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Power Tools

KEYWORDS

biscuit joiner
cordless
electricity

extractor
portable
rechargeable

router
transformer

In the past few years, power tools of all kinds have become essential pieces of equipment for professionals and are common in most homes for use in DIY.

Power tools are run using electricity or are battery powered (**cordless**). All power tools can be dangerous and it is important to take care when using them. Only use tools with the permission of the teacher, as students should not use some tools. Electrically powered tools are more dangerous than battery-powered tools because they are connected to mains electricity.



Selection of power tools

Advantages of power tools

- Work is done quickly
- Repetitive work is carried out accurately
- Complex work is done easily
- They are portable

Disadvantages of power tools

- They are expensive
- They usually need a power source
- They are more dangerous due to the electricity
- They take time to set up and use accurately

The variety of new power tools available has increased. Cordless power tools have become popular. They are not powered by mains electricity, but by using a rechargeable battery.

Cordless tools

- Use a **rechargeable** battery
- Don't need a power supply nearby
- Reduced risk of electric shock
- The battery life is limited



Safety guidelines

Follow these guidelines for your added safety:

Cordless power tools

- Use power tools only with your teacher's permission
- Always use the tools as instructed
- Always wear the appropriate protective safety equipment
- Switch off before changing bits, belts or glass paper for sanders, or making adjustments to any power tool
- Always keep the cutters or moving part of the tool pointing away from yourself and others
- Keep the flex of the tool away from the cutter
- Keep guards in place
- Report any damage at once
- Don't let others distract you while you are working and don't disturb others while they are operating equipment
- Never leave a power tool running; wait for it to stop before walking away
- Disconnect the power supply when the tool is not in use
- If in doubt seek the assistance of your teacher



Transformer

Mains electricity is supplied at 220 volts. This voltage is dangerous; a transformer reduces the voltage going to the power tool from 220 volts to 110 volts.

- A 110-volt tool must be used with a transformer
- 110-volt tools have a special yellow plug
- Power tools should be 110-volt or cordless for safety
- Use: Reduces voltage and improves safety



Transformer and plug

Extractor

Extractors are part of the health and safety equipment in the workshop. They act like heavy duty

Hoovers that are in most workshops today. They remove dust and shavings from machines and power tools. The dust is sucked through the duct pipe to the machine where it is filtered and collected.



Extractor

- Use: Removes dust particles from machines

SANDERS

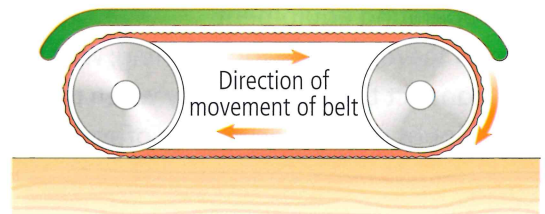
There are a few types of sander available. The sander smooths down the surface of wood in preparation for a finish.



Sanders

Belt sander

The belt sander is a large and robust sander. The abrasive belt is stretched over two rollers which drive forward giving a constant cutting action. The sander has a dust collection bag or dust collection point that connects to an extractor.



Direction of the belt on a belt sander

- Uses: Different grades of belt from coarse to fine
- Removes a lot of material quickly, but can cause damage
- Strips paint
- Sands large flat surfaces

Orbital sander

The orbital sander has a flat pad, which vibrates in tiny circular motions at speed. A number of types are available. Take care not to over-sand as this causes the rounding of edges.

- Uses: Smooths flat surfaces quickly
- Achieves a high-quality finish
- Sandpaper is easy to replace

DRILLS



Drills are used to bore holes in metal, plastic or wood. When drilling any materials with a power drill, the work piece must be held firmly. Drills are often used with screwdriver bits to drive screws easily and quickly.

There are many types of drill available, suitable for light to heavy work.

Features of drills

- Many special functions
- Hammer action for masonry
- Variable speeds
- Forward and reverse actions for driving screws
- Adjustable torque settings for driving screws, etc.
- Drills can be mounted in drill stands for more precise drilling
- Uses: To bore holes in a variety of materials



The parts of a drill



An electric powered drill and a cordless drill



Driving screws with a drill attachment

IRON

The ordinary clothes iron is used to apply iron-on veneers. These veneers have a thin layer of glue which melts when heat is applied. The veneers cover the edges of sheet material. The iron is also used for removing small bruises from the surface of wood.

