Router course tutor Chris Yates gets to grips with jigs, templates and guides to simplify production

Jig design for routing

When looking at an article or book on routing, jigs usually get an early mention. The thought of using a jig, let alone designing and making one from first principles, can be a bit offputting to woodworkers new to routing – and even to some more experienced users. This article explores the reasons why jigs may be the right way to go and demystifies some of the whys and wherefores in designing jigs. The second part of this article will look at the construction of some practical jigs and cover the bits and pieces that jig makers are likely to find helpful.

While this article is focussed specifically on jigs for routing, the principles it describes are relevant more widely and can also be used with other machines.

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Jig misconceptions

Firstly, let us try to dispel two common misconceptions about jigs: that they are expensive, and that you need to buy several of the plethora of shiny devices available from suppliers. Although I do have a few bought-in jigs, the vast majority in my workshop are shop-made – and in some cases made from offcuts. Any clamps or other bought-in fittings are usually removed on completion of a project and kept for further use later meaning the outlay on a new jig is likely to be very low.

So, why do we need jigs? There are several reasons, of which the most common are:

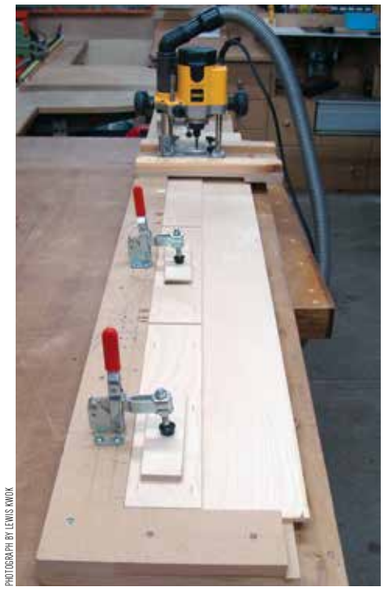
- Safety – they are needed to protect you and/or the workpiece from tooling
- Accuracy – they help you to cut exactly where you want
- Repeatability - if you have a number of identical components to make, a jig can ensure they are exactly the same and not just similar
- Efficiency – even for one component, time spent making a jig can save you a great deal more in the setup and cutting of test pieces to complete it by other means
- Enabling – there may simply be no other sensible or safe way to achieve what you need, especially when it comes to producing small workpieces

In practice, there will often be two or more of the above reasons for using a jig in any particular situation but in summary the design and use of jigs will probably reduce the risk of something going wrong.

What are jigs?

At their most basic, jigs are a guide system to control movement of a router or workpiece relative to the other, safely. They may be very simple, such as an end stop comprising a block of wood clamped to a router table fence to ensure that cuts are stopped at exactly the right place, or they may control more complex movement of the router like the one adjacent. It is likely that shop-made jigs will be made predominantly from wood, as it is usually available, easy to work with existing tools and cheap. In contrast, bought-in jigs are likely to be made from more durable materials, such as metal, Tufnol or other man-made materials. This is reflected in their prices, as well as their anticipated durability.

Most router users will probably be familiar with kitchen worktops jigs, if only from catalogues, but there is a host of jigs available to help you cut dovetails, circles, ellipses, or even relatively straightforward rectangular or circular openings, such as letterboxes or hinge recesses. In many cases, whether you buy or make a jig will be determined by how many times you expect to use it but in some cases, it is just not practical to make your own.

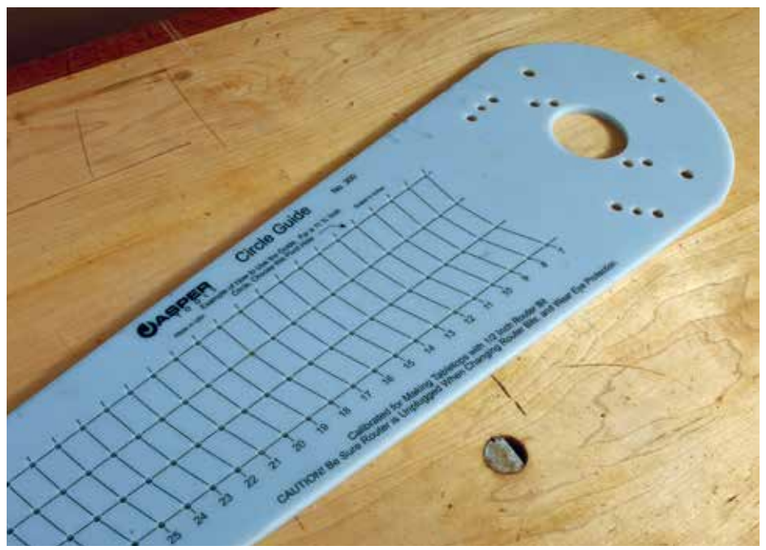


PHOTOGRAPH BY LEWIS KNOX

A complex jig, used for a number of things. The router is firmly guided on both sides of its base resulting in accurate width rebates

