

# Saber Saw (Jigsaw)



This is a very popular tool because it is among the least expensive tools with which to make straight and curved cuts in woods and metals, depending on the type of exchangeable blade used. It is a versatile machine, and relatively safe and easy to operate as long as certain precautions are taken.

When choosing a jigsaw (see Fig. 27), it is always best to pay extra for a good one. It is not uncommon for a cheap machine to have a life span of a year or so, barely allowing the warranty to expire. A top-quality, well-maintained version of the same tool will have a life span of 15 to 25 years, and is obviously much more economical. Look for a machine with bearings on all moving parts. Bushings will wear quickly under the strain of even moderate use. A well-balanced machine should operate with minimum vibration.

## Jigsaw Blades

Jigsaws use long, thin, tempered steel blades, which are held into the machine at the upper end, leaving the bottom protruding downward past the sole of the machine.



Jigsaw blades are extremely brittle, and will break easily if twisted or bent, creating a hazard of flying metal shards. When cutting, avoid putting side pressure on the blade, or cutting a radius which is too small for the blade to handle. Start the machine before addressing the material, and allow it to come to a complete stop before removing it from material. Do not set the machine down on the protruding blade.

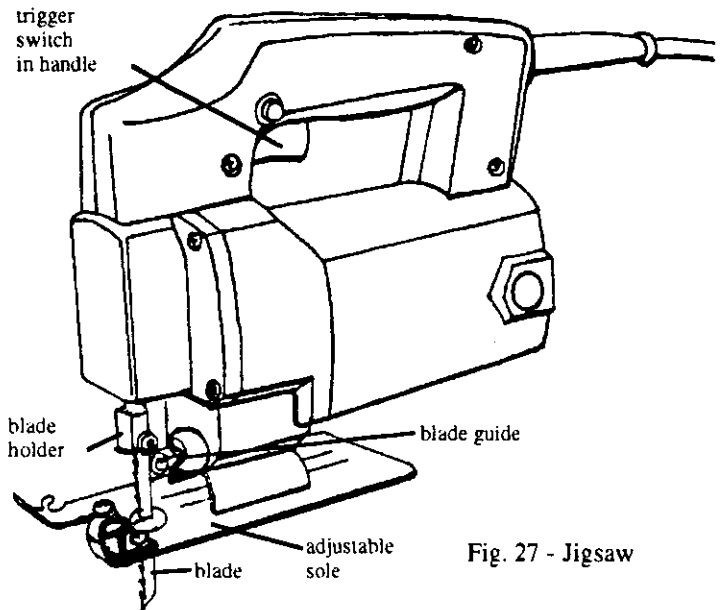


Fig. 27 - Jigsaw

Blades become dull quickly, due to the stress and heat that they are subjected to, and are therefore usually short-lived and easily replaceable, following the manufacturer's directions. If it becomes difficult to push the machine through the material, the blade is probably dull and in need of replacing. A dull blade will have rounded teeth, the "set" will be reduced, and resins may have accumulated on the teeth or shaft of the blade.

Different blades are made for different materials and cutting operations, and are available singly or in sets. Be sure that the blades you are buying are the right ones for the job and for the machine.

## Safety and Procedures:

1. Wear eye protection when using the jigsaw. These machines cut on the upstroke, so that the saw is drawn onto the work by the cutting action. This means that sawdust and filings are discharged upward, toward the operator.

2. Loud vibrations and dust may necessitate hearing, and breathing protection as well.

3. Disconnect the power supply before changing blades or making adjustments.

4. The cord must be kept out of the way while cutting.

5. Clamp material to a surface to prevent damaging vibrations. Clamp as close to the cut line as possible without interfering with the travel of the saw.

6. To operate the jigsaw;

- \* Position the front end of the base of the saw onto the material to be cut. Align the blade with the line of the cut to be made.

- \* Pull the machine back a bit, so that the blade is not engaging the material.

- \* Press downward lightly to hold the saw onto the material, and start the saw before addressing the blade to the material.

- \* When the motor has reached maximum speed, push the saw slowly forward into the material with an even pressure. A sharp blade will cut with almost no effort on your part, other than to guide the saw. Do not attempt to force the blade through the material.

7. Prior to starting a cut in the middle of a panel, drill a hole in the material through which the blade is inserted. "Plunge-starting" is the term given to a method of starting cuts without previously drilling a hole. Because the resulting vibrations are prone to breaking blades, causing operator injury, and/or damaging the machine, this method will not be discussed here. Plunge-starting a jigsaw cut is dangerous and should be discouraged. Always drill a starter hole.

8. When cutting curves, care must be taken that the radius of the curve does not exceed the minimum cutting radius of the blade you are using. Attempting to cut a curve of too small a radius will result in the blade binding against the sides of the cut. This

will generate unwanted heat and vibration which could break the blade.

9. When cutting metal, it is advisable to use cutting oil on the cut line to lubricate the blade.

10. Be aware of the location of the blade on the underside of the material to avoid cutting into benches and sawhorses.

11. Never reach around to the underside of the material when cutting.

12. After making a cut, allow the blade to stop completely before removing the tool from the work.

13. Never attempt to insert a moving blade into or out of a cut line or hole. The blade may break, or the saw may be jolted from your hands. The machine must come to a full stop before doing this.

14. Do not put the saw down until the motor has come to a stop. Lay the saw on its side, so that no weight is placed on the blade.

15. Store the saw on a shelf with a hole drilled through it to accept the blade, allowing the weight of the machine to rest on its sole rather than on the blade.

# Scroll Saw

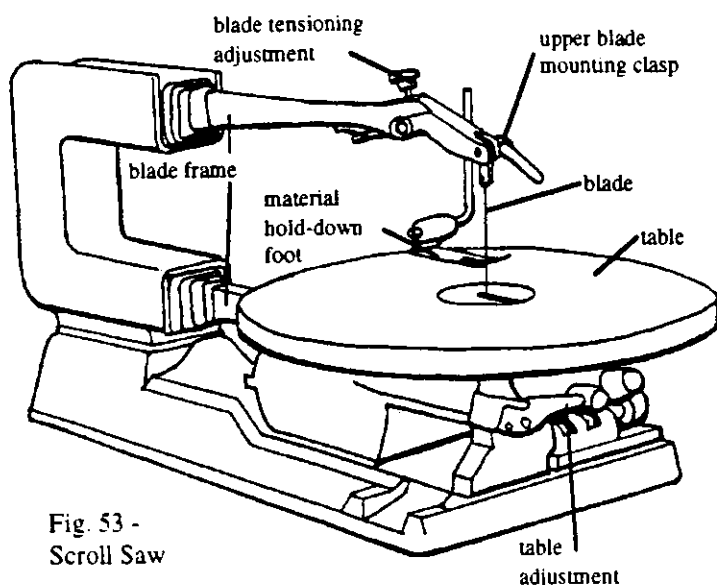


Fig. 53 -  
Scroll Saw

Simple to operate, and requiring only a small work area, the scroll saw is common in small hobby workshops. Because of its versatility and ability to do small, intricate, curved cutting operations, it finds a place in the larger shop as well.

The scroll saw consists of a large C-shaped metal frame in which a thin blade is held vertically. The blade passes through the cutting table, which is placed below the center of the saw tooth length. Since the blade is very thin, it is able to negotiate tight curves.

The saw is usually belt-driven by an external motor, and is usually pedestal-mounted in order to provide access from 3 directions. Proper belt tensioning must be maintained according to the instructions in the machine's operation manual.

