Design & Fabrication Of Portable Table Saw Machine For Small Wood Working Project & Workshop

A thesis
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DECLARATION

We, hereby, declare that the work presented in this project is the outcome of the investigation and research work performed by us under the supervision of Md. Din Al-Amin, Lecturer, Department of Mechanical Engineering, Sonargaon University (SU). We also declare that no part of this project and thesis has been or is being submitted elsewhere for the award of any degree.

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CERTIFICATION

This is to certify that this project titled "DESIGN AND FABRICATION OF AN Portable Table Saw Machine For Small Wood Working Project & Workshop" carried out by, Syed Shahnewaz (BME1903019482), Md. Nazmul Islam (BME1903019462), Suman Kumar Singha (BME1903019496), Md. Al Amin (BME1903019465) meets the regulations governing the award of degree of Bachelors of Science (B.Sc.) in Mechanical Engineering, Sonargaon University (SU), and it is approved for its contribution to scientific knowledge and literary presentation.

……..

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ACKNOLEDGEMENT

At first, we are thankful to almighty Allah, for giving us the courage and enthusiasm to complete the thesis work. We would like to express our special thanks of gratitude to our project guide, “Md. Din Al-Amin” sir, who gave us the golden opportunity to work on this wonderful project. Which also helped us in doing a lot of research and we learned about new things while researching the topic. We are also grateful to all our thesis & project working team of SU for their help in construction of the project work and give their valuable knowledge and time for completing the experiment. Finally, we would like to thank everybody who supported us in any respect for the completion of the thesis

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ABSTACT

In this fabrication of project, we will mainly be focusing on problems facing by the many operators is that they have to use larger machine to manufacture a small wood work piece, which consume more electricity and expensive. Which in turn increase the cost of work piece, due to it size less space remain vacant and annually worldwide 30,000 incidents take places injury related mainly include hand and fingers. To overcome all this problem, mention above we have discussed and fabricating the portable table saw which can almost solve all the problem mention earlier. Asit will be smaller in size so it will not take large space so it can be adjusted at many shelves, this project will use a dc motor of 24 v which consume less electricity which will solve the problem of high electricity consumption. The operators will afford this table saw as it supporting frame will made from wood and will sustain considerable amount of weight and we will make as compact as possible. This machine will increase the productivity as it is easy to operate. This machine is beneficial and will be affordable to all who will perform wood operation. This machine will also reduce the risk factor as it will be much safer if use properly.

Keywords: Portable Saw, Light Weight, Table Saw, Cost Effective.

Table of Content

Table		Page
1.	Introduction	7
	1.1 Project Background	8
	1.2 Problem Definition	8
2.	METHODOLOGY	9
	2.1 Study	9
	2.2 Design	10
	2.3 Components Detail	11
	2.4 Assembling	12
	2.5 Completion	14
3.	Flowchart	17
4.	Safety Guideline	18
5.	Operation	21
6.	Formula & Calculation	28
7.	Conclusion	29
8.	References	30

1. INTRODUCTION

A table saw is a wood cutting tool consisting of a circular saw blade mounted on an arbor that is driven by an electric motor (either directly or by belt or by gear). The blade propagates through the top of the table, which provide a support for the work piece being cut. It also known as saw bench. The table saw mainly used for cutting wooden work piece, but sometime metal sheet is also cut by using it. The first table saw was invented in 18th century. It was invented by Samuel Miller from South Hampton in England in 1777. The wood tool has a fixed arbor and table. You have to move the table in up and down movement to cut the work piece at different height. To cut the work piece you had two options either to clamp it in the wise or hold the part you need to cut on the blade and start the motor for the blade to rotate in a circular motion and cut it. The main disadvantage of Miller Medal was that it was having no option to controlled the depth and direction of cut and it was too bulky model. The table saw is typically thought of as the workhorse of the woodshop, as it is likely the most versatile and productive of all wood working machines. In a cutting-edge table saw, depth of the cut is shifted by moving the sharp edge all over: the higher the edge juts over the table, the deeper is the cut made. The point of cut is controlled by altering the sharp edge. A table saw is a wood working tool, consisting of a circular saw blade, mounted on an arbor, that is driven by an electric motor. Motor and arbor are connected with the help of timing pulley and belt. This table saw tool can be used for cross-cut, miter-cut, square, dado, rabbet, and even apply shapes to edges of wood stock.

1.1 PROJECT BACKGROUND

The main reason behind choosing the design and fabrication of portable table saw machine is to provide a machine that will be affordable to people who can't afford expensive table saw machine this will give them an opportunity to work on their project or operation at low cost. Due to low weight of the machine and minimum size will be carried out at any working sites without any difficulties. Portable table saw machine will be much cheaper than larger machine in much aspect such as,

a) It will consume low electricity compared to large machine.

b) As it will be light in weight which reduces the price of machine.

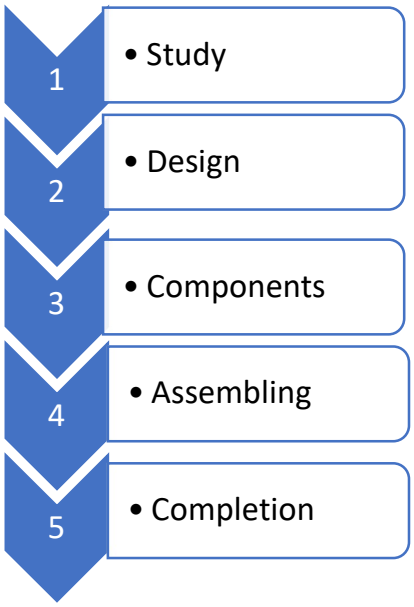
This portable machine will be works with the same efficiency as that of large table saw machine. It will be much more compact machine so you don't have to think about the space requirement for this machine. You can keep it anywhere you want. One of the important reasons behind the project is that the machine will be increase the productivity and save time. While using such a large table saw you have risk of injury and that can be fatal, but due to its small size here injury can't be fatal and will avoid injury if use properly.