- Uses: Applying iron-on veneers
- Removing bruises from wood surfaces

JIGSAW

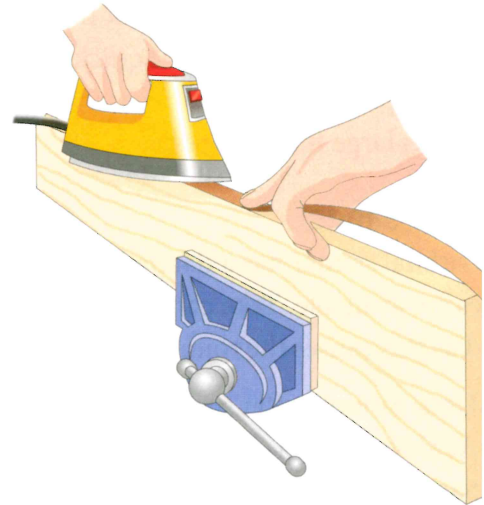
The jigsaw has a narrow blade that is driven in an up and down motion by the motor. The saw can be fitted with a fence for cutting straight lines, but it is usually used to cut curves.



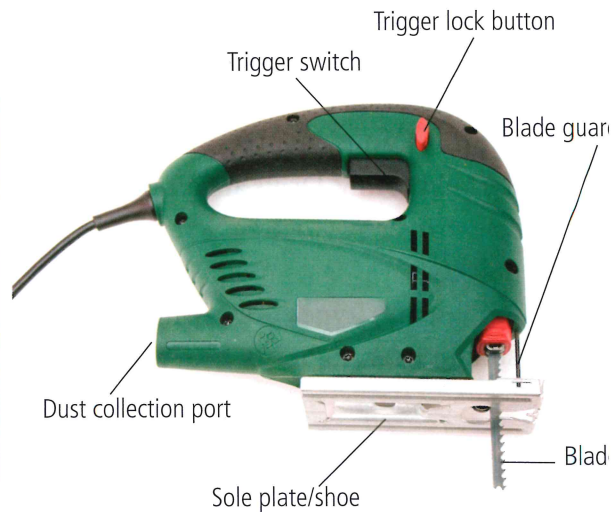
Jigsaw cutting a curve (safety cover removed for clarity)

Features of the jigsaw

- Adjustable base plate allows cutting at an angle
- The depth of cut is limited
- The narrow blade is easily replaced
- Different blades are used for different materials
- Uses: Light work and sheet material
- Cutting curves and large holes



Iron-on edging being applied



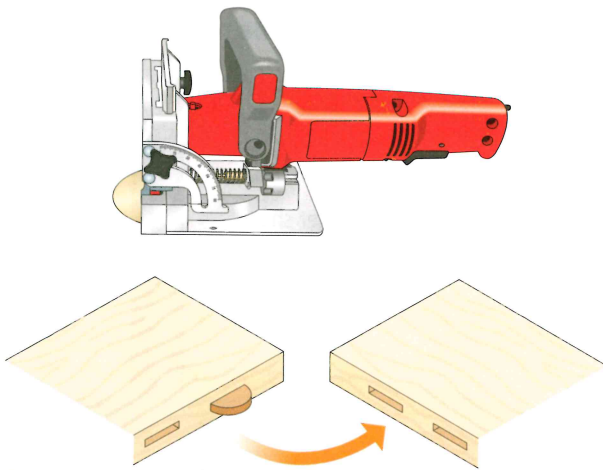
The parts of the jigsaw

Jigsaw safety

- Always wear eye protection
- The work piece should be held firmly
- Disconnect the jigsaw before making adjustments
- Always keep the power cable away from the blade

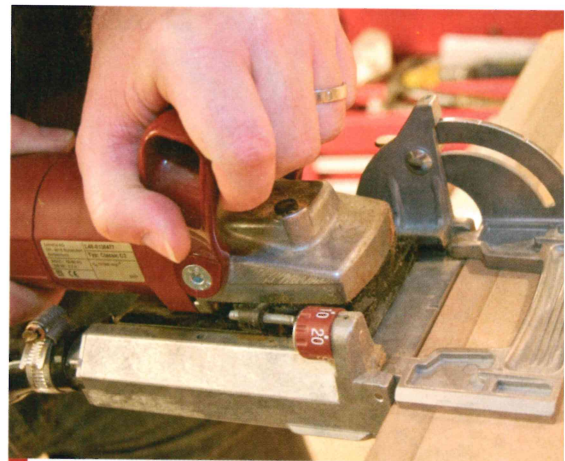
BISCUIT JOINER

The **biscuit joiner** is a modern power tool, which is used to make a special joint. It has a small circular saw, which cuts a slot in the two pieces of wood to be joined. A biscuit, which is usually made from pressed beech, is glued and put into the grooves and it acts like a loose tongue.



Biscuit joiner and a biscuit joint

- Uses: For joining edges of boards together
- Making a simple strong joint



Using the biscuit joiner

ROUTER

The **router** is a versatile **portable** power tool that is used for cutting mouldings in timber. There are a large number of attachments (bits), which will cut joints such as mortises, rebates, housings and dovetails. The router is a particularly dangerous tool and should only be used by the teacher.