**When choosing a scroll saw, check the marketplace before making a decision, keeping your needs in mind.**

\*There are different sizes and types of scroll saws available.

\*Look for quality metal castings and precision machined surfaces.

\*Moving parts need to be easy to adjust and lubricate, and should be lubricated regularly.

\*Check that the blade mounting clasps are easy to operate and maintain, and that they

provide a sure grip at both ends of the blade.

\*The table needs to provide firm support.

\*Make sure that the throat opening is large enough to accept the material that you will be working with.

**Guards:** If the machine comes equipped with belt and safety guards, install and use them. Remove them only for servicing, and re-install them immediately afterward. Keep all safety guards and equipment in good condition.

## Safety and Procedures



1. **Wear safety eyewear at all times. Breathing and hearing protection may also be necessary.**

2. **Blade shrapnel can be hazardous.** Because the blades are so thin, they are prone to bending and breaking easily. Careful cutting will lengthen blade life, and therefore improve the safety odds.

3. Install the blade so that it cuts on the downward stroke, pressing the material onto the table.

4. Scroll saw blades cut best when they are sharp, and they will stay sharp longer if they remain cool and stay straight.

5. Care must be taken not to force the cut, allowing the blade to cut at its own speed.

6. Proper blade tensioning will help to ensure that the blade is stretched tightly between the mounting points, reducing its tendency to bend.

## General Maintenance

Follow the manufacturer's directions closely when servicing the machine and changing blades. When you change the blades, check the blade tensioning mechanisms, as well as the blade clasps. Replace any cracked or worn parts immediately with the correct replacement part.

# Bandsaws

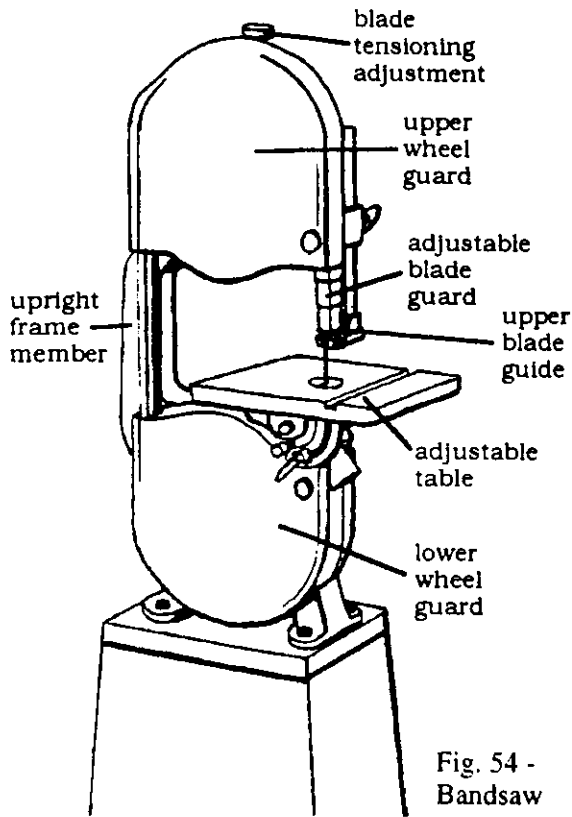


Fig. 54 - Bandsaw

Bandsaws are available in a wide range of sizes, from very large floor standing models to small models which are to be mounted on a pedestal or workbench. Their thin vertical blade allows for the cutting of curves, and their large depth of cut allow the cutting of thick materials. Designs include two and three-wheel models. Three-wheel models generally have a larger throat capacity in comparison to the machine's overall size.

The size of the machine is measured by the throat capacity, which is the distance from the blade to the upright wheel support member at work surface height. This measurement equals the maximum width of cut that can be made on the machine. Other measurements include throat depth, which is the maximum thickness of material that can be cut.

**When choosing a bandsaw,** keep your future as well as your present needs in mind. Small bandsaws can be quite inexpensive, and the temptation to buy is great. These saws are usually quite light in



their construction, however, with a cast aluminum wheel frame, and plastic wheels. It may be wiser to go for a larger machine, capable of a wider range of work. The larger machine will likely have a heavy cast iron frame, metal wheels, and adjustment mechanisms capable of greater precision.

Check the frame thoroughly for defects. A warped frame can cause the wheels to be misaligned and not adjustable. The blade will be difficult to keep on the machine.

Since the upper blade guard must be adjusted up and down often to compensate for various thickness of materials, it must travel exactly parallel with the blade. A misaligned frame will cause the upper blade guard to go out of adjustment as it travels the height of the throat opening.

A simple check for frame straightness is to raise the upper blade guard to its uppermost position and lock it in place. Adjust the blade guides, as indicated on the next page, in this position. Now, lower the blade guard assembly to its lowermost position, just above the table. A close inspection of the blade should indicate that it is still running clear of the guides to the sides, and to the rear. If it is touching one side, loosen the guide until the blade once again clears it. The distance that you must loosen the guide is the amount that the frame is twisted over the length of the guide adjustment.

Some, but not all, machines have an adjustment mechanism, which allows the guard to be re-set in relationship to the blade should the frame move slightly. Follow the manufacturer's guidelines when making these adjustments.

Be sure that the machine has guards over the wheels and the return side of the blade. The blade guard should leave only the cutting part of the blade exposed, and the motor belt drive should be enclosed as well.

## Adjusting Blade Guides

Adjust the blade guides so that they just clear the blade, with a paperwidth of clearance. The right and left guides should have approximately equal adjustment play let out, with the blade running through the center of the opening between them, and approximately 1/16 of an inch in front of the rear guide wheel. Follow manufacturer's directions closely.

## Installation

Bandsaws must be firmly bolted to the floor or a sturdy surface. This will reduce vibrations and prevent them from falling over.

In order to reduce dust emission, connect bandsaws to the workshop vacuum dust collection system.

If the machine does not come with a work lamp, it may be a good idea to install one. Good visibility of the cutting area is a great safety benefit.

## Bandsaw Blades

Bandsaw blades are available in different grades of steel, various widths, and different tooth patterns and sizes. Find out about these differences, and which type of blade is best for your particular application. A narrow blade, for instance, will cut a smaller radius curve than a wide blade will. It will not perform so well when attempting to make straight cuts, however.

It is important that the blade be of the proper length. Read the manufacturer's information to determine the proper blade length for your machine. Do not use blades that are of a different, or unknown length.

When purchasing blades, examine the welded joint closely. It should show no signs of cracking, and the weld should be ground flat so that it will pass freely through the guides on the bandsaw.

## Changing Blades

Replace blades as soon as they show signs of becoming dull. Dull blades will clog easily and cause burning of the material. They will wander if forced into the material, and are dangerous when the "set" of the teeth is lost. Bandsaw blades are usually uneconomical to resharpen, and require replacement when dull.

Blade breakage can occur if an unsupported piece becomes jammed between it and the guide fence. The blade motion will pull the piece down sharply onto the table, and crimp the blade, causing a crack which will expand very quickly.

If a blade breaks, turn the machine off immediately. Wait for the wheels to stop turning before opening the wheel guard panels.

Use caution, pay attention, and wear gloves when uncoiling a new blade, or re-coiling a used one. Bandsaw blades are quite springy, and will open very quickly if not held in check.

When changing blades, follow the manufacturer's directions closely. Adjust blade tension accordingly. Ensure that the blade runs freely, replacing all guards and securing all locking devices after final adjustments have been made.