1.2 PROBLEM DEFINITION

The current problem facing by many small workshop owner and local carpenter Is that in order to cut single piece of wood they have to use bigger expensive table saw. Which in turn consume more electricity and acquired more space. In order to tackle those problem, we will fabricating a small portable table saw which will require less space and consume low electricity and provide same efficiency as those of large table saw to cut small piece of wooden work piece. The Objective of this paper is to

- To perform essential cut quickly, safely, efficiently
- To cut work piece precisely in required dimension
- To reduce the power consumption of electricity

2. METHODOLOGY

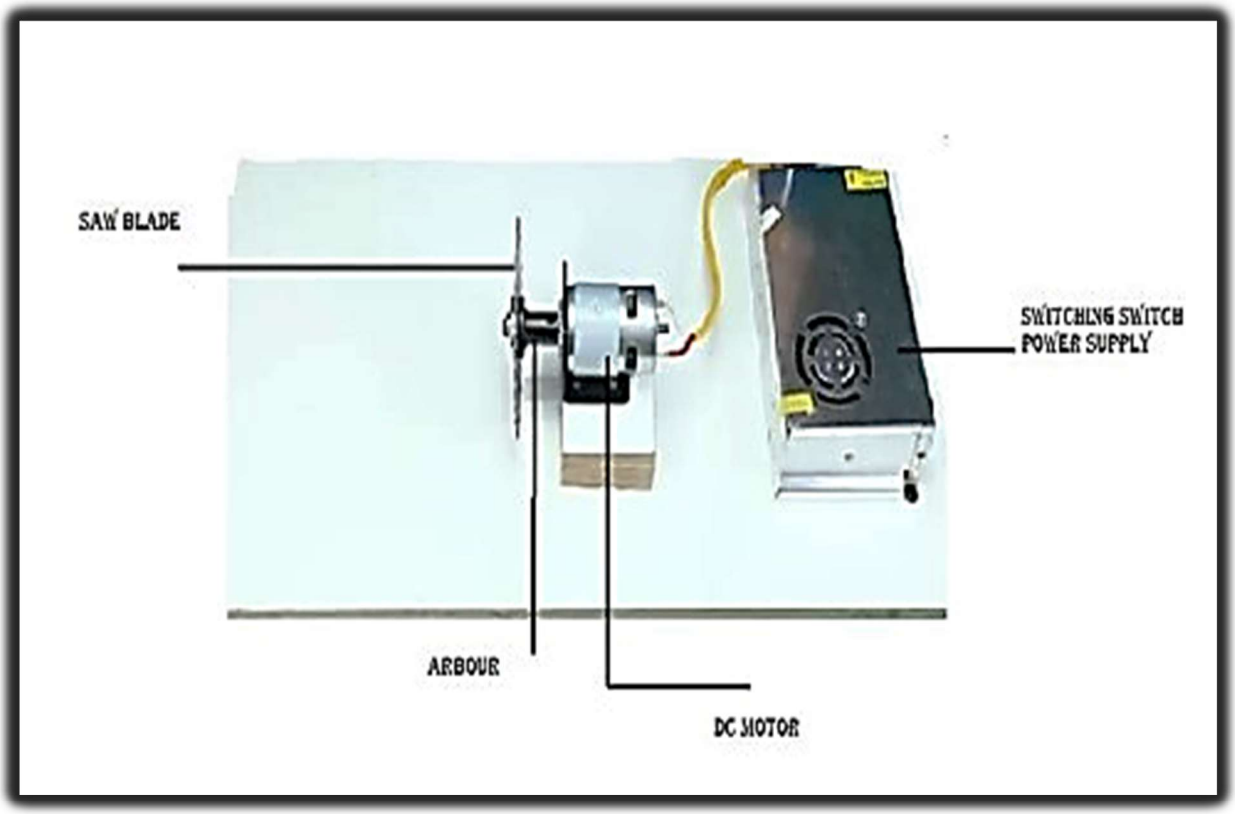


2.1 STUDY

A table saw (also known as a saw bench or bench saw) is a woodworking tool, consisting of a circular 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 top of a table, which provides support for the material, usually wood, being cut.

In most modern table saws, 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.

2.2 DESIGN

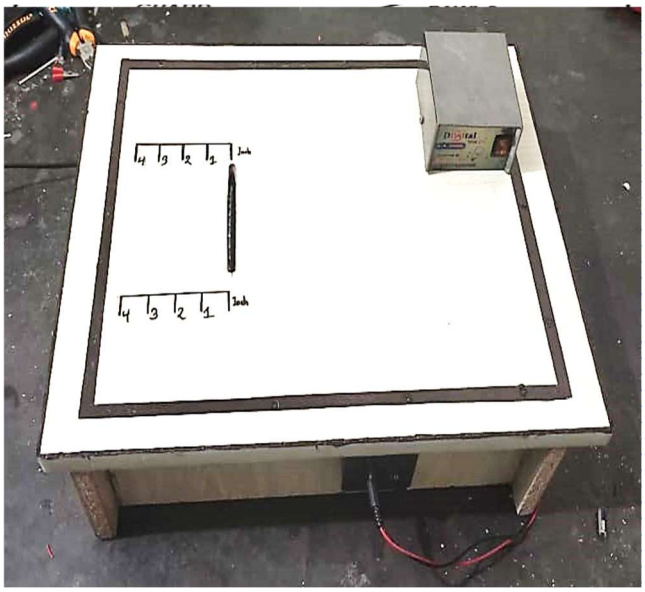


2.3 COMPONENTS DETAIL

Sr. No	Components	Objective	Quantity
1.	Dc Motor 775	Power transmission to shaft	1
2.	Power Supply	Convert 220v to required Volt	1
3.	Saw Blade	To cut the work piece	1
4.	Saw Blade Holder	To hold the saw blade	1
5.	Dc Motor Holder	To hold the motor	1
6.	5mm Shaft	Transmit power to saw	1
7.	Plywood with 16 mm thickness	Sustain weight of machine or base of project	1
8.	Switch Button	Enable power to motor	1
9.	Super Glue & Screw	To stick Wood frame	Multiple
10.	Wire	To Connect Motor Power Supplier	2
11.	Switch Bord	To switching the machine	1

KNOW YOUR TABLE SAW

The safe use of this product requires an understanding of the information on the tool and in this operator's manual, as well as a knowledge of the project you are attempting. Before use of this product, familiarize yourself with all operating features and safety rules.



ANTI-KICKBACK PAWLS - Kickback is a hazard in which the workpiece is thrown back toward the operator. The teeth on the removable anti-kickback pawls point away from the workpiece. If the workpiece should be pulled back toward the operator, the teeth dig into the wood to help prevent or reduce the possibility of kickback.

BEVEL SCALE - The easy-to-read scale on the front of the cabinet shows the exact blade angle.

BLADE - This saw is provided with a 24-tooth, 10 in. carbide blade. The blade is raised and lowered with the height/bevel adjusting handwheel. Bevel angles are locked with the bevel locking lever.

WARNING!
Do not use blades rated less than the speed of this tool. Failure to heed this warning could result in personal injury.

BLADE GUARD - Always keep the removable blade guard down over the saw blade for through-sawing cuts. BEVEL LOCKING LEVER - This lever, placed just under the saw table surface on the front of the cabinet, locks the angle setting of the blade.

HEIGHT/BEVEL ADJUSTING HANDWHEEL - Located on the front of the cabinet, use this handwheel to lower and raise the blade for height adjustments or blade replacement. This handwheel also makes the adjustment for bevel angles easy.