Features of the router

- Replaced moulding planes
- Many different cutters are available
- Can be mounted on a special router table
- Uses: Making decorative mouldings on the edges of timber
- Rebating and grooving



Router in use

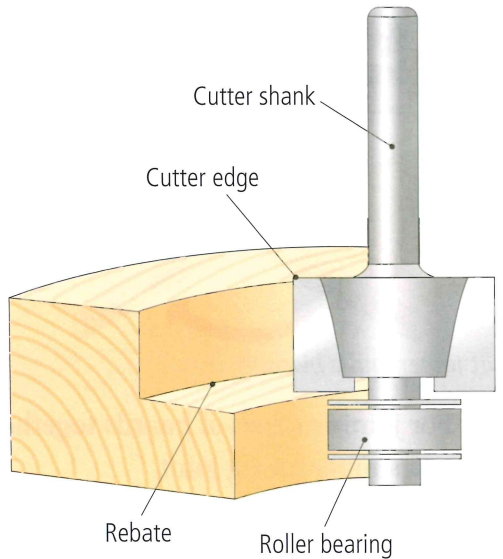
The cutter sticks out below the base plate, which can be raised or lowered to allow the depth of cut to be adjusted. A plunge mechanism allows the cutter to be raised and lowered quickly.

Router safety

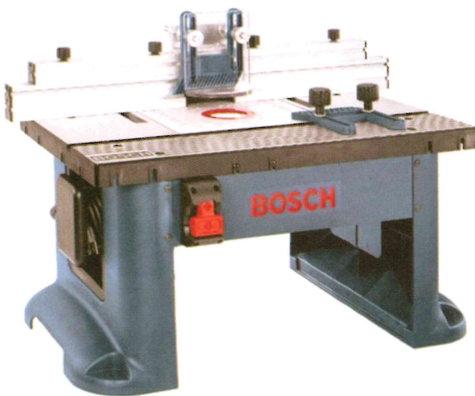
- Always wear eye protection
- Ensure the wood is held securely
- Always keep the cutter facing away from yourself and others
- Always keep the power cable away from the cutter
- Always disconnect from power supply when not in use
- Disconnect before making adjustments
- Allow the cutter to stop before placing the router on the bench



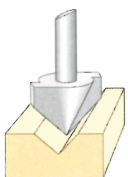
Router



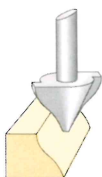
Router cutter



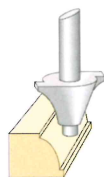
Router table



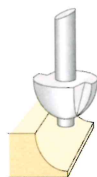
V-groove bit



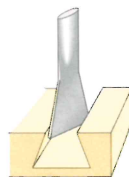
Ogee bit



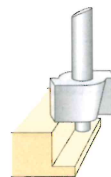
Beading bit



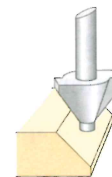
Cove bit



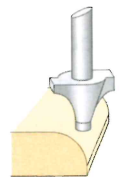
Dovetail bit



Rebate bit



Chamfer bit



Ovolo bit

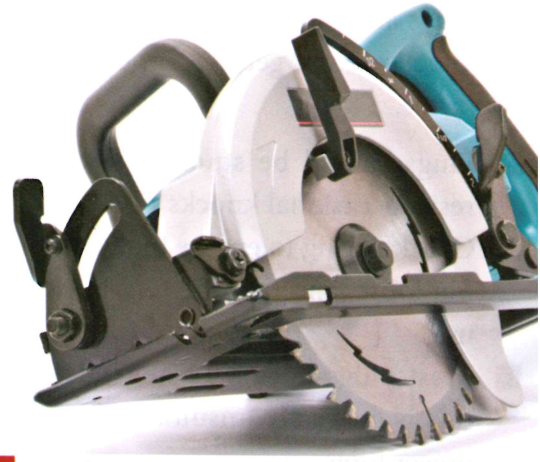
Some router cutters and the mouldings they produce

CIRCULAR SAW

The portable circular saw is not widely used in schools. It is used on sites for cutting sheet material and other work. The circular saw has a fence that keeps the blade running parallel to an edge.

Circular saw safety

- It is a very dangerous tool
- Keep hands away from the blade
- Always disconnect when not in use
- It has a spring-loaded guard that covers the blade when it is not cutting
- Uses: Cutting sheet material and large pieces
- Adjustable base plate allows the depth and angle of cut to vary



Circular saw

PLANER

The planer has cutters that remove material quickly and easily. It is used by carpenters on site.

- Uses: Smooths rough timber quickly
- Removes excess material
- Adjustable depth of cut



Planer

POWER SUPPLY

Electricity drives power tools or charges the battery. Plugs on the power cables must be wired correctly to make sure they are safe to use.

