

Vertical spindle moulding machines

Safe working practices

HSE information sheet

Woodworking Information Sheet No 18 (Revision 2)

Introduction

This information sheet gives practical guidance on safe working practices when using a vertical spindle moulding machine for straight, stopped and curved work. This information is aimed at employers and others who have control of how these machines are used. Machine operators will also find this information of use.

Accident history

Vertical spindle moulding machines have a history of serious accidents that frequently involved the loss of several fingers. Although the severity of injuries has reduced since the requirement to use chip limited tooling was introduced, they remain a common cause of accidents in the woodworking industry. Accidents are caused:

- by cutters snatching;
- from workpiece kick-back;
- during straight work by not using a false fence and pressure pads (Shaw guards) to adequately enclose the cutters;
- during stopped and curved work by not using backstops, jigs or workpiece holders.

Training issues

It is important that the machines are fitted with the necessary safeguards and operators are trained to use them and carry out the work safely.¹ Training is particularly important for those involved in maintenance, setting and cleaning to ensure that these activities are undertaken in a safe manner.

No one should be allowed to work on a vertical spindle moulding machine unless they have demonstrated competence. It is advisable that competent operators are authorised in writing by a responsible person (director, senior manager etc). This will then form part of the training records. Anyone who supervises the use of any work equipment should

have access to information and where appropriate, written instructions.¹

Legal requirements

Legal requirements covering the use of these machines are contained in *Safe use of woodworking machinery Provision and Use of Work Equipment Regulations 1998 (as applied to woodworking machinery). Approved Code of Practice and guidance.*¹ This document gives practical advice on the provision of information and training as well as aspects of guarding and maintenance.

When buying a new vertical spindle moulder, it should be supplied with a declaration of conformity and have a CE Mark. Designers and manufacturers must conform to the essential safety requirements of the Machinery Directive and associated European Free Trade Association (EFTA) regulations. One way of achieving this is by designing and constructing the machine to meet BS EN 848-1.² Cutters should meet BS EN 847 Part 1.³

Safeguarding of vertical spindle moulders

To reduce the risk of contact with the cutter block during rundown, machines must be fitted with a **braking** device that brings the block to rest within ten seconds. The deadline for fitting a braking device was 5 December 2005.^{1, 4}

The type of tooling in use and the height at which it is set will determine the size of the hole in the table (ie the gap between spindle and table). Use **table rings** to close the gap to a minimum, see Figure 1. This reduces the risk of the workpiece dipping and catching the edge as it passes over the gap.

For most work, the cutters on vertical spindle moulding machines can be guarded to a high standard. Where this is not possible, use jigs or work holders and stops.

No single type of guard or safety device can deal adequately with the variety of work which can be done on these machines. You must assess each job carefully and provide the best protection to suit the particular circumstances.

Backcutting or climbcutting (feeding the workpiece in the same direction as spindle rotation) is a highly dangerous operation. This is because the machinist cannot exert any force to resist the sudden forward movement of the workpiece if the cutter snatches. It should be discouraged even if a jig or work holder is used. Wherever possible, feed the workpiece to the tool against the direction of spindle rotation.

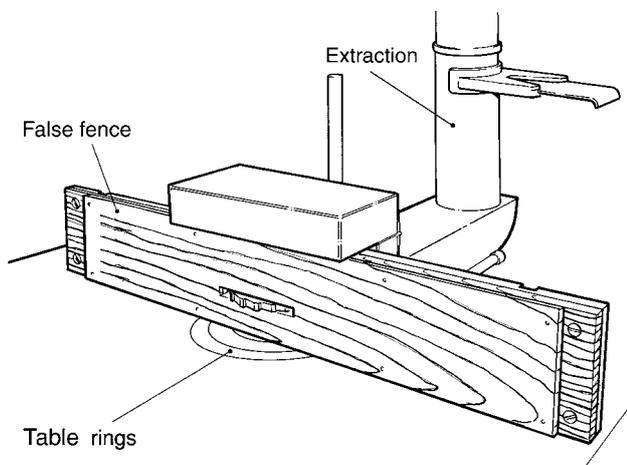


Figure 1 The use of a false fence greatly reduces the exposure of dangerous parts

Tooling

Always use limited cutter projection tooling on hand-fed machines such as vertical spindle moulders. This has been a legal requirement since 5 December 2003.³ This type of tooling reduces the risk of kick-back and the severity of injury should the operator's hand contact the tool, see Figure 2. Such tooling should be designed to BS EN 847-1³ and more detailed guidance can be found in Woodworking Information Sheet WIS37.⁵

Only tools marked 'MAN' (meaning hand-feed) should be used on vertical spindle moulders, even if a demountable power feed unit is to be used.