## Safety and Procedures

1. Do not wear loose clothing or gloves, tie back long hair, roll up sleeves, and wear a face shield.
2. Ensure that the floor area around the machine is clear of debris, and that you have adequate room in which to maneuver freely before performing any operation on the bandsaw.
3. Before turning on the machine, adjust the upper guide to a position approximately 1/8 inch above the stock, or, when cutting narrow stock, 1/8 inch above the rip fence.
4. Adjust the rip fence and secure it, or if crosscutting or making an angled cut, use the miter fence.

5. Use push sticks when working close to the blade. Push sticks should be kept close at hand at all times.

6. Turn the dust extractor on, and open the duct gate before operating these machines.

7. Always allow the machine time to reach operating speed before feeding material.

8. Stand to the side of the material when feeding.

9. Be alert and cognizant of "trailing fingers" which protrude over the edge of the piece being fed into the blade.

10. Keep your hands clear of the side of the blade. If a blade breaks, it usually lashes to the side.

11. When not using a fence, always feed material directly into the blade. Side pressure may pinch and break the blade.

12. For precision straight cuts, use a wide blade and the rip fence. Do not force the material into the blade, as this will make it wander. Use slight side force to keep the material against the fence.

13. Refrain from twisting the blade by attempting to cut a radius too small for the width of the blade.

14. When making intricate scroll-type cuts, it is best to first make some "relief cuts", at 90 degrees to the line. This way, pieces will fall off before they pinch and jam the blade.

15. Small pieces pose the risk of falling down the slot between the blade and the table, jamming the blade. To prevent this, make a cut through a thin sheet of material which is approximately the same size as the saw table, up to the point where the edge of the sheet meets the table edge. Clamp the sheet there, and use it as your cutting surface.

16. Never attempt to cut cylinders, cones, spheres, or any form without a flat bottom, without first constructing a jig (see page 32) in which to hold it firmly.

17. When making angled cuts requiring the table to be tilted, there is a tendency for the

workpiece to slide down the table, bending the blade. When making crosscuts in these situations, it is best to clamp the workpiece to the miter block, and feed using the table slots as guides. When ripping material along its length, place the rip fence along the downhill side of the blade.

18. Always be alert for unusual, regular, clicking sounds that may indicate a cracked or damaged blade.

19. Stop the bandsaw completely before attempting to withdraw material from an incomplete or partial saw cut. Otherwise, you will risk mistracking (pulling the blade off the center of the wheels) or blade rejection.

20. If the machine is so equipped, stop the blade movement by using the foot brake before leaving the machine. Apply the brake slowly, or the blade may jump from the wheels.

21. Never leave the machine running unattended.

22. Do not attempt to clear debris from the work surface while the machine is running. Shut the machine off first and use a brush. Brushing debris from the table by hand could result in a hand full of splinters.

23. Always clear the table and floor area immediately after each operation.

## General Maintenance

The upper and lower blade guides must be maintained regularly, making adjustments, and replacing worn guide blocks, bushings, or bearings.

Bandsaws usually have replaceable rubber tires on the wheel to grip the blade. These tires are domed slightly; they have a raised center so that the blade will stay on the wheel. Inspect the tires regularly, brushing off accumulated and embedded dust and debris. Replace tires with new ones of the proper size if they should become badly worn, stretched, cracked, or damaged. Follow manufactures directions when doing this.

# Circular Saw Blades

Circular blades are used in many woodworking procedures on several different tools. Although they cannot make curved cuts, they have the advantage of speed and accuracy in straight square, angled, or beveled cuts. Circular blades are designed to rotate in one direction only. They are available in different tooth patterns to perform specific cutting tasks according to the kind, type, and thickness of the material. Different sizes of blades are available with different center mounting hole sizes. Make sure that the blade you purchase will fit the machine you are using.

Sawblades are usually marked with a maximum rotational speed rating. Make sure that the speed of your saw is less than, or equal to, the recommended blade speed.

## Carbide-tipped Sawblades

Carbide tips have become standard on circular saw blades because they stay sharp longer. Because they are so hard, however, carbide teeth are also very brittle. These teeth will chip easily if dropped or if they encounter hard foreign objects in the wood being cut.



Blades are not to be laid directly onto a metal saw table top. If you must lay a blade down for any reason, be sure to put a piece of wood sheathing onto the metal table top to protect the carbide teeth.

Do not stand directly in front of a carbide-toothed blade when it is in operation.

Do not use a carbide-tipped blade that has been dropped. Have it checked for loose teeth before using it again. Dropping a carbide blade could result in cracking or loosening of the silver solder which holds the individual carbide teeth onto the body of the blade. This could cause a tooth to fly off during the cutting procedure. Such loose teeth become bullets when this happens, and are documented to be lethal.

Carbide blades are very expensive, both to buy and to sharpen. They must be handled carefully and laid on wood surfaces only. Never cut wood embedded with any sort of metal, or coated with concrete, dirt, or heavy paint. When not in use, store blades in their wood or cardboard containers, or hang them on a rack made specially for the purpose.

## Anti-Kickback, or Chip Limiting Blades

Chip limiting blades (See Fig. 55) are safer to use because they control the depth of the cut of each tooth as it slices through the material. They have carbide teeth interspersed with shoulders which provide a bearing surface if the feed rate becomes excessive. These have been shown to reduce the risk of injury from kickback of the material, especially during the introduction of the blade to the material.

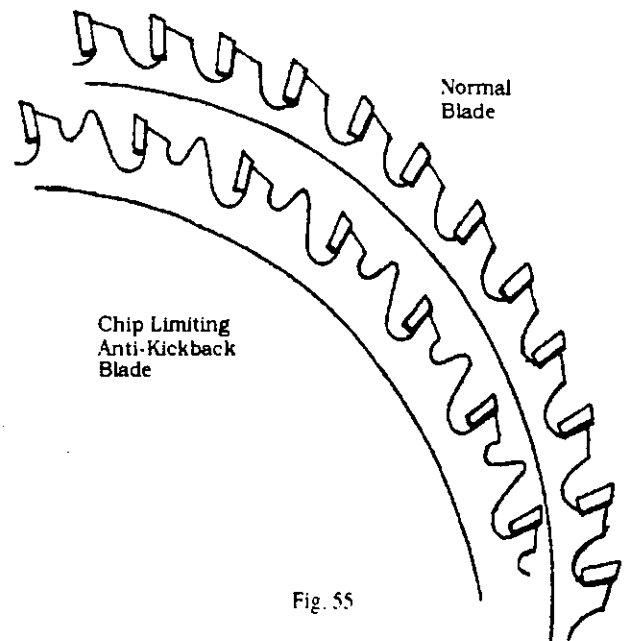


Fig. 55



**NOTICE:** When using machines with Circular Blades, most of the rotational energy is being exerted back toward the operator. If a loose piece of wood should become jammed between the blade and the rip fence or backing board, inertia will cause the piece to be ejected with great force from the machine.

This also pertains to the sawdust generated by the blade. It will be ejected toward the operator.

## Types of Cuts

Cuts are described as being either rip, crosscuts, miters, or bevels.

**Rip Cuts:** Generally, a rip cut is one which follows the direction of the woodgrain, or one that goes lengthwise on a sheet.