MITER GAUGE - The miter gauge aligns the wood for a cross cut. The easy-to-read indicator shows the exact angle for a miter cut.

MITER GAUGE GROOVES - The miter gauge rides in the grooves on the saw table.

RIP FENCE - A sturdy metal fence guides the workpiece and is secured with the locking lever. RIVING KNIFE - A removable metal piece of the blade guard assembly, slightly thinner than the saw blade, which helps keep the kerf open and prevent kickback. When in the through sawing, or "up" position, it is higher than the saw blade. When in the non-through sawing, or "down" position, it is below the saw blade teeth.

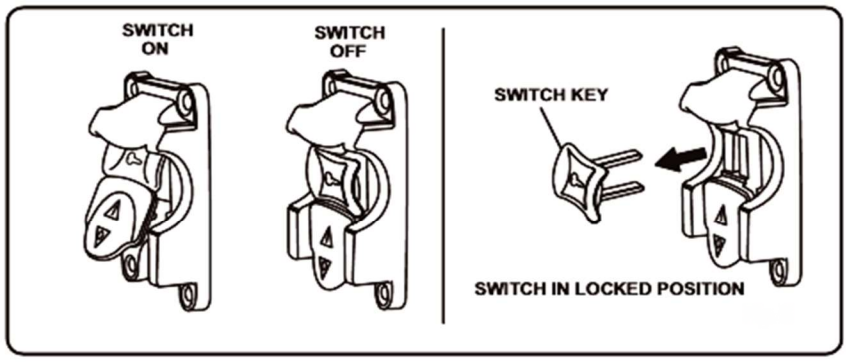
SCALE - Located on the front rail, the easy-to-read scale provides precise measurements for rip cuts. SWITCH ASSEMBLY - This saw has an easy access power switch located below the front rail. To lock the switch in the OFF position, remove the switch key from the switch. Place the key in a location that is inaccessible to children and others not qualified to use the tool.

OPERATING COMPONENTS

The upper portion of the blade projects up through the table and is surrounded by an insert called the table insert. The height of the blade is set with a handwheel on the front of the cabinet. To accommodate wide panels, the saw table has rails on each side. Detailed instructions are provided in the Operation section of this manual for the basic cuts: cross cuts, miter cuts, bevel cuts, and compound cuts.
The rip fence is used to position work for lengthwise cuts.
A scale on the front rail shows the distance between the rip fence and the blade.
It is very important to use the blade guard assembly for all through-sawing operations. The blade guard assembly includes: riving knife, anti-kickback pawls, and plastic blade guard.

SWITCH ASSEMBLY

This saw is equipped with a switch assembly that has a built-in locking feature. This feature is intended to prevent unauthorized and possible hazardous use by children and others.



TO TURN YOUR SAW ON:

- With the switch key inserted into the switch, lift the switch to turn on (I).

TO TURN YOUR SAW OFF:

- Press the switch down to turn off (O).

TO LOCK YOUR SAW:

- Press the switch down.
- Remove the switch key from the switch and store in a safe, secure location.

WARNING!
ALWAYS remove the switch key when the tool is not in use and keep it in a safe place. In the event of a power failure, turn the switch off (O) and remove the key. This action will prevent the tool from accidentally starting when power returns.

WARNING!
ALWAYS make sure your workpiece is not in contact with the blade before operating the switch to start the tool. Failure to heed this warning may cause the workpiece to be kicked back toward the operator and result in serious personal injury.

WARNING!
To reduce the risk of accidental starting, ALWAYS make sure the switch is in the off (O) position before plugging tool into the power source.

BLADES

For maximum performance, it is recommended that you use the 24-tooth, 10" carbide-tipped combination blade provided with your saw. Additional blade styles of the same high quality are available for specific operations such as ripping.

Your local dealer can provide you with complete information. Kerf width must be within the limits stamped on the riving knife.

2.4 ASSEMBLING

In this paper a design for a machine here we will take a long wooden board of dimension 16x20x0.5 inches. At the right center of board, we will cut 5x0.3 inches small block shape for passing the cutter blade. Then we will fix the motor holder on to the wooden block. Using screw, we will be attaching the motor with motor holder. After fixing the motor, will add external shaft to the motor to hold saw blade tightly. As we will using a 24-volt DC motor will require a power supply of 24-volt 10A. Then we will mount the power supplier at the corner of wooden block and doing the necessary connection. Later we will add a switch button to supplier to control it from single point. Now we will make a lid with the wooden board of dimension (30x20x05) inches and close it from the top of the box. The blade will protrude up 2cm upward while operating by cutting the board. At end we will adding a measuring scale and fences (if required) to guide the work piece accordingly.

CAUTION:

•Always be sure that the tool is switched off and unplugged before carrying out any work on the tool. The tool is shipped from the factory with the saw blade and blade guard not in the installed condition.

Removing or installing saw blade

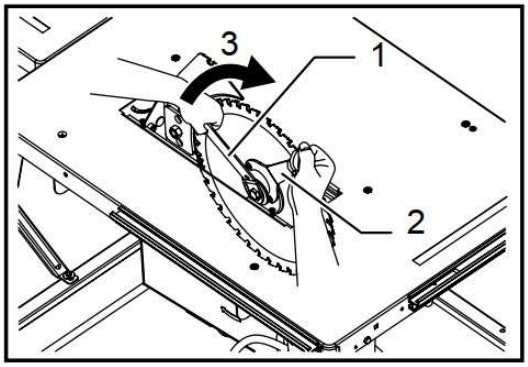
CAUTION:

• Always be sure that the tool is switched off and unplugged before installing or removing the blade.

• Use only the Makita hex wrench provided to install or remove the blade. Failure to do so may result in overtightening or insufficient tightening of the hex bolt. This could cause an injury.

• Use the following saw blade. Do not use saw blades which do not comply with the characteristics specified in these instructions.

To remove the saw blade, remove the table insert on the table. Hold the outer flange with the wrench and loosen the hex bolt clockwise with the hex wrench. Then remove the outer flange.



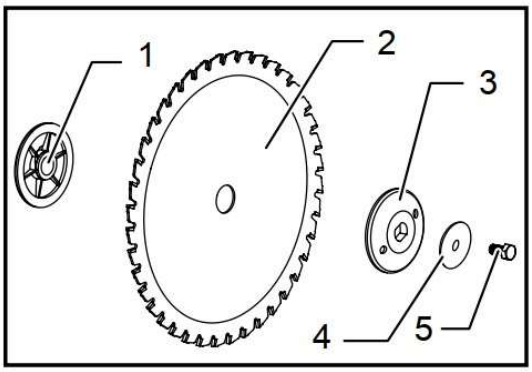
1. Hex wrench
2. Wrench
3. Loosen

To install the saw blade, assemble the inner flange, saw blade, outer flange, washer and hex bolt onto the arbor. Make sure that the teeth of the blade are pointing down at the front of the table.