On new (CE-marked) machines, the spindle should not be supplied with a slot for inserting cutter blades (known as a French or slotted spindle). On old (ie pre-CE marked) machines, the use of such spindles is not legal as they should have been phased out by 5 December 2003.³

Straight work

This includes work where the moulding extends over the full length of the workpiece and stopped work where the cut extends over part of the length of the workpiece. The cutters, cutter block and spindle behind the fence should be fully enclosed by a suitably designed guard which allows for the connection of dust exhaust outlets.

Before machining starts, the gap between the outfeed and infeed fences must be closed by the attachment of a false fence allowing only that part of the cutter which is cutting to be exposed, see Figure 1. A false fence will also provide good workpiece support and prevent the workpiece from 'dipping in' between fences. However, it may be necessary to fit a different false fence for every job.

Before the cutter is broken through the false fence, the area where the cutter will break through must be protected by top and side pressure pads big enough to prevent access to the cutters. Breaking in is then achieved by either pushing/adjusting the fence assembly back onto the cutter, or by raising the cutter up into the false fence (the method used will depend on the type of tooling in use).

To provide workpiece support for long lengths of timber, use extension tables or roller trestles, see Figure 3.

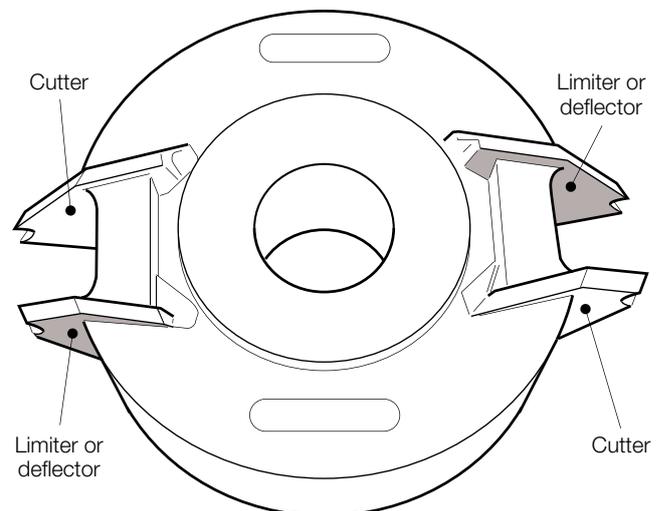


Figure 2 Example of limited cutter projection tooling

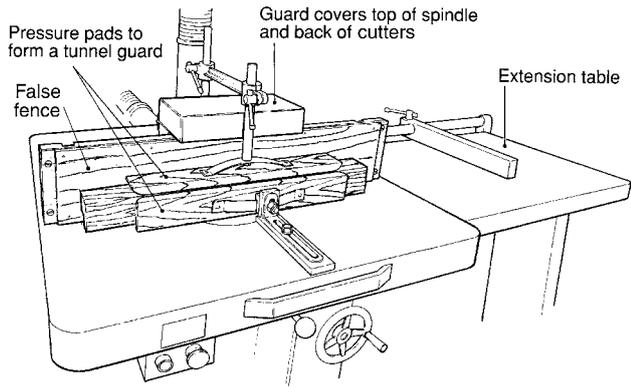


Figure 3 Vertical spindle moulding machine fitted with two Shaw guards forming a tunnel. The dimensions of the pressure pads prevent access by the operator to the cutters when the workpiece is removed