**Crosscuts:** A crosscut is generally one that goes across the grain pattern, or widthwise on a sheet.

**Miter cuts:** A miter is a cut on a 45 degree angle across the material.

**Beveled cuts:** A beveled cut is angled from the vertical through or into the thickness of the material.

**Compound Cut:** A combination of a miter and a beveled cut.

For more information about rip cuts and crosscuts, see pages 128-129 "Table Saw".

## Dado Blades

This is normally a set of blades, which, when used in combination with each other will produce a **dado**, or grooved cut. The regular blade must be removed to accommodate the dado set.

The dado cut is variable in thickness, usually from 1/4 inch to 13/16 inch, made in 1/16 inch gradients by progressively stacking the blades onto the spindle. The

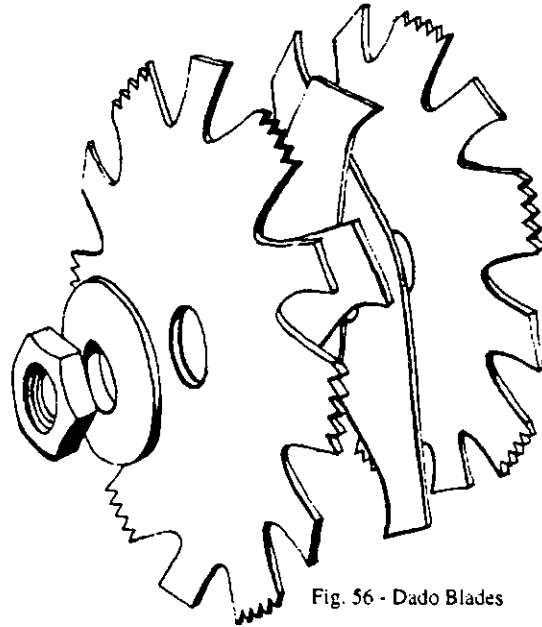


Fig. 56 - Dado Blades

outer blades are indispensable, and must both be used for every dado cut. Use of the inner chipper blades is optional. They are used to build up the width of the cut.

**Dado Shims** are plastic shims of different thicknesses, used to make standard dado blade sets compatible with materials of metric thicknesses. These shims are inserted on the mandrel shaft between the blades to add dimension.

When using shims, spread them evenly between blades. Do not stack shims all to one side.

Do not use shims, or a combination of shims, thicker than .08 mm. A greater dimension between blades will cause them to leave uncut material between them, with a chance for kickback.

Another type of dado blade uses the "wobble principle", where a thin blade is held in an untrue position, causing it to cut a wide swath as it is fed through the material. Follow the manufacturer's recommendations closely when using these blades.



## Safety and Procedures



**1. Dado blades are more dangerous than our senses tell us they are, and therefore must be treated with respect at all times.**

Because of their combined width, dado blades push more air than regular blades. Together, they are stronger than a single blade, and therefore vibrate less. Because of these reasons, the combination of blades dampen sound vibrations and dado blades are not as loud as regular blades. They also appear to move more slowly than regular blades due to the strobe effect caused by the twin cutters of the chipping blades.

2. When installing the blades, be sure that the outer blades are correctly oriented (there is a left and a right blade), and that the internal "chipper" blades are spaced so that they do not interfere with each other, or with the outer blades. Tooth contact could result in chipped, loose, or broken-off teeth, which can be very dangerous.

3. Thrust washers: Included in the set of blades are two special thrust washers, which must be used in conjunction with the blades.

Blade thrust washers must be installed with the rimmed edge against the blade. Washers must be sized to cover 1/3 of the diameter of the blade.

4. Table Insert: Dado blades, when used in conjunction with a table saw, will not fit through the normal table top blade access insert. A special insert, which will accept the wider dado blade set, will have to be bought or made.

5. After installing the dado blade, check to be sure that it is tightly mounted onto the spindle, and replace the original table insert with the proper "special" insert suitable for the increased width of the blade. Before plugging the machine back in, rotate the blade by hand, to make certain that the table insert or the rip fence do not interfere with its rotation.

## Maintenance and Storage

Store Dado blade sets in a special wooden box that has been constructed for the purpose. Dividers inside the box separate the interior into compartments, one for each blade. This prevents the blades from contacting and doing damage to each other. **Dado blades should go directly from the box onto the spindle, and from the spindle back into the box.**

# Power Miter Saw

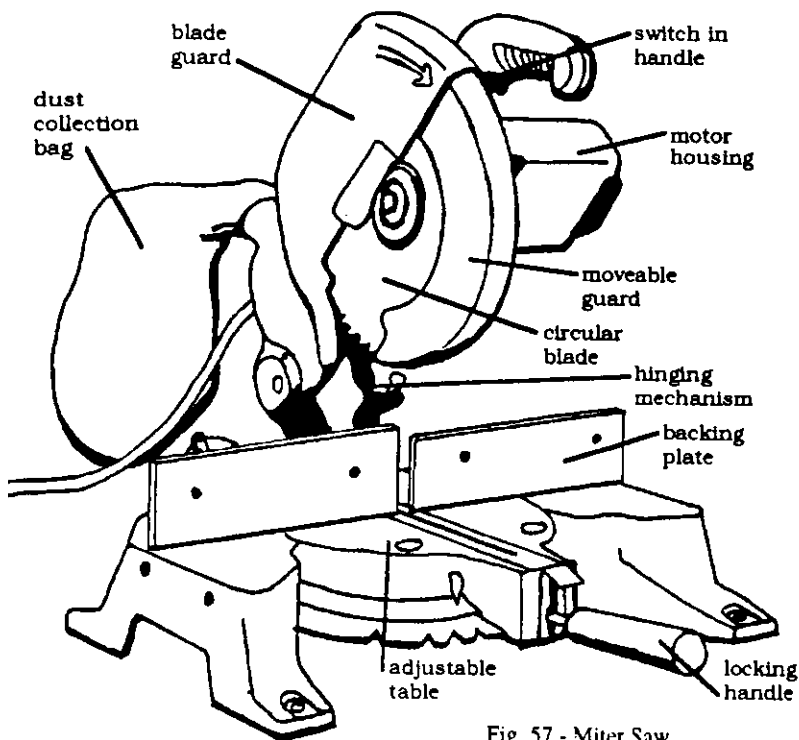


Fig. 57 - Miter Saw

This machine has a plunging motor head which powers a circular blade, allowing for precise cut-off and miter operations. The motor head can be adjusted in relationship to the table, right or left, to an angle of 45 degrees or beyond. A 10-inch blade model can normally handle up to 2 X 6 inch material when cutting at 90 degrees, and 2 X 4 material when cutting at 45 degrees. Larger and smaller sizes are also available.

**Compound Mitre Saw-** This machine has features which allow the cutting head to be tilted, as well as angled, in relationship to the table.

**Sliding Miter Saw-** This saw has a sliding mechanism which allows the cutting head to travel outward, not unlike the radial arm saw. This feature enables the saw to handle wider material.

Read the instruction manual for the tool that you are using to familiarize yourself with its operation, maintenance, and proper use.

Some machines can be adapted to other applications using accessories. When

purchasing accessories, do not substitute. Use only those accessories that have been designed to fit your machine and are suitable for the work being done. Follow instructions closely when fitting and using them.

## Setting up the machine:

Miter saws must be mounted on a workbench or other surface that will put the operating handle at approximately waist height.

Operation of these machines is best when they are mounted in a long table which serves to extend the machine table and backing plate outward in both directions.

Keep the work area well lit and clean. This includes the floor around the working area, as well as the working surface. A dedicated lamp, lighting the work area, is a great safety benefit.