CAUTION:

• Keep the flange surface clean of dirt or other adhering matter; it could cause blade slippage. Be sure that the blade is installed so that the teeth are aligned in the cutting (turning) direction. To secure the blade in place, hold the outer flange with the wrench, then tighten the hex bolt counterclockwise with the hex wrench.

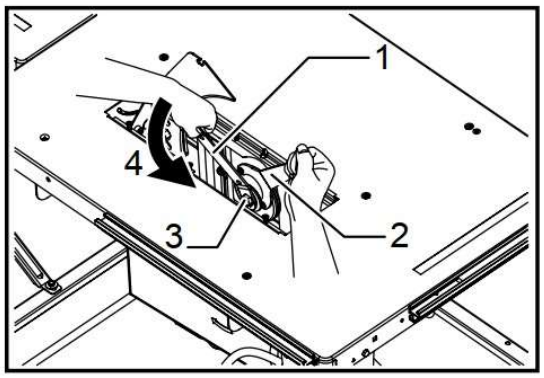
BE SURE TO TIGHTEN THE HEX BOLT SECURELY.



1. Inner flange
2. Saw blade
3. Outer flange
4. Washer
5. Hex bolt

CAUTION:

• Be sure to hold the hex bolt carefully with the hex wrench. If your grip should slip, the hex wrench may come off the hex bolt, and your hand could strike the sharp blade edges

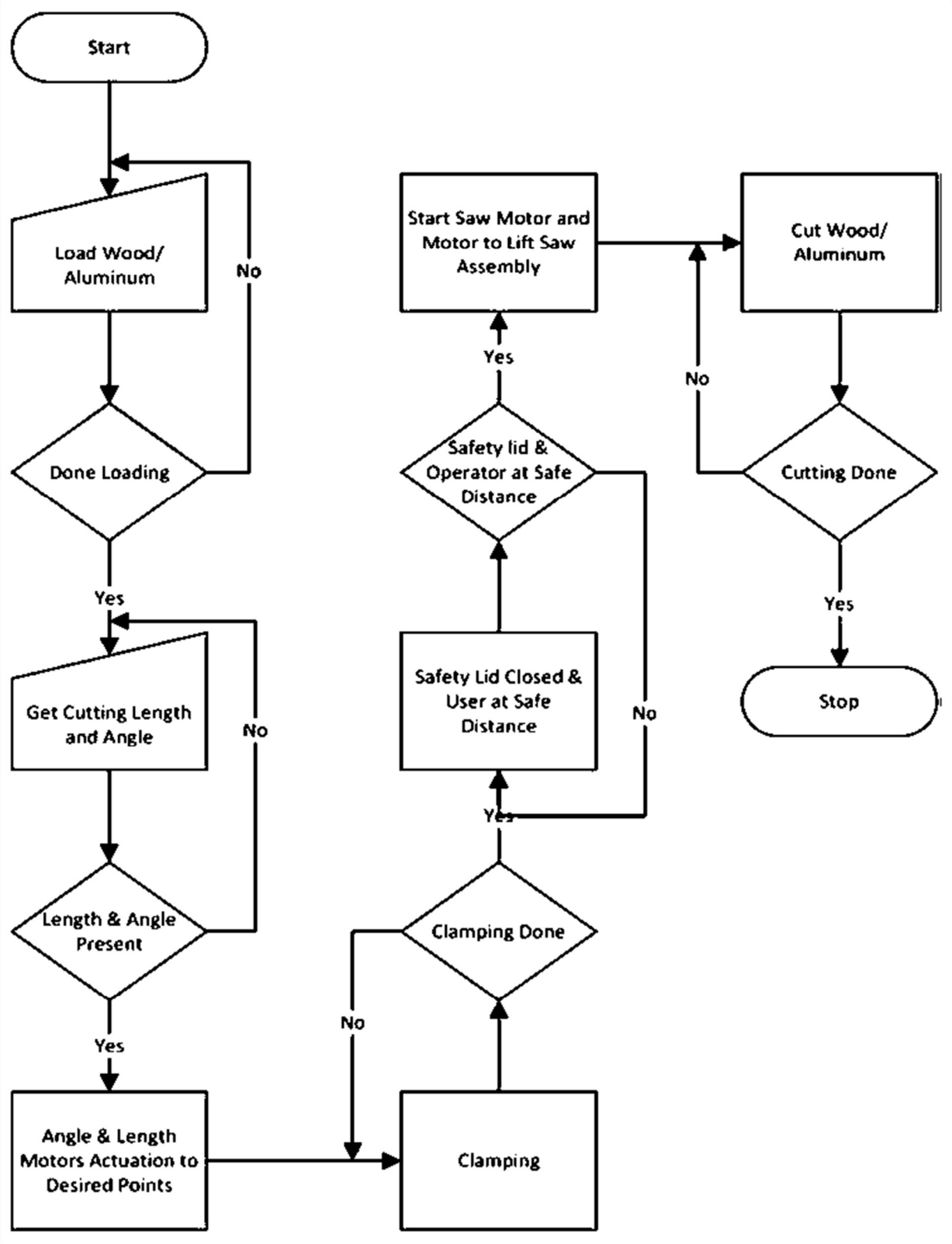


1. Hex wrench
2. Wrench
3. Hex bolt
4. Tighten

2.5 COMPLETION

The traditional method for cutting wood using a table saw involves a stationary saw motor in which the wood is fed through the saw by hand. This approach entails serious safety hazards. On the other hand, aluminum cutting requires extra precaution and careful craftsmanship to ensure an accurate cut, and the cutting can be dangerous if not executed properly. Given the inherent risks of conventional sawing practice, limitations of cutting both materials, benefits of automation and to support panelized construction, in this paper Axiomatic design theory is applied for investigating the problems of the present table saws and for designing an uncoupled new one. As a result of mapping from functional domain to physical domain, the feed speed and RPM for wood and aluminum cutting found to be coupled. A complete control system strategy from defining the process flow to its full implementation was crafted to meet the design objectives and based on the analysis an uncoupled design of saw cutting machine is introduced. Discrete event modelling is employed to estimate the performance of the machine and implication of different sizes of profiles. The simulation results provide valuable insight into machine's key performance indicators, for instance, cycle time and operator's utilization.