A typical kitchen worktop jig made from hard warring solid laminate has all the profiles necessary for jointing the ends of worktops

This cross-cutting jig is made from Tufnol and is guided by the fence on a router table



This versatile circle cutting jig is pre-drilled with 6mm increments

A dovetail jig can revolutionise your batch production

With several good dovetail jigs on the market at a range of prices, it is quite likely that buying one of them makes sense compared to making a less adaptable jig, which would probably take an appreciable amount of time to make. In contrast, why anyone would buy a circle cutting jig baffles me, when you can make any number of them for different projects in very little time in your own workshop. There it is again – choice!

Manufactured jigs come in basic forms but will often require the use use of specific cutters and guidebushes

There are always a couple of questions to ask yourself before deciding to design your own jig. Firstly, how general purpose will you make it? In other words, do you anticipate using it for similar projects again and again? If so, you may put more effort into making it more adaptable to, say, a range of sizes of workpiece, than if you are making it for a specific cut on a single size of workpiece. For example, this can have an impact on the way you hold the workpiece in the jig as well as the overall capacity of the jig. If you anticipate using it just once, you might be prepared to screw the workpiece to the jig, or use double-sided adhesive tape to mount it, whereas if you expect to use it regularly, you may well choose to use toggle clamps or shop-made cam clamps. In my workshop I have a few jigs that I use regularly, but the others I tend to dispose of on completion of a project and recycle usable hardware.

One of the jigs I use most often is a general purpose jig that lets me cut accurate stopped rebates on long thin lengths of laminated ply and another enables me to cut tidy handholds. In the first case, the size of workpiece varies between projects, so the jig currently in use is large enough to accommodate the largest so far required. Simple screw down stop blocks locate the workpiece in the right position and toggle clamps hold the workpiece securely. This lets me use the same jig to make similar but differently located and sized stopped rebates accurately on many different sized workpieces.

In contrast, the handhold jig could hardly be simpler. It is intended to be used with a router with a guidebush, so the size of handhold can be easily adjusted just by changing the sizes of router cutter and guide bush. Simple screw-on battens can enable the jig to be repositioned on different workpieces quickly and repeatedly.

PHOTOGRAPH BY LEWIS KNOX

A much-used, but very simple, hand-hold cutting jig. While it is very simple, it can be used to make hand-holds of varying sizes by changing the cutter or guidebush

Jigs can be really simple, such as these blocks clamped to a router table fence to achieve a stopped groove

Jig to job or job to jig?