**Do not operate the saw on the floor or the ground.** When working on site, the saw can be bolted or clamped to a rigid surface, supported between sawhorses.

## Safety Features

**Safety Release Button:** As a safety feature, many models include a safety release button on the handle which must be depressed before the trigger can be squeezed, starting the motor.

**Automatic Brake:** Some models also feature an automatic brake which stops the blade rotation much more quickly when the trigger is released.

**Blade Guard:** Virtually all models are supplied with a blade guard as standard safety equipment. Be sure that the guard is on the machine, and operational, before starting the cut. The guard must cover exposed teeth when the carriage unit is in its upper "rest" position. It should function smoothly, allowing full protection as the carriage is moved downward, when making

the cut. Do not remove the guard unit from the machine.

## Miter Saw Blades

The direction of the blade rotation helps to pull the material against the backing plate, and downward onto the saw table. Care must be taken, though, to ensure that the blade is mounted in the correct orientation, with exposed teeth pointed toward the backing plate. Use a crosscut or combination blade, and keep it clean and sharp at all times.

## Safety and Procedures



1. Wear safety glasses, and/or a faceshield. A dust mask and hearing protection may also be necessary.
2. Tie back long hair. Do not wear loose clothing or gloves while operating this machine.
3. Ensure that all wrenches and tools are removed from the machine, and that the motor switch is in the "off" position before plugging it in.
4. Take the time to correctly perform an operation. Generally speaking, the slower the blade goes through the material, the smoother, the more accurate, and the safer the cut will be.
5. If you find your mind wandering, take a break immediately. When using this machine in large duplicating procedures, your attention must be kept from wandering. Hands must be well clear of the blade travel, and all fingers accounted for, before each cut is made.
6. Extra care must be taken when working with small pieces. Pieces shorter than 20 cm. (8 inches) in length have a tendency to move after they are cut off, and are prone to catching in the blade and being ejected forcibly. Do not grab at them.
7. Do not store materials to be cut behind the miter saw. This will cause you to reach over the machine, or behind the blade. Keep all activity on the operational side of the machine where you can be sure of your footing and balance.

8. Adjust the angle of cut by unlocking and turning the saw mechanism in relation to the backing board. Be sure that the locking handle is turned tight again before starting the motor.

9. Do not attempt to hand-hold unsupported material which cannot be placed securely on the saw table and against the backing plate. Make sure that all parts of your hand are well clear of the cut line.

10. The machine is operated by holding the material, usually with the subordinate hand, securely on the table, and against the backing plate. The dominant hand grasps the motor handle and starts the motor.

11. After letting the blade reach operating speed, the motor (and blade) carriage is lowered through the material.

12. Cut through the material, and continue downward until the stop point is reached, before releasing the trigger. Allow the blade to stop completely before removing the off-cut piece and returning the carriage to its upright position.

13. Do not remove your hand from the carriage handle until the blade guard has covered the blade area completely.

## General Maintenance

Unplug the machine, and follow the manufacturer's instructions when changing blades or making other adjustments. With the blade removed, check the machine body, the pivot mechanisms, and the electrical cord and plug. Also check the saw table and backing plate for cracking and wear. Blow accumulated dust from the motor cooling ports, blade guard, and adjustment mechanisms before installing the blade. Wear a dust mask while doing this.

Blade thrust washers must be replaced so that the raised outer rim collar (if there is one) is against the blade, supporting it on the outer edges. Cracked collar washers should be replaced immediately with the correct part.

If repairs are needed, do them immediately, before the machine is used again, using only the proper parts.

# Table Saw

The Table Saw is designed to perform rip, cross, beveled, and angled cuts with precision. It consists mainly of a circular blade protruding upward through a table top. As with all tools, different sizes and configurations are available. Familiarize yourself with the products available before making a purchasing decision.

Traditionally, table saws have used externally-mounted motors, which transmit power to the blade through the use of a v-belt drive. These machines require regular maintenance, inspecting the tensioning of the belt, and checking the belt for cracks. The motor pulley must be aligned to the blade drive pulley on the carriage assembly underneath the table.

Some models are available with built-in internal direct drive motor units. These units are designed to be virtually maintenance and vibration free. However, they are usually built lighter, and are therefore not as durable as the belt-drive machine.

Both machines are used in a similar manner, and the height and angle adjustments are similar. Both are prone to dust build-up in the carriage mechanism underneath the table, and must be cleaned regularly. It is beneficial to have your table saw attached to a dust vacuum system.

**Setting Up the Machine:** Free-standing pedestal-type table saws should be solidly anchored to the floor. Bench-type saws must be mounted on a workbench or other surface, which will put the operating table at approximately waist height.

Operation of these machines is simplified by mounting them in a long table. This extended machine table behind and to the sides of the blade will help support incoming and outgoing material.

The saw table can be waxed to allow material to slide over it freely. First, unplug the machine and lower the blade completely.

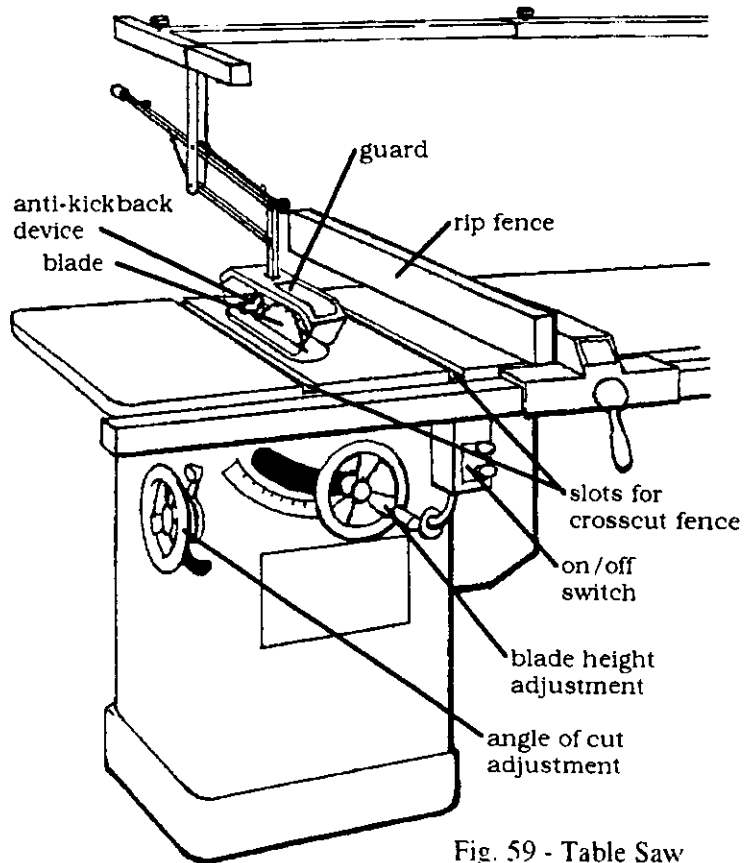


Fig. 59 - Table Saw

To avoid accidents, keep the work area well lit and clean. This includes the floor around the table saw working area, as well as the working surface. A dedicated lamp lighting the work area is a great safety bonus.

**The on/off switch for this machine should be located at knee height. This will allow it to be shut off with your knee when both hands are still on the material, as may be required in some situations. A knee-operated "paddle" switch can also be considered.**



**Do not operate the saw on the floor or the ground.** When working on site, the saw can be bolted or clamped to a rigid surface, supported between sawhorses.

