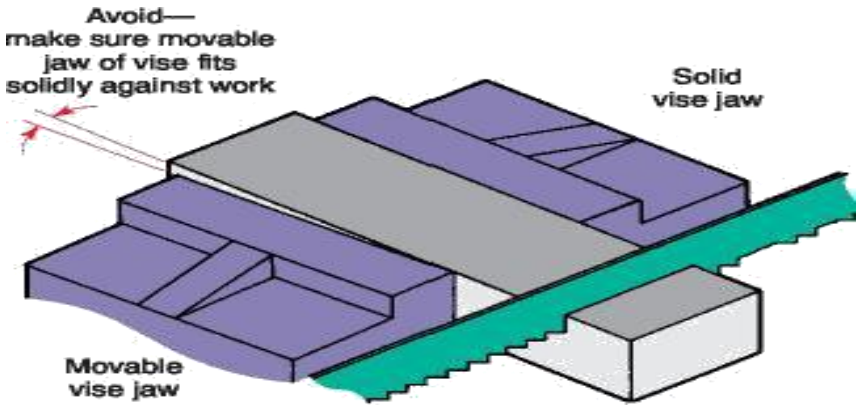

Figure 11: Power Hacksaw blade cutting operation.

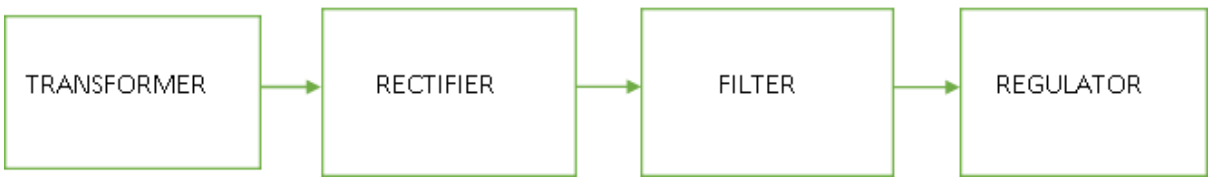

Figure 12: Power supply unit.

The transformer steps up or steps down the input line voltage and isolates the power supply from the power line as shown in figure 12. The rectifier section converts the alternating current input signal to a pulsating direct current. However, as you proceed in this chapter you will learn that pulsating DC is not desirable. For this reason a filter section is used to convert pulsating DC to a purer, more desirable form of DC voltage. The final section, the regulator, does just what the name implies. It maintains the output of the power supply at a constant level in spite of large changes in load current or input line voltages. All digital circuits work only with low DC voltage. A power supply unit is required to provide the appropriate voltage supply. This unit consists of transformer, rectifier, filter and a regulator. AC voltage typically of 230Vrms is connected to a transformer which steps that AC voltage down to the desired AC voltage level. The main components used in the power supply unit are Transformer, Rectifier, Filter and Regulator. The 230V AC supply is converted into 9V AC supply through the transformer. The output of the transformer has the same frequency as in the input AC power. This AC power is converted into DC power through diodes. Here the bridge diode is used to convert the AC supply to the DC power supply. This converted DC power supply has the ripple content and for normal operation of the circuit, the ripple content of the DC power supply should be as low as possible. Because the ripple content of the power supply will reduce the life of the circuit. So to reduce the ripple content of the DC power supply, the large value of capacitance filter is used as shown in figure 13.

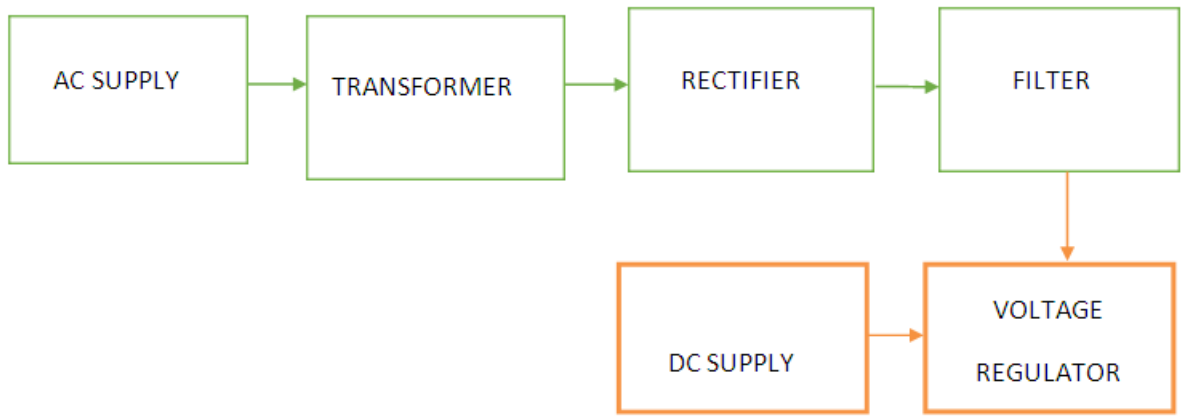

Figure 13: Power supply block diagram.