Each electrical cable usually has three wires:

Colour	Wire
Brown	Live
Blue	Neutral
Green and yellow	Earth

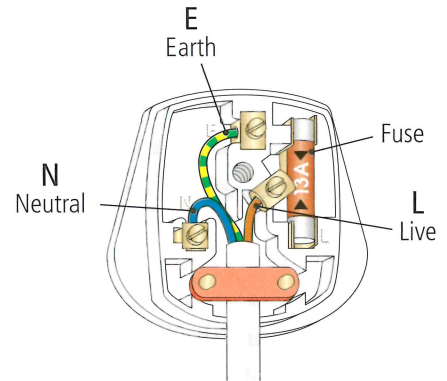
The earth wire is important for safety: in the event of an accident, the earth wire directs current safely to the ground through the electrical supply, preventing serious injury.



Plugs

All plugs are fitted with a fuse to prevent too much current getting through to the appliance.

- Plugs should be sturdy in order to resist occasional knocks
- Check wiring to ensure that wires are not loose, and that the tool is safe to use
- Most plugs have a 13-amp fuse but this is generally unsuitable for most power tools



Wiring for an electrical plug

You should fit the correct fuse for the particular tool before it is used. The correct amps rating for the tool is usually given in its instruction manual, but is easily calculated. The calculation is based on Ohm's law:

Ohm's law

$$V = I \times R$$

$$\text{Watts} = \text{Volts} \times \text{Amps}$$

Example

Calculate the correct fuse amps rating for a 600-watt power drill that will be connected to a 220-volt mains supply.

$$V = I \times R$$

$$I = \frac{W}{V}$$

$$I = \frac{600}{220}$$

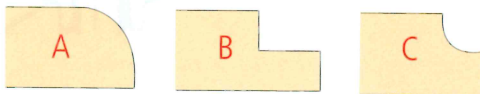
$$I = 2.73 \text{ amps}$$

Therefore, a 3-amp fuse will be sufficient for the drill.

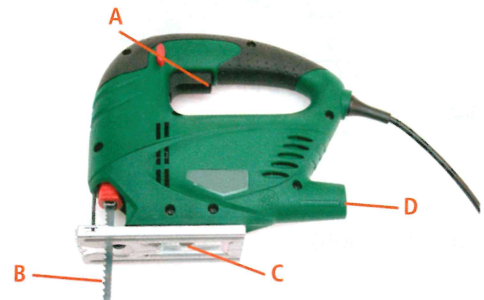
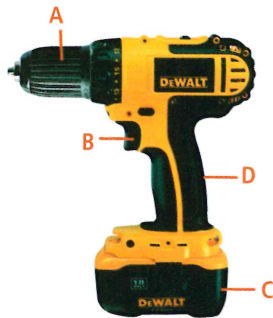


Exercises

- 1 Explain three safety rules associated with power tools and give examples of each.
- 2 Describe three advantages of modern power tools.
- 3 Describe two disadvantages that cordless power tools have.
- 4 Name the mouldings given in the diagram below.



- 5 Name the parts of the power tools shown in the diagrams below.



- 6 What is the function of the fuse in an electric plug?
- 7 Many electrical power tools use a 110-volt power supply rather than a 220-volt. Why is this voltage preferred?
- 8 Which power tool would be used with the bit below?

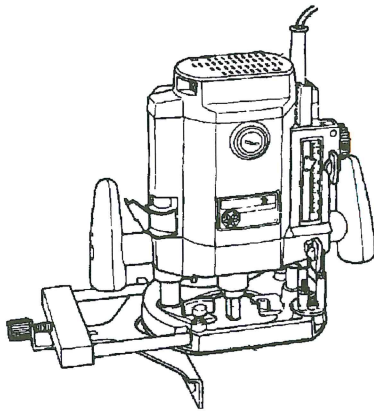
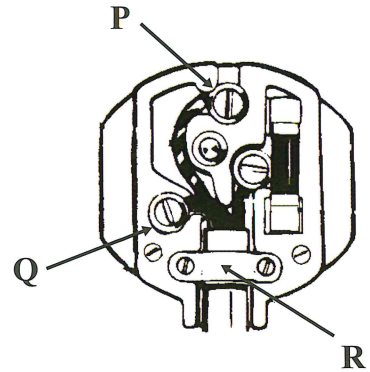




Exam Questions

- 1 Shown in the diagram is a plug-top.
 - (a) Name the plug terminals labelled P and Q.
 - (b) What is the function of the component labelled R?
(JC, HL, 2006)

- 2
 - (a) Name the power tool shown in the diagram below.
 - (b) For what purpose is this tool used?



(JC, HL, 2005)

Web Links

www.dewalt.ie

www.festool.ie/

www.trend-uk.com/en/IE/product/index.php

www.esc.org.uk/about-us/ Electrical Safety Council

www.ultimatehandyman.co.uk/1cordlessdrill.htm

www.ehow.com/topic_1850_wood-router-basics.html