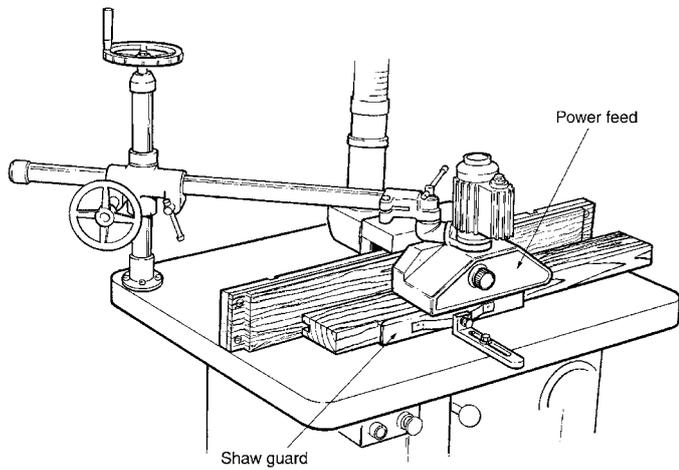


Figure 4 Use of power feed and side pressure pad for straight work

Full length straight cuts

Where possible a demountable power feed unit should be used for straight cuts. This should be easily adjustable to suit different sizes of workpiece and should not, in itself, create a trapping hazard. Used in conjunction with a side pressure pad, a power feed unit often represents the best method of guarding, see Figure 4.

Where a demountable power feed unit cannot be used, the cutting area should be enclosed by vertical and horizontal spring-loaded pressure pads. These pads form a tunnel, see Figure 3, through which the workpiece can be safely fed with a push-stick (see Figure 5).



Figure 5 Push-stick

The top and side pressure pads should be made of hardwood and be the same width and depth as the workpiece. Those supplied with some newer machines may be plastic or light alloy. They must also be long enough to prevent operators' hands from reaching the cutters. Pads of various lengths and widths will be necessary to accommodate a range of workpiece sizes.

The machining of thin panels may only require use of a top pressure pad (see Figure 6).

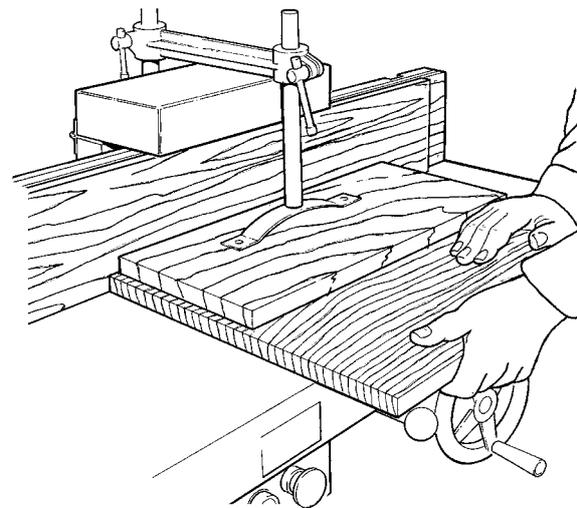


Figure 6 Straight work with only the top pressure pad in use

When a wide or heavy cut is made, especially on thin material, the fence may not give adequate support to the moulded section of wood. Adequate support can be provided by fixing a packing piece, which is a mirror image of the moulding, to the out-feed side of the fence.

Straight work with stopped cut

The cutters may have to break into the solid face, instead of starting the cut at the beginning of the workpiece and/or have to break out before reaching the end. Because a guard cannot be used which is fully effective in preventing contact with the cutters (except on thin workpieces) jigs should be used. Access to the cutter from the top can, however, be prevented by using a top pressure pad.

Stops allow for greater control of the jig, allow greater stability of the workpiece and prevent kick-back when 'dropping on'. Typically, the jig containing the workpiece is placed against a backstop, fed slowly onto the cutters to break in, then fed forward against the false fence to the front stop and the jig taken off, see Figure 7.

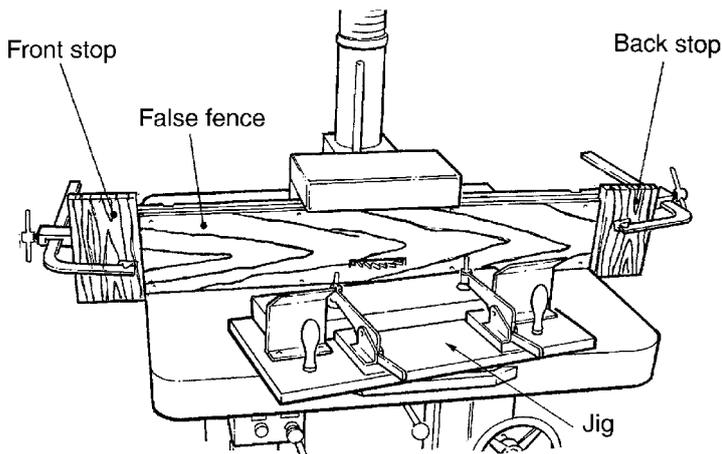


Figure 7 Jig (note toggle clamps and handles) and back/front stops for producing stopped work