1.12. DC Motor

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either

electromechanical or electronic; to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

The introduction of variable resistance in the armature circuit or field circuit allowed speed control. Modern DC motors are often controlled by power electronics systems which adjust the voltage by "chopping" the DC current into on and off cycles which have an effective lower voltage a shown in figure 14.

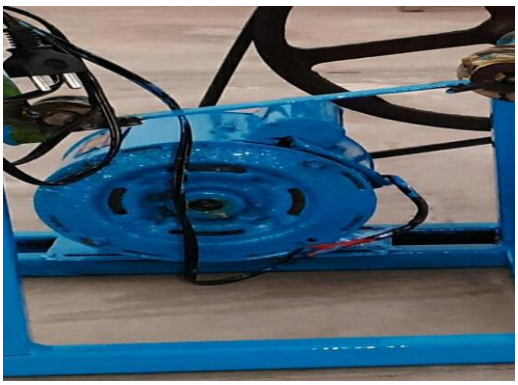

Figure 14: DC motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

2. LITERATURE REVIEW

David Gordon Wilson studied the vast literature to understand the concepts which affect the performance of the machine .The concept of two ways hacksaw cutting machine mainly carried out for production based industries.

Zoeb khan expressed that Industries are essentially implied for generation of valuable merchandise and enterprises at low creation cost, Machinery cost and low stock cost. Information about built up a model of a machine reach would be fit for performing diverse

task all the while, and it ought to be monetarily productive. These machines can be utilized as a part of remote spots where power is customary. It is planned as a versatile one which can be utilized for cutting in different spots. It can be utilized for working on materials like thin metals, wood. A solitary stage vertical electric engine unbendingly set at the focal point of metallic establishment gave.

Linxu et al. research about the shaft of motor rotates at 90-100 rpm with the power 2HP. The circular disc is mounted on the shaft of the motor with the help of key and key slot arrangement. It consists of a pedal powered machine setup which has a simple mechanism operate with chain and sprocket arrangement.

Chaudhary Pravinkumar k learned about the chain is put on the teeth of the haggle. The pole is mounted on platform direction. To begin with mechanical linkage is evacuated by expelling nut and screws and v belt drive boring connection. It is realized that the regular power hacksaw machine can be supplanted with the robotized control Hacksaw machine.

S. G. Bahaley et al. expressed that automated power hacksaw machine gives high efficiency in brief day and age in examination with the ordinary power hacksaw machines. The real preferred standpoint of this machine is intercession of work is lessened to greatest level. In this fast developing modern segment the utilization of intensity Hacksaw machine is wide, time and work assumes a noteworthy part underway process. The Material choice and testing of hacksaw sharp edge in light of mechanical properties expressed that the suitable saw edge must be chosen for better activity and fine cutting by choosing the number of teeth per inch.

Boyer et al. Showed that failures could occur due to mechanisms and environmental factors. He also suggested that failure analysis of a metal structure requires identifying the type of failure mode. The failure mode is classified as either a deformation or fracture.

Layer et al. Concluded that the process of identifying a failure mode is complicated because different techniques can be used to determine the actual cause of failure.

3. Working Mechanism Crank And Slider Mechanism

This mechanism is used to convert the rotary motion of the crank into the reciprocating motion of hacksaw a shown in figure 15. The lengths of the crank and connecting rods are made using trial and error method.A crank is an arm attached at right angles to a rotating shaft by which reciprocating motion is imparted to or received from the shaft. It is used to

convert circular motion into reciprocating motion. The arm may be a bent portion of the shaft, or a separate arm or disk attached to it. Attached to the end of the crank by a pivot is a rod, usually called a rod. The end of the rod attached to the crank moves in a circular motion, while the other end is usually constrained to move in a linear sliding motion.

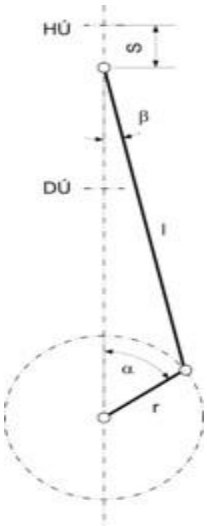

Figure 15: Crank and slider mechanism.

The term often refers to a human-powered crank which is used to manually turn an axle, as in

Figure 16: Automotive Double Hacksaw Machine.

A bicycle cranks set or a brace and bit drill. In this case a person's arm or leg serves as the connecting rod, applying reciprocating force to the crank a shown in figure 16. There is usually a bar perpendicular to the other end of the arm, often with a freely rotatable handle or pedal attached.

3.1. Advantages

- The weight of the machine is less.
- High production rate.

- The Cost is less
- Easy maintenance and maintenance cost less.
- It with stand all atmospheric effects.
- Highly skilled operators are not used.
- The Work piece can be easily handled.

CONCLUSION

This project has been able to establish that, the need for wood, PVC material cutting can function effectively and efficiently with minimal maintenance, yet is inexpensive to construct, is both possible and achievable. The overall cost and choice of materials would promote mass production and hence, it can be a substitute to the expensive conventional cutting thereby making it assessable and affordable by local farmers.

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