**The angle of cut is adjusted by unlocking and turning the saw mechanism in relation to the table surface. Be sure that the locking handle is turned tightly again before starting the motor. The blade will tilt at any angle to 45 degrees to the right by unlocking**

and turning the corresponding wheel under the side of the table. Consult the manufacturer's manual if you are unsure about its location. Be sure to tighten the locking screws after each adjustment.

**The depth of cut** is adjusted by unlocking and turning the handwheel at the front of the machine below the table. Set the blade so that its tip will clear the material by about 1/4 inch, or .5 cm.

**Accessories:** Some machines can be adapted to other applications with accessories. When purchasing accessories, do not substitute. Use only those that have been designed to fit your machine, and are suitable for the work being done. Follow instructions closely when fitting and using them.

## Kickback



The back of the blade, as it rises out of the table, creates the critical "kickback zone". As material passes by this area of the blade, it has a tendency to be lifted off of the table. If it moves slightly sideways at this point, it will be caught by the rotational motion, and will be flung back toward the operator.

The chances of kickback occurring can be greatly decreased by taking some common-sense steps toward its prevention:

- \* When material with internal stresses are cut they bend. This is because the stresses must be re-neutralized. Sometimes, material bends inward and pinches against the back of the blade. Use of a splitter (see Fig. 60) will help to solve this problem, as will a wedge inserted into the sawkerf to separate the material.
- \* A misaligned rip fence which is not parallel to the blade may cause the material to pinch sideways into it. To prevent this, the fence should be kept perfectly parallel to the blade.
- \* Short, wide material poses a special problem. It is difficult, at this point, to distinguish between a "rip" and a "cross" cut. If using the rip fence, the material must be held tightly against it as it goes

through the blade. The safer way is to treat these cuts as crosscuts, and to use a crosscut fence with a backing board which supports the bulk of the material up to the blade. A similar setup is illustrated in Fig. 62. The unsupported offcut is allowed to go free and uninterrupted.

- \* Small offcuts will tend to vibrate into the blade. To prevent this, use a backing board with the crosscut fence. The board should extend across the blade, and support material on the offcut side as well as the payload side. Push the offcuts clear of the back of the blade with each cut.

- \* Install a splitter, as detailed on page 127. Anti-kickback pawls, although effective, must be removed when making shallow cuts, and re-installed promptly.

## Safety Features

Install, use, and maintain all safety equipment supplied by the manufacturer.

**Safety Release Button:** As a safety feature, many models include a safety release button, or a key which must be inserted and turned before the motor can be started. This is especially important if children are to be present in the workshop.

**Automatic Brake:** Some models also feature an automatic brake, which stops the blade rotation much more quickly after the motor is stopped.

**Guards:** Most tablesaws are supplied with a blade guard to deflect debris away from the operator, and to keep fingers out of the blade.

- \*The blade guard should allow the blade to be tilted, raised, and lowered without removal or adjustment. Most standard guards are fitted into the splitter groove, which is the slot in the table insert directly behind the blade. These units must be removed when using dado blades, or when making cuts that do not penetrate the material.

- \*Accessory blade guards are also available which allow the use of dado blades. These are independent, overhead units which are

either mounted to the floor or the saw table. Some guard units have an electrical cut-off switch, disabling the saw motor or sounding an alarm until the guard is in position.

\*Be sure that the guard is on the machine, and operational, before starting the cut.

\*The guard must cover exposed teeth when it is in its "rest" position. It should function smoothly, allowing full protection, and yet flip out of the way readily for measuring.

\*It should also function smoothly when rising above incoming material at the beginning of the cut.

**Splitters:** The splitter (see Fig. 60) is a tracking device. It is probably the most effective anti-kickback device available because it keeps the material from moving sideways into the blade and being caught by the rotating teeth.

Splitters are metal fins, secured behind and in line with the blade, that protrude through the blade slot. Some are higher than the blade itself, with anti-kickback pawls or a dust guard attached. This type must be removed when a shallow cut is made, where the blade does not cut completely through the material.

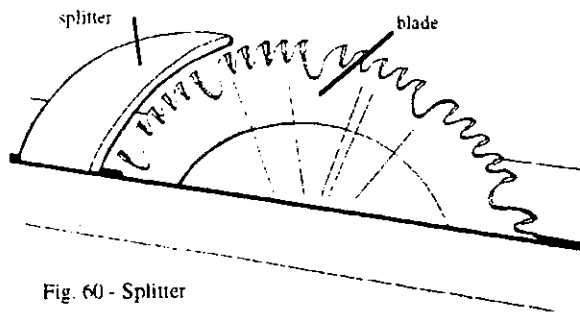


Fig. 60 - Splitter

The best splitters ride up and down as the blade adjusts, and do not rise above it. This allows their use even when making shallow cuts. These splitters are adjusted to ride quite close to the blade, and are an effective means of preventing kickback.

**Power Feeders** allow the material to be fed into and out of the blade without being

handled by hand. Mounted on an adjustable arm mechanism, they can be adjusted to exert pressure downward onto the material, as well as sideways against the fence. They feed material at a regulated rate, and their mechanical motion helps prevent kickback. They are quite expensive, however, and are usually reserved for high-volume production sawing operations.

## Fences

All table saws have two adjustable fences which are used to guide the material straight into the blade. Never attempt to "freehand" a piece through the table saw. Always use fences, push sticks, and jigs. Do not attempt to hand-hold unsupported material which cannot be placed securely on the saw table, and against the fence.



Always use a push stick when working close to the blade. If cutting thin stock, or strips, or performing any other procedure where you are working close to the blade, use a push stick in each hand.

Metal fences should be protected with a wooden faceplate to prevent blade-to-metal contact during close operations.

Fences are also available as a separate item, apart from the saw. These specialty designs are usually highly accurate and efficient to use.

**Rip Fence-** The fence which runs parallel to the blade is called the rip fence because it is used only for that purpose, that is, to cut material along its length. It is adjustable and lockable at any point along the width of the table.

Never use the rip fence when making a crosscut, and never use the rip fence as a stop for cross-cutting. The material will become jammed between the blade and the fence and will be forcibly ejected.



**The Crosscut Fence, or miter block,** slides on its bar in either of two grooves in the tabletop. It is designed to hold material for cutting across the grain. It is adjustable and lockable at any angle up to 45 degrees right or left, in order to handle crosscuts, angles, and miters. Hold material tightly.

preferably with clamps, against the crosscut fence when preparing to make the cut.

When making crosscuts, if at all possible, use the radial arm saw or the miter saw, or construct a jig for the purpose.



**If you must use the table saw for crosscuts, use the crosscut fence only. If making multiple cuts, clamp a stop block to the table, and be certain that the material clears the stop block before it enters the blade. (see Fig. 62)**

**Jigs-** Many operations that would be unsafe using the table saw can be done safely by using the correct jig in order to properly hold the work. Books are available which explain jigs, their uses, and construction. Read and use the information presented in these books. (also see Jigs, page 32)

## Table Saw Blades

The direction of the blade rotation helps to pull the material downward onto the saw table. Care must be taken to ensure that the blade is mounted in the correct orientation, with exposed teeth pointed toward the operator. Use the proper blade for the cut, and keep blades clean and sharp at all times. For more information on blades, see "Circular Saw Blades", on pages 117-119.

**When the blade is installed correctly, the points of the teeth will be facing you, as they rotate forward and downward into the table. Material must be fed into the blade against the direction of rotation.**

Never use a blade that has chipped or missing teeth. It will be off-balance, and may have other undetected defects.