3. FLOWCHART


Start
Load Wood/ Aluminum
No
Done Loading
Yes
Get Cutting Length and Angle
No
Length & Angle Present
Yes
Angle & Length Motors Actuation to Desired Points
Clamping
No
Clamping Done
Yes
Safety Lid Closed & User at Safe Distance
No
Safety lid & Operator at Safe Distance
Yes
Start Saw Motor and Motor to Lift Saw Assembly
Cut Wood/ Aluminum
No
Cutting Done
Yes
Stop

4. SAFETY GUIDELINE

Be sure to read and understand this manual for your safety. When using this product, it is important to read and understand this information. It will protect you and help prevent any problems

- **KNOW YOUR POWER TOOL.** Read the operator's manual carefully. Learn the saw's applications and limitations as well as the specific potential hazards related to this tool.
- **GUARD AGAINST ELECTRICAL SHOCK BY PREVENTING BODY CONTACT WITH GROUNDED SURFACES.** For example, pipes, radiators, ranges, refrigerator enclosures.
- **KEEP GUARDS IN PLACE** and in good working order.
- **REMOVE ADJUSTING KEYS AND WRENCHES.** Form a habit of checking to see that keys and adjusting wrenches are removed from tool before turning it on.
- **KEEP WORK AREA CLEAN.** Cluttered areas and benches invite accidents. DO NOT leave tools or pieces of wood on the saw while it is in operation.
- **DO NOT USE IN DANGEROUS ENVIRONMENTS.** Do not use power tools in damp or wet locations or expose to rain. Keep the work area well lit.
- **KEEP CHILDREN AND VISITORS AWAY.** All operators should wear safety glasses and be kept a safe distance from work area. Do not contact tool or extension cord while operating.
- **MAKE WORKSHOP CHILDPROOF** with padlocks and master switches, or by removing starter keys.

Here are the guidelines to help you understand the symbols used in this guide.

DANGER!
Indicates a potentially hazardous situation which could result in death or serious injury.

WARNING!
Indicates a situation which could result in death or serious injury

CAUTION!
Indicates a potentially hazardous situation which could result in mild to moderate injury

NOTICE:
When used without the Safety Alert symbol, this indicates a potentially hazardous situation which, if not avoided, can result in property damage

- **DON'T FORCE TOOL.** It will do the job better and safer at the feed rate for which it was designed.
- **USE RIGHT TOOL.** Don't force the tool or attachment to do a job it was not designed for. Don't use it for a purpose not intended.
- **USE THE PROPER EXTENSION CORD.** Make sure your extension cord is in good condition. Use only a cord heavy enough to carry the current your product will draw. An undersized cord will cause a drop in line voltage resulting in loss of power and overheating. A wire gauge size (A.W.G.) of at least 14 is recommended for an extension cord 25 feet or less in length. If in doubt, use the next heavier gauge. The smaller the gauge number, the heavier the cord.
- **DRESS PROPERLY.** Do not wear loose clothing, gloves, neckties, or jewelry. They can get caught and draw you into moving parts. Rubber gloves and nonskid footwear are recommended when working outdoors. Also wear protective hair covering to contain long hair.
- **ALWAYS WEAR SAFETY GLASSES WITH SIDE SHIELDS.** Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.
- **SECURE WORK.** Use clamps or a vise to hold work when practical. It's safer tha using your hand and frees both hands to operate tool.
- **DON'T OVERREACH.** Keep proper footing and balance at all times.
- **MAINTAIN TOOLS WITH CARE.** Keep tools sharp and clean for better and safer performance. Follow instructions for lubricating and changing accessories.
- **DISCONNECT TOOLS.** When not in use, before servicing, or when changing attachments, blades, bits, cutters, etc., all tools should be disconnected.
- **AVOID ACCIDENTAL STARTING.** Be sure switch is off when plugging in any tool
- **USE RECOMMENDED ACCESSORIES.** Consult the instruction manual for recommended accessories. Use of improper accessories may risk injury.
- **NEVER STAND ON TOOL.** Serious injury could occur if the tool is tipped or if the cutting tool is unintentionally contacted.
- **CHECK DAMAGED PARTS.** Before further use of the tool, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, binding of moving parts, breakage of parts, mounting and any other conditions that may affect its operation. A guard or other part that is damaged must be properly repaired or replaced by an authorized service center to avoid risk of personal injury.
- **USE THE RIGHT DIRECTION OF FEED.** Only feed work into a blade or cutter against the direction of rotation of blade or cutter.
- **NEVER LEAVE TOOL RUNNING UNATTENDED. TURN THE POWER OFF.** Don't leave tool until it comes to a complete stop.

- **WHEN OPERATING A POWER TOOL OUTSIDE, USE AN OUTDOOR EXTENSION CORD MARKED "W-A" OR "W"**. These cords are rated for outdoor use and reduce the risk of electric shock.
- **KEEP BLADES CLEAN, SHARP, AND WITH SUFFICIENT SET.** Sharp blades minimize stalling and kickback.
- **KEEP HANDS AWAY FROM CUTTING AREA.** Keep hands away from blades. Do not reach underneath work, around or over the blade while blade is rotating. Do not attempt to remove cut material when blade is moving.

SPECIFIC SAFTEY RULES

- **NEVER** perform any operation "freehand" which means using only your hands to support or guide the workpiece. Always use either the rip fence or miter gauge to position and guide the work.
- **NEVER** stand or have any part of your body in line with the path of the saw blade.
- **NEVER** reach behind, over, or within three inches of the blade or cutter with either hand for any reason.
- **MOVE THE RIP FENCE** out of the way when cross cutting.
- **DO NOT USE THE MITER GAUGE AND RIP FENCE** during the same operation.
- **NEVER** use rip fence as cutoff gauge when cross cutting.
- **NEVER** attempt to free a stalled saw blade without first turning the saw OFF and disconnecting the saw from the power source.
- **PROVIDE ADEQUATE SUPPORT** to the rear and sides of the saw table for wide or long work pieces.
- **AVOID KICKBACKS** (work thrown back toward you) by:
  a) Keeping blade sharp.
  b) Keeping rip fence parallel to the saw blade.
  c) Keeping riving knife, anti-kickback pawls, and blade guard in place and operating.
  d) Not releasing the work before it is pushed all the way past the saw blade using a push stick.
  e) Not ripping work that is twisted, warped or does not have a straight edge to guide along the fence.

5. OPERATIONS

APPLICATIONS

You may use this tool for the purposes listed below:

- Straight line cutting operations such as cross cutting, ripping, mitering, beveling, and compound cutting
- Cabinet making and woodworking

NOTE: This table saw is designed to cut wood and wood composition products only.

BASIC OPERATION OF THE TABLE SAW

The polarized plug must be plugged into a matching outlet that is properly installed and grounded according to all local codes and ordinances. Improper connection of the equipment can result in electric shock. Do not modify the plug if it will not fit the outlet. Have the correct outlet installed by a qualified electrician. Refer to the Electrical section in this manual.

CAUSES OF KICKBACK

Kickback can occur when the blade stalls or binds, kicking the workpiece back toward you with great force and speed. If your hands are near the saw blade, they may be jerked loose from the workpiece and may contact the blade. Kickback can cause serious injury. Use precautions to avoid the risks.