Newer alloy jigs are also available, see Figure 8

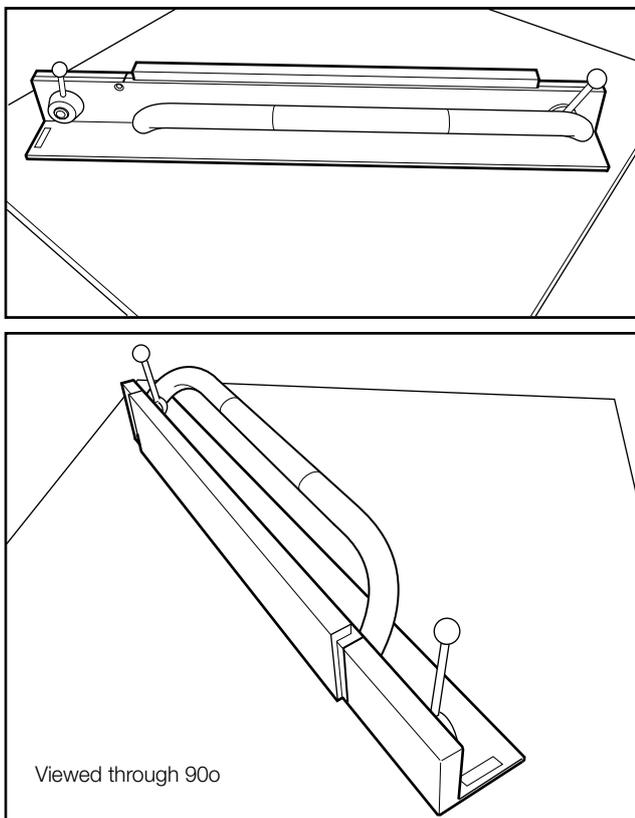


Figure 8 Alloy jig

In cases where it is not practicable to hold the workpiece in a jig or holder (eg large window frames, doors etc), the operator's hands need to be safely positioned well away from the cutters. In these circumstances, stops need to be robust enough to provide a firm support for the workpiece.

Shaped or curved work

When setting up for shaped or curved work, the straight fence is removed and a guiding device (ie a ring fence or ring guide), together with an adjustable guard (traditionally a 'bonnet' guard), is fitted to enclose as much of the spindle and cutter block as possible, see Figure 9.

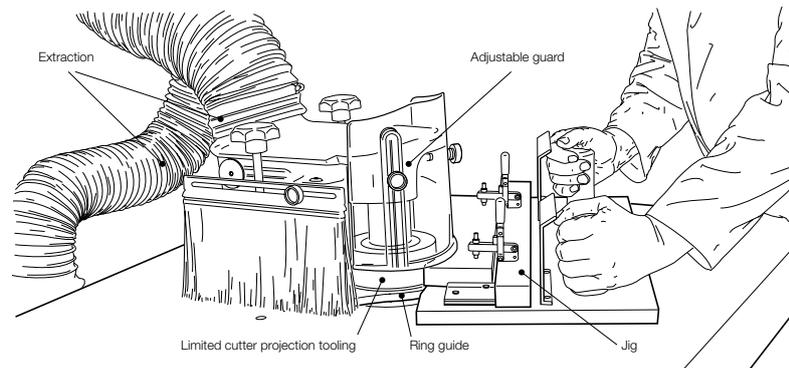


Figure 9 Example of guard and guiding device for curved work

Use jigs incorporating a template for all curved work. The template determines the outline of the finished shape and is held against a ring guide as the workpiece is moved past the cutter. The ring guide determines the line of cut and where possible it should be set above the cutters. However, for some operations it may have to be below the cutters. The ring guide is used as a lead-in and guide to the template or workpiece.