**Maintenance:** Unplug the machine, and follow the manufacturer's instructions when changing blades or making other adjustments. With the blade removed, check the mandrel assembly, the pivot mechanisms and the electrical cord and plug for cracking and wear. If repairs are needed, do them immediately, before the machine is used again, using only the proper parts. Blow accumulated dust from

the motor cooling ports, blade guard, and adjustment mechanisms before installing the blade.

Blade thrust washers must be replaced so that the raised outer rim collar is against the blade, supporting it on the outer edges. Cracked collar washers or arbor nuts should be replaced immediately with the correct part.

## Safety and Procedures

**Be very careful when operating this machine; it is probably the most dangerous machine in the workshop. Observance of safe working procedures is vital.**



- 1. Wear safety glasses, and/or a faceshield. A dust mask and/or hearing protection may also be necessary.**
- 2. Tie back long hair. Do not wear loose clothing or gloves while operating this machine.**
- 3. All wrenches and tools must be removed from the machine, and the motor switch in the "off" position before it is plugged in.**
- 4. Before setting up a cut, be sure that the floor area is clear of obstructions, and that both the saw table and runoff table are clear of debris.**
- 5. Check the material for splinters, or loose knots that may fall off during the cut. Do not cut old, painted, or nailed material.**
- 6. Before starting the machine, rehearse the cut in your mind. Where will you put your hands during each phase? Is there a push stick at hand? Do you need two push sticks? Is a featherboard needed?**
- 7. Turn on the dust extractor and open the gate before proceeding. If your machine is**

not connected to a dust extractor, wear a dust mask.

8. Always stand to one side of the saw kerf (the cut created by the saw blade), so that any material or loose saw teeth thrown back by the blade will pass by you. Never place your hands, head, or body in a line directly in front of the rotating blade.

9. Make the cut in such a way that you avoid reaching around or over the blade during the operation.

10. Cut through the material, and continue pushing the material until it is well past the rotating blade before turning off the motor.

11. Allow the blade to stop completely before removing the off-cut piece, and before taking measurements or making adjustments for the next cut.

12. Do not store materials to be cut behind the table saw. This will cause you to reach over the machine, or behind the blade. Keep all activity on the operational side of the machine, where you can be sure of your footing and balance.

13. Take time to correctly perform an operation. Generally speaking, the slower the blade goes through the material, the smoother, the more accurate, and the safer the cut will be.

14. Keep your attention from wandering. Hands must be well clear of the blade travel, and all fingers accounted for, before each cut is made. If you find your mind wandering, take a break immediately.

15. Extra care must be taken when working with small pieces. Pieces shorter than 20 cm. (8 inches) in length have a tendency to move after they are cut off, and are prone to catching in the blade and being ejected forcibly. Do not grab at them.

## Rip Cuts

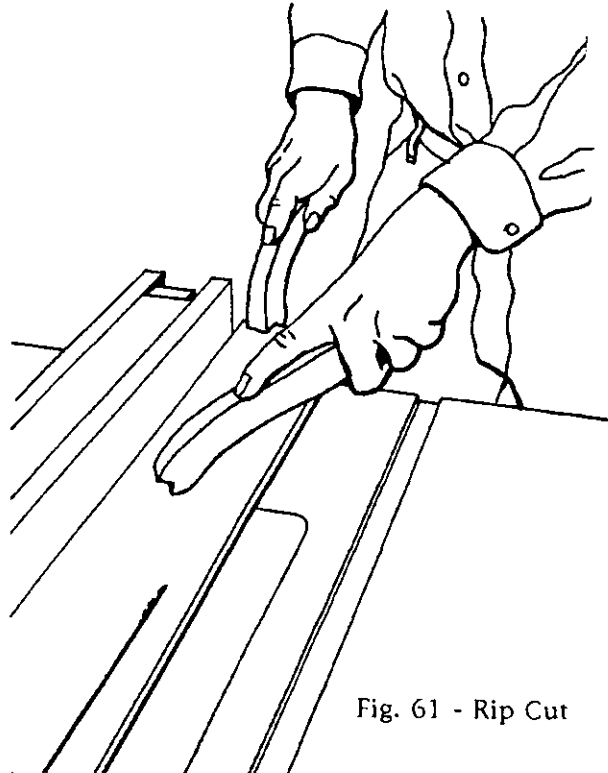


Fig. 61 - Rip Cut

Guards removed for clarity

Traditionally, a rip cut involves cutting a board lengthwise, with the direction of the grain of the wood. This definition has become obsolete with the development of sheet plywood and particleboard materials. For the sake of these new materials, a rip cut is performed when the resultant piece (the part that passes between the blade and the rip fence) is longer than it is wide. After letting the blade reach operating speed, the material is fed along the fence, and into the blade. (see Fig. 61)

**Exiting material, especially dimensioned lumber, may pinch the blade. Splitters can be used (see Fig.60). Wedges may also have to be inserted to keep the saw kerf open.**



**When ripping, stand to the left of the material, and push the material against the fence with your left hand, while pushing it through the blade with your right. Never stand in line with a rotating saw blade.**



Always be sure that the material is laying flat on the table as it passes over the blade. If the material is off the tabletop at the blade, it will chatter and snap back.

When completing a rip cut, use a push stick to push the material completely through the blade, as material left next to the blade may vibrate into it as the motor winds down.

## Cross Cuts

Traditionally, a crosscut was made when a board was cut widthwise, across the grain direction. With the advent of sheet materials, a crosscut can be said to be made when the resultant piece (the piece to be cut off) is wider than it is deep.

When crosscutting, position the larger part of the material against the guide, and hold only that part. When the cut is completed, the resultant shorter piece will float free of

the blade. Pushing against the piece to be cut off will pinch the material into the blade at the end of the cut, creating an opportunity for kickback.

When making multiple crosscuts of the same length, a stop block can be clamped to the rip fence or to the table top to be used as a gauge. This block must be placed so that the material will clear the block prior to entering the blade. This prevents the cut-off material from being caught between the rip fence and the rotating blade at the end of the cut, with the resultant opportunity for kickback.

**Never use the rip fence as a stop for crosscutting.**



Optional sliding tables are available, which offer much greater accuracy and safety protection than the ordinary crosscut fence. If you can afford it, this is a good accessory to buy.