Kickback can be caused by any action that pinches the blade in the wood such as:

- Making a cut with incorrect blade depth
- Sawing into knots or nails in the workpiece
- Twisting the wood while making a cut
- Failing to support work
- Forcing a cut
- Cutting warped or wet lumber
- Using the wrong blade for the type of cut

- Not following correct operating procedures
- Misusing the saw
- Failing to use the anti-kickback pawls
- Cutting with a dull, gummed-up, or improperly set blade

AVOIDING KICKBACK

- Always use the correct blade depth setting. The top of the blade teeth should clear the workpiece by 1/8 in. to 1/4 in.
- Inspect the work for knots or nails before beginning a cut. Knock out any loose knots with a hammer. Never saw into a loose knot or nail.
- Always use the rip fence when rip cutting. Use the miter gauge when cross cutting. This helps prevent twisting the wood in the cut.
- Always use clean, sharp, and properly-set blades. Never make cuts with dull blades.
- To avoid pinching the blade, support the work properly before beginning a cut.
- When making a cut, use steady, even pressure. Never force cuts.
- Do not cut wet or warped lumber.
- Use extra caution when cutting some prefinished or composition wood products as the anti-kickback pawls may not always be effective.
- Always guide your workpiece with both hands or with push sticks and/or push blocks. Keep your body in a balanced position to be ready to resist kickback should it occur. Never stand directly in line with the blade.
- Use of a featherboard will help hold the workpiece securely against the saw table or fence.
- Clean the saw, blade guard, under the table insert, and any areas where saw dust or scrap workpieces may gather.
- Use the right type of blade for the cut being made.
- Always use the riving knife for every operation where it is allowed. The use of this device will greatly reduce the risk of kickback.

CUTTING AIDS

See Figure 19.

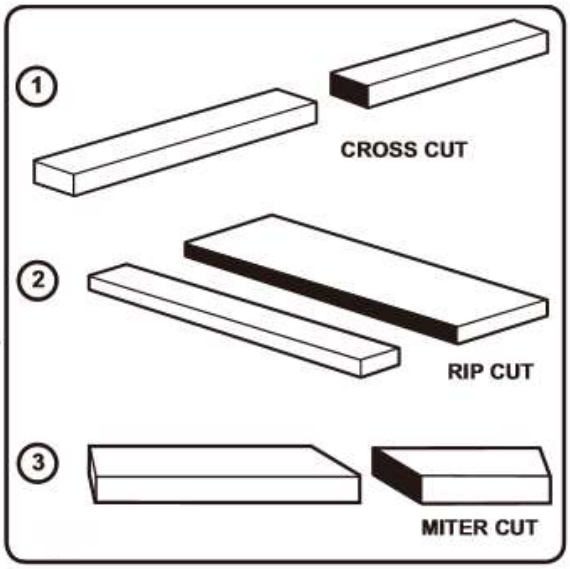
Push sticks are devices that may be used for pushing a workpiece through the blade in any rip cut. When making non-through cuts or ripping narrow stock, always use a push stick, push block, and/or feather- board so your hands do not come within 3 inches of the saw blade. They can be made in various sizes and shapes from scrap wood and used in a specific project. The stick must be narrower than the workpiece, with a 90˚ notch in one end and shaping for a grip on the other end.

A push block has a handle fastened by recessed screws from the underside. Use push blocks for narrow cuts and all non-through cuts.

NOTICE: Be sure the screws in a push block are recessed to avoid damaging the saw or workpiece.

TYPE OF CUTS

There are six basic cuts: 1) the cross cut, 2) the rip cut, 3) the miter cut, 4) the bevel cross cut, 5) the bevel rip cut, and 6) the compound (bevel) miter cut. All other cuts are combinations of these basic six. Operating procedures for making each kind of cut are given later in this section.



WARNING!
Always make sure the blade guard and anti-kickback pawls are in place and working properly when making these cuts to avoid possible injury.

Cross cuts are straight 90° cuts made across the grain of the workpiece. The wood is fed into the cut at a 90° angle to the blade, and the blade is vertical.

Rip cuts are made with the grain of the wood. To avoid kickback while making a rip cut, make sure one side of the wood rides firmly against the rip fence.

Miter cuts are made with the wood at any angle to the blade other than 90°. The blade is vertical. Miter cuts tend to "creep" during cutting. This can be controlled by holding the workpiece securely against the miter gauge.

WARNING!
Always use a push stick with small pieces of wood, and also to finish the cut when ripping a long, narrow piece of wood to prevent your hands from getting close to the blade.

Bevel cuts are made with an angled blade. Bevel cross cuts are across the wood grain, and bevel rip cuts are with the grain.

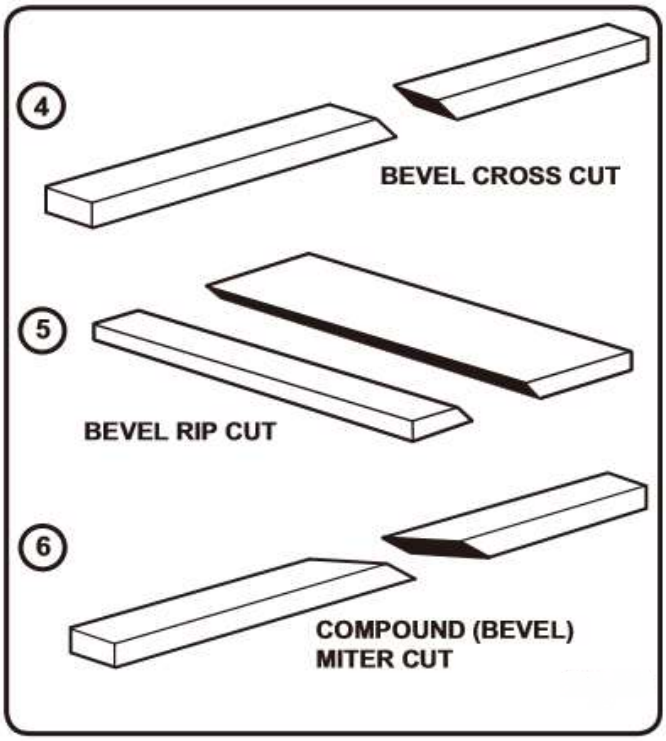
Compound (or bevel) miter cuts are made with an angled blade on wood that is angled to the blade. Be thoroughly familiar with making cross cuts, rip cuts, bevel cuts, and miter cuts before trying a compound miter cut.

- Always provide proper support for the wood as it comes out of the saw.

TO CHANGE BLADE DEPTH

The blade depth should be set so that the outer points of the blade are higher than the workpiece by approximately 1/8 in. to 1/4 in. but the lowest points (gullets) are below the top surface.