Large, small or complex workpieces

In general, it is possible to use a jig unless the workpiece is so large that a jig would make the job unmanageable or the workpiece is so small or complicated that it cannot be held securely in a jig.

Small and complex shapes may require you to use a spike or push-stick, see Figure 5. Alternatively, a lead-in device fixed to the machine table may facilitate safe feeding of the workpiece.

Design of jigs and work holders

The use of jigs and work holders is necessary for all stopped and curved work, unless the nature of the operation makes it impracticable. Even if workpieces are irregularly shaped and there is a limited production run, jigs should always be used.

The design of jigs and work holders is determined by the work to be done and they are typically made

of hardwood and plywood, although newer designs using alloys are also available, see Figure 8. They should allow quick and accurate location of the workpiece which should be held firmly in position. Jigs should have secure handles and wide bases, so that machinists have a firm grasp at a safe distance from the cutters. The workpiece should be clamped or secured within the jig. The most convenient method of holding the workpiece in the jig is to use manually operated quick-acting clamps which work with either a toggle or a cam action. Hand shields in front of operators' hands provide additional protection, see Figures 7 and 9.

With curved work, a combined template and jig helps ensure that work is held firmly and correctly to produce the required shape and finish. Box jigs are particularly useful as they allow better control of the workpiece and reduce or prevent breakout. The template should also be extended horizontally, beyond the nose and tail of the work to provide lead-in and lead-out control, for safe working, see Figure 10.

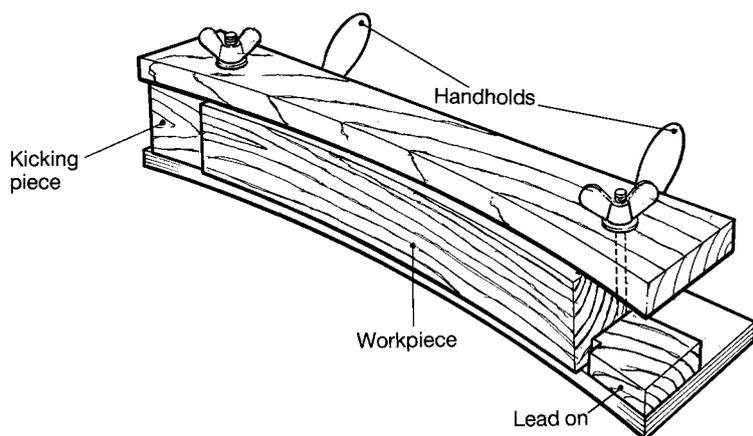


Figure 10 Box jig

References

- 1 *Safe use of woodworking machinery. Provision and Use of Work Equipment Regulations 1998 (as applied to woodworking machinery). Approved Code of Practice and guidance L114 (Second edition)* HSE Books 2014
www.hse.gov.uk/pubns/books/l114.htm
- 2 BS EN 848-1:2007+A2:2012 *Safety of woodworking machines. One side moulding machines with rotating tool. Single spindle vertical moulding machines* British Standards Institution
- 3 BS EN 847-1:2013 *Tools for woodworking. Safety requirements. Milling tools, circular saw blades* British Standards Institution

4 *Retrofitting woodworking machine brakes* Woodworking Information Sheet WIS38(rev1) HSE 2013 <http://www.hse.gov.uk/woodworking/wis.htm>

5 *Tooling for use with hand-fed woodworking machines* Woodworking Information Sheet WIS37(rev1) HSE 2014
<http://www.hse.gov.uk/woodworking/wis.htm>

Further reading

Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Fourth edition) HSE Books 2014 www.hse.gov.uk/pubns/books/l22.htm

More information on vertical spindle moulders, including videos illustrating correct working practices, can be found on HSE's woodworking website: www.hse.gov.uk/woodworking/spindlemoulder.htm

Further information for suppliers, installers and users of new and second-hand machinery can be found on HSE's Work equipment and machinery webpages: <http://www.hse.gov.uk/work-equipment-machinery/index.htm>

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

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British Standards can be obtained in PDF or hard copy formats from BSI: <http://shop.bsigroup.com> or by contacting BSI Customer Services for hard copies only Tel: 0845 086 9001 email: cservices@bsigroup.com.

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