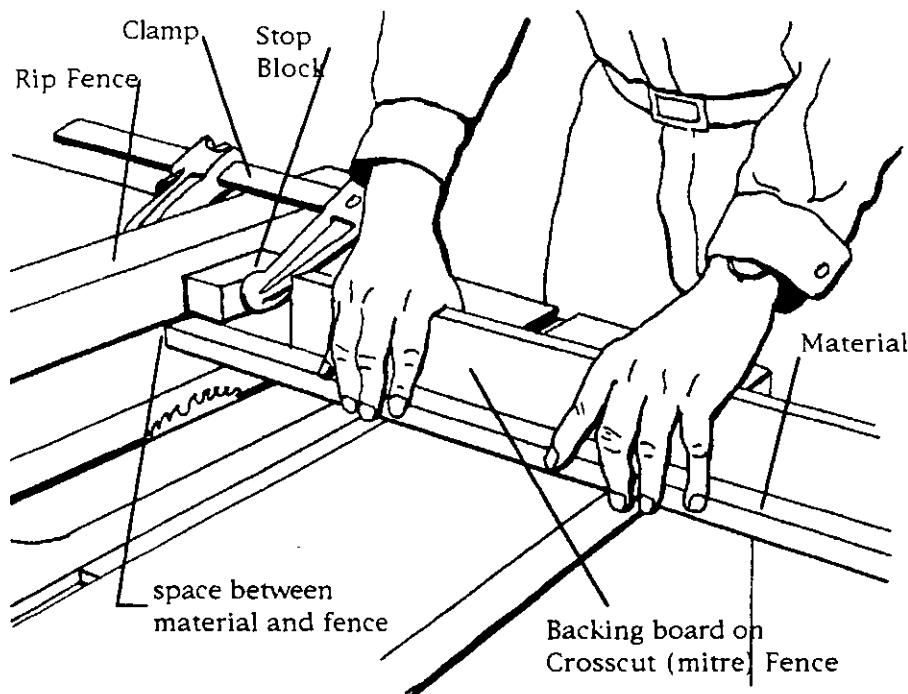


Fig. 62 - Crosscut

**Guard Removed for Clarity**

# Jointers

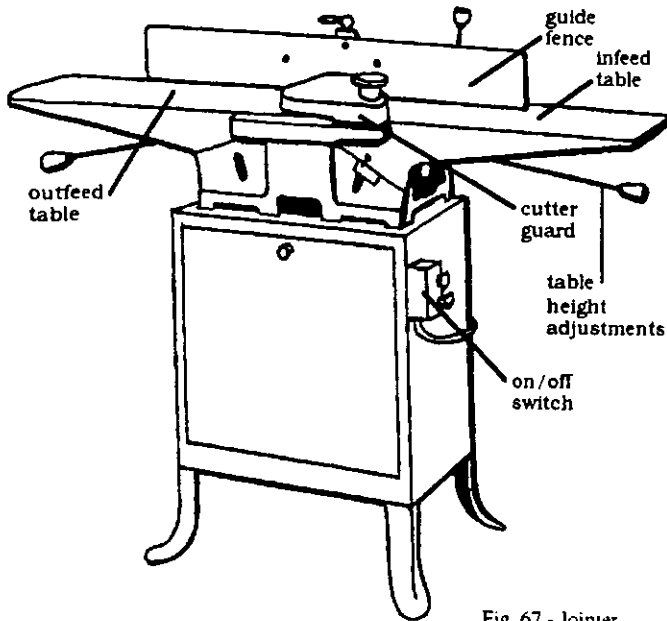


Fig. 67 - Jointer

**When purchasing a planer or a jointer,** research the options carefully to purchase a machine that is suitable for your needs. They are available in many size, quality, and price ranges.

Different materials require different tools, and large material requires large tools. Do not overload a machine by feeding material which is of the wrong type (no metal, plaster, or concrete), too large, or too heavy for the framework or cutters to handle.

**Guards:** Most machines are equipped with safety guards over belts, drives, and cutterheads. Install, maintain, and use these devices according to the manufacturer's instructions at all times.

**Accessories,** if purchased, must be compatible with the machine they are being mounted onto, and properly installed and maintained in proper working condition according to the manufacturer's recommendations.

**Setting up the machine:** Most machines are designed to be connected to a dust extraction system. They should be securely mounted to the floor, or a suitable pedestal. The on/off switch should be mounted within easy reach of the operator during the cutting operation.

\*Like all large tools, the floor around these machines should be clear of obstructions when working. The work area should be well-lit, and there should be enough clearance to allow the material to pass completely, unobstructed.

Because of their large, high speed, exposed cutterheads, jointers should be used with caution. Knives rotating at high speed become invisible, and are much more dangerous than they appear. Never project your fingers over the ends of the material.



## Jointer shoes and push sticks

Passing material over the planing head by hand is to be discouraged, as there is then only one layer of protection (the material) between your hands and the cutters.

\*Use a jointer shoe to push the material over the head, against the rotation of the cutterhead. Holding blocks can also be made that have 2 handles. That way, when both hands are situated on the handles, they are well away from the rotating knives as they pass over them. Longer push blocks allow weight to be distributed along the length of the material being planed.

\*Special push blocks can also be made for use during bevelling operations.

\*When using pushing devices, maintain an even pressure throughout the cut, downward onto the table, and inward against the fence.

\*Maintain a firm, controlled grip, to counter the rotating blade's tendency to throw the material back.

\*See page 101 for jointer shoe illustration.

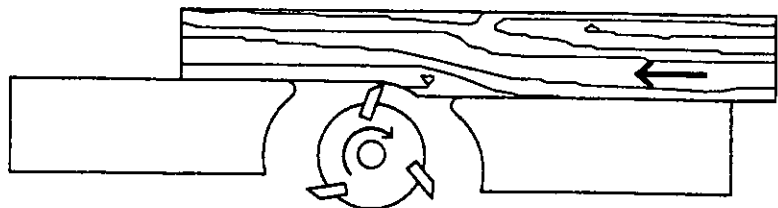


Fig. 67a - Jointer

showing material movement, cutter rotation & depth of cut

## Safety and Procedures



**1. Eyeglasses and hearing protection should be worn, along with a faceshield.**

**2. If the machine is not connected to a dust extraction system, wear a suitable dust mask.**

**3. Do not wear loose clothing or gloves. Baggy sleeves should be rolled up and tied.**

**4. A swivelling or sliding guard cover protects the cutterhead from damage, and the operator from injury. Before turning on the machine, open this cover only enough to allow the material to pass between it and the fence.**

5. Jointers have a mechanism which allows the guide fence to be tilted. Before using the machine, check that the angle between the tables and the fence is correct, and that the locking mechanisms are tight.

6. The depth of cut can also be adjusted, by varying the height of the infeed table. Depth of cut should be maintained at a maximum of about 1/16 inch or less.

7. Before passing material through these machines, inspect for loose knots which may become dislodged and shot out during the procedure. Loose knots and splinters should be removed or well-glued before proceeding.

8. When dressing lumber on these machines, material will sometimes be pulled out from the planed surface, resulting in chipping and depressions. This is usually caused by feeding the material against the direction of the grain. On most occasions, this can be remedied by reversing the material end for end before making the next pass over the cutter. On figured material in which the grain changes direction over the length of the board, this situation may be impossible to avoid. The problem can be minimized by keeping extremely sharp

cutting edges on the knives, and by slowing down the rate of feed.

9. Make several shallow passes to complete an operation. Do not attempt to plane large amounts of material in a single pass. Take several passes, each cutting about 1/16 inch.

10. Adjust the outfeed table to the height of the knives. This adjustment should never be changed.

11. Avoid passing thin or short material over the jointer. Short material (less than 12" in length), and thin material (less than 3/4" wide, or less than 5/8" thick) should not be surface planed with these machines. Material shorter than 12" in length, less than 3/4" wide, and 1/4" thick should not be edge jointed.

12. When passing long material through the jointer, use infeed and outfeed table extensions or rollers to take the weight of the material, or get someone to help you.

13. Never attempt to brush debris from the table surface while the machine is running.

14. Do not leave the machine running and unattended. When an operation has been completed, always shut the power off immediately.

15. When finished with the machine, and when it has stopped rotating, clear the debris from the table, sweep the floor area, and deposit the cuttings in a garbage container. Slide the cutter guard against the fence to fully protect fingers from the cutter.

## General Maintenance

For care of jointer knives, see page 139.

Follow the manufacturer's recommendations for periodical maintenance and lubrication. Use only proper replacement parts when doing repair work.