- Turn the bevel lock lever to the right.
- Raise the blade by turning the height/bevel adjusting handwheel clockwise or lower it by turning the handwheel counterclockwise.

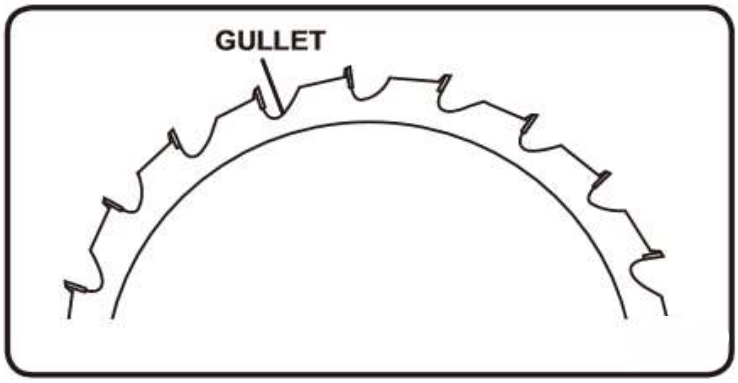


TO CHANGE BLADE ANGLE (BEVEL)

This table saw has a rack and pinion bevel control that allows you to make angled cuts from 90° to 45°.

NOTE: A 90° cut has a 0° bevel and a 45° cut has a 45° bevel.

- Unplug the saw.
- Loosen bevel locking knob. Move the height adjusting handwheel to the right to bevel to a 45° angle. Then tighten bevel locking knob.



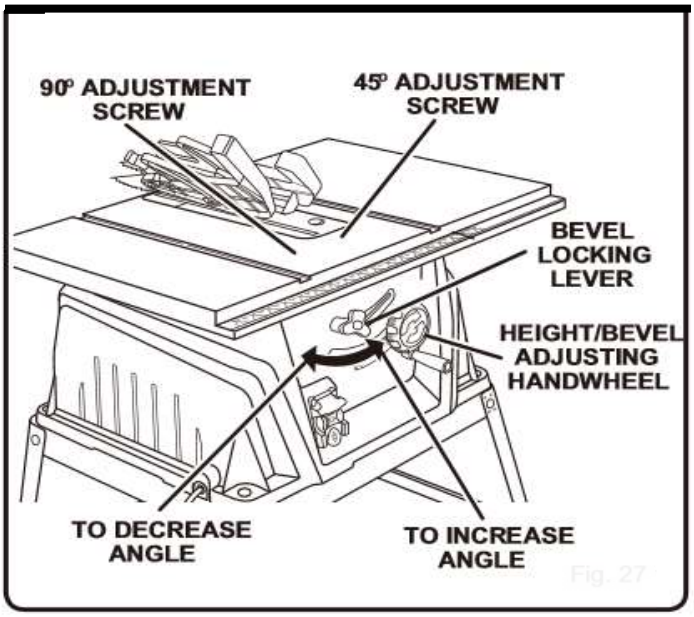


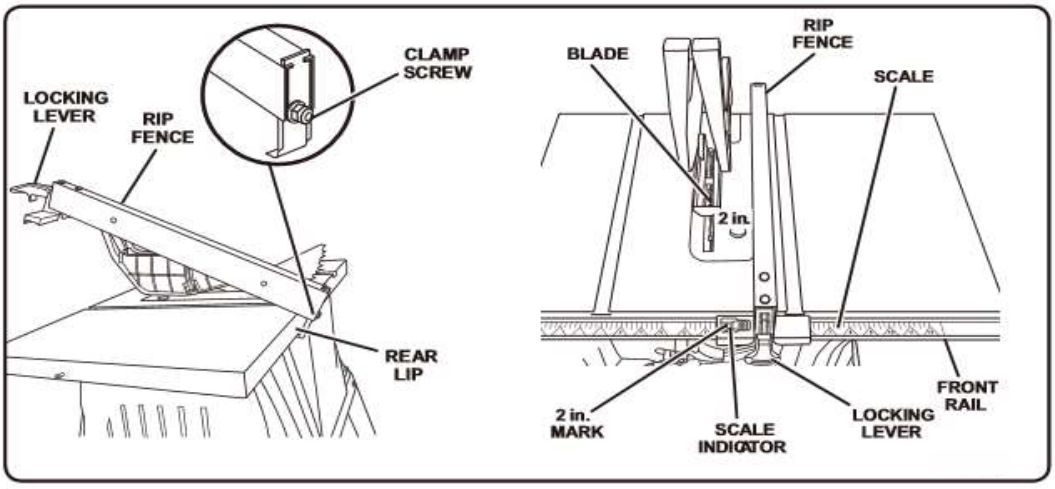
Fig. 27

WARNING!
To reduce the risk of injury, always make sure the rip fence is parallel to the blade before beginning any operation.

TO USE THE RIP FENCE

- Place the rear lip on the rear of the saw table and pull slightly toward the front of the unit.
- Lower the front end of the rip fence onto the guide surfaces on top of the front rail.
- With the rip fence flat on the saw table, push the fence towards the front rail to align the fence to the saw table.
- Push the locking lever down to align and secure the fence. Check for a smooth gliding action. If adjustments are needed, see To Check the Alignment of the Rip Fence to the Blade in the Adjustment section of this manual.
- Make two or three test cuts on scrap wood. If the cuts are not true, repeat the process.

NOTE: The rip fence must be secure when the locking handle is engaged. To increase the grip of the rip fence on the rear lip of the table, tighten the clamp screw on the rear of the rip fence by turning it clockwise.



TO SET THE RIP FENCE SCALE INDICATOR TO THE BLADE

Use the indicator on the rip fence to position the fence along the scale on the front rail.

NOTE: The anti-kickback pawls and blade guard assembly must be removed to perform this adjustment. Reinstall the blade guard assembly when the adjustment is complete.

Begin with the blade at a zero angle (straight up).

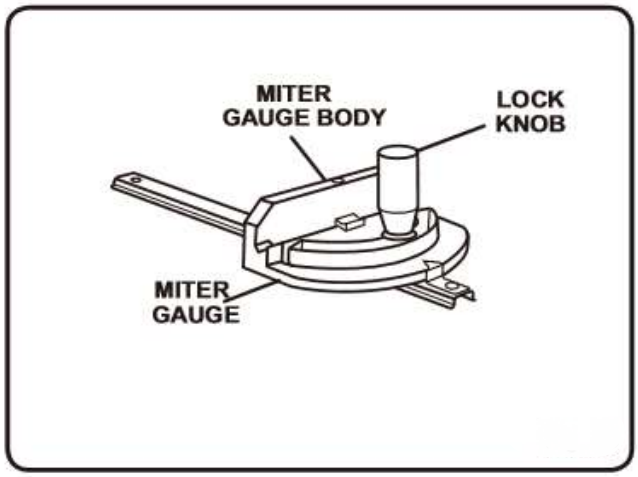
- Unplug the saw.
- Loosen the rip fence by lifting the locking lever.
- Using a framing square, set the rip fence 2 in. from the blade tip edge.
- Loosen the screw on the scale indicator and align with the 2 in. mark as shown.
- Tighten the screw and check the dimension and the rip fence.