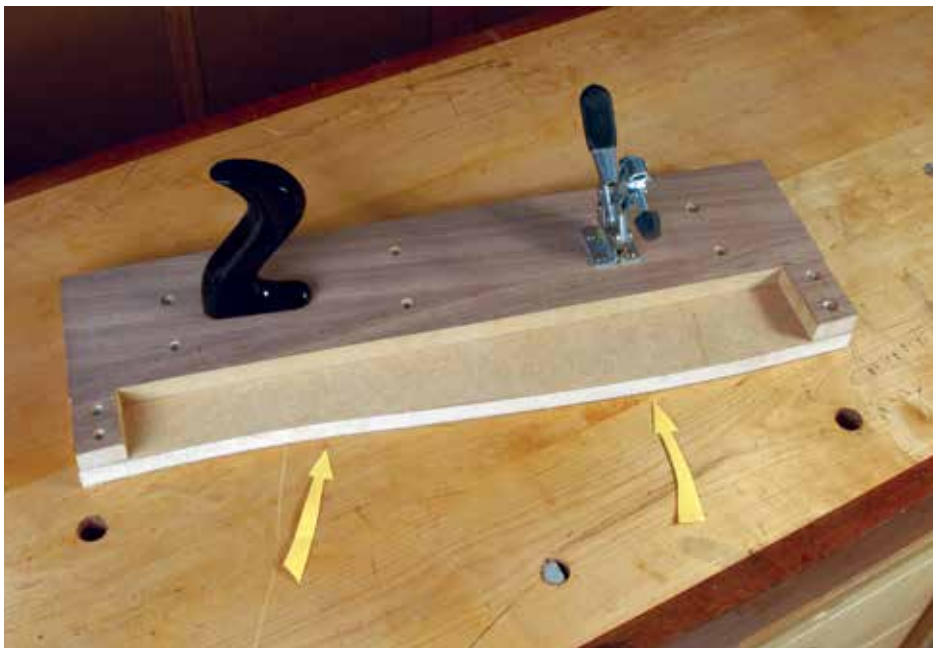
Another question to consider is where will the jig be used? Will you fit the workpiece to the jig, or the other way around? Or will you use the jig in combination with the router table? The answers will have a determining effect on the design of the jig, not least its size. For example, a circle cutting jig I used recently had a radius of 180mm, so obviously it had to go to the workpiece and not the other way around. Conversely, a jig to hold a small workpiece safely for machining on the router table will probably be no larger than around 900 × 400mm or it will be too difficult to handle safely – the balance will be all wrong. As well as size, a determining factor is likely to be the order of machining tasks, not least so that there is always a reference edge to work from. So, as always, it pays to think through the tasks to be undertaken before making a start on jig design and construction. For example, can a workholding jig be used for more than one machining operation, perhaps using an edge of the jig itself as a substitute reference edge on subsequent tasks.

Principles

To help clarify the mind before designing our jig, I have tried to determine some jig design principles. As an example, the following notes relate to a common configuration of a benchtop jig in which the workpiece is held and with the router passing over the top of the jig. However, similar principles apply to workholding jigs used on a router table or other configurations.

Reference edge

The most important consideration is to define a reference edge and make sure that the workpiece can be mounted into the jig using it. This is especially important if you are going to use the jig to machine multiple identical workpieces. If possible, identify a straight edge and measure everything from it. If that is not practicable, you may need to use a mating shaped spacer piece to position the workpiece accurately and consistently.



A sled-type jig is a carrier for the workpiece to pass by the cutter. The required profile is created as part of the jig

The workpiece extends beyond the edge of the jig

Make your jig longer at both ends of the workpiece for clean entry and exit points

Starting the cut

When planning a jig, think about how the router is to be introduced to the workpiece. As ever, you will want to avoid taking large cuts in a single pass, so will the workpiece need to be cut roughly to shape first. If so, this might give more opportunity to plunge the router away from the edge and enable it to be moved to the edge while spinning, thereby reducing the risk of an uneven entry mark and probably a burn mark as well.

Stopping the cut

For the same reasons as above, ensure that there is room to remove the router cutter from the edge being cut before releasing the plunge and removing the router.

Supporting the router

How will the router be supported throughout the cut? It can happen with some jigs that the router needs to rest on a surface that will be progressively removed, resulting in at least one side of the router base being unsupported. Fairly obviously this can result in the router tipping and digging the cutter into the workpiece. Therefore, the jig must be designed to provide support for the router throughout the cut, possibly by using a suitably sized auxiliary base fixed to the router bottom that can span any aperture in the jig. This will need to be stiff enough to maintain the router at the correct height, otherwise any cut that does not penetrate the workpiece will have an uneven depth.

Holding the workpiece

The jig must be able to hold all of the workpiece in exactly the right position repeatedly, even after some of the cuts have been made. This is more likely to become an issue if routing delicate workpieces, where the router cutter will tend to draw thin or small parts of the workpiece towards the cutter, thereby removing more material than intended. In extreme cases, it may be necessary to fit flush-mounted bolts screwing through the jig top into captive nuts fitted on the underside of the jig base to tightly sandwich the workpiece across all the at-risk areas.

It is useful to think about how the workpieces will be held early in the jig design, as the footprint of the router – and any auxiliary base or fences – may make it difficult to mount clamps or other hold-downs without them getting in the way. As in all routing tasks, a little ingenuity may be required!

Protecting the workpiece

Always try to arrange the jig so that if the router does move off a guide edge, guidebush or bearing it won't damage the workpiece, but will just cut into waste wood. F&C

NEXT MONTH

In the next part of this series, I will look at the subject of jigs more closely: why they may be the right way to go, demystify some of the whys and wherefores in designing jigs and look as well as looking at the construction of some practical jigs.