TO USE THE MITER GAUGE

The miter gauge provides greater accuracy in angled cuts. For very close tolerances, test cuts are recommended. There are two miter gauge grooves, one on either side of the blade. When making a 90° cross cut, you can use either miter gauge groove. When making a beveled cross cut (the blade tilted in relation to the table) the miter gauge should be located in the groove on the right so that the blade is tilted away from the miter gauge and your hands.

The miter gauge can be turned 60° to the right or left.

- Loosen the lock knob.
- With the miter gauge in the miter gauge groove, rotate the gauge until the desired angle is reached on the scale.
- Retighten the lock knob.



WARNING!
The blade must be parallel to the miter gauge groove so the wood does not bind resulting in kickback. Failure to do so could result in serious personal injury. Do not loosen any screws for this adjustment until you have checked with a square and made test cuts to be sure adjustments are necessary. Once the screws are loosened, these items must be reset.

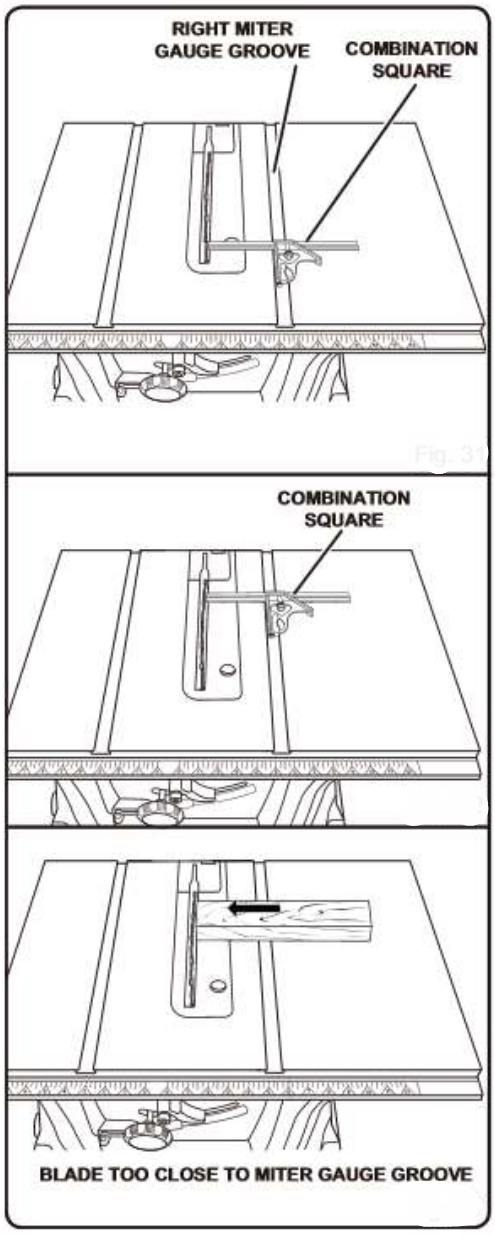
HEELING (PARALLELING) THE BLADE TO THE MITER GAUGE GROOVE

- Unplug the saw.
- Remove the blade guard and anti-kickback pawls. Raise the blade by turning the height/ bevel adjusting handwheel.
- Mark beside one of the blade teeth at the front of the blade. Place a combination square even with the front of the saw table and the side of the saw blade as shown in figure 31.
- Turn the blade so the marked tooth is at the back.
- Move the combination square to the rear and again measure the distance. If the distances are the same, the blade is square. If the distances are different:
- Place riving knife in “down” position.
- Loosen the adjusting screws, located on top of the saw table.

NOTE: If the back of the blade was too far from the combination square, place a block of wood on the left side of the blade and push it into the blade until the blade is square. Retighten the screws.

If the back of the blade was too close to the combination square, place a block of wood on the right side of the blade and push it into the blade until the blade is square.

- Retighten the screws.



WARNING!
To reduce the risk of injury from kickback, align the rip fence to the blade following any blade adjustments.

Always make sure the rip fence is parallel to the blade before beginning any operation.

6. FORMULA & CALCULATION

The time of cutting operation can be calculated as below:

Cutting Speed : $\frac{\pi dn}{1000} = \frac{\pi \, x \, 50 \, x \, n}{1000} = \frac{\pi \, x \, 50 \, x \, n}{1000} = 35$

$$= \frac{1000 \, x \, 35}{\pi \, x \, 50} = 222.5$$

Number of revolution for complete cut : $\frac{350}{0.5} = 700$

The time of cutting operation can be calculated as below:

$$\text{Time} = \left(\frac{\text{Length of cut}}{\text{Feed per revolution x R.P.M}} \right)$$

7. CONCLUSION

The portable table saw machine is proposed by keeping in mind the two critical factors while manufacturing, the accuracy and the cost. The machine which we will make works with the same accuracy as that of large table saw with cost effectiveness. The machine prototype will be simple for cutting variety of wooden work pieces with varying length and dimension. This machine will cut the work piece at 900 angles. It will also reduce the risk factor while working. The machine will be provided with measuring scale (if required) to cut the work piece at required length. To guide the work piece, we will add fences parallel to the cutting blade, The machine will be providing a good provision for the replacement of the cutter in case of accident and damage. The traditional method for cutting wood using a table saw involves a stationary saw motor in which the wood is fed through the saw by hand. This approach entails serious safety hazards. On the other hand, aluminum cutting requires extra precaution and careful craftsmanship to ensure an accurate cut, and the cutting can be dangerous if not executed properly. Given the inherent risks of conventional sawing practice, limitations of cutting both materials, benefits of automation and to support panelized construction, in this paper Axiomatic design theory is applied for investigating the problems of the present table saws and for designing an uncoupled new one. As a result of mapping from functional domain to physical domain, the feed speed and RPM for wood and aluminum cutting found to be coupled. Incomplete control system strategy from defining then process flow to its full implementation was crafted to meet the design objectives and based on the analysis an uncoupled design of saw cutting machine is introduced. Discrete event modelling is employed to estimate the performance of the machine and implication of different sizes of profiles. The simulation results provide valuable insight into machine's key performance indicators, for instance, cycle time and operator's utilization.

8. REFERENCES

Journal Papers:

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[3] Marek Rakowski, Pawel Bachman, "Innovative Safety System of Work of Wood Cutting Electric Table Saw, Based on the Measurement of Current Consumption," Advanced Materials Research, vol. 1001, pp. 421–425, 2014.