

Issue 312
Good

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- 7-PAGE PALM ROUTER GROUP TEST •
- BEGINNERS' GUIDE TO ROUTING •
- POWER TOOLS STORAGE BOX •
- HANDY SHOE RACK •
- PENTAGON TABLE •
- BLANKET CHEST •



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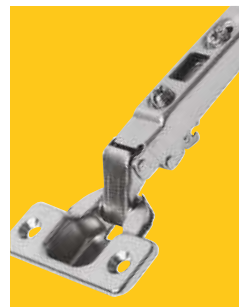
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Welcome

Hello and welcome to our Router Special, and who better to sponsor this issue than Trend, a company that has been instrumental in establishing routing in the UK since the 1950s. 'Think router, think Trend' is a phrase that's often heard, and it's not surprising given the in-roads that have been made over the last 60 or so years. Never choosing to rest on their laurels, this company are constantly developing new technologies to ensure their routing innovations are always cutting-edge - find out more about their extensive range of cutters, jigs and templates on page 38.

Routing galore

While routing is undoubtedly a broad subject, we've tried to appeal to everyone by providing a mixture of router-themed content, which is suitable for the beginner through to the more experienced user. We've got a wide range of routing projects for you to make, including a power tool storage box, blanket box and a beginners' shoe rack, as well as a great technique article, which debunks common myths and tells you all you need to know about buying and using this versatile piece of kit. As Peter Bishop shows, there really is something to suit every budget. And if you're not sure about which router is right for you, then Andy King's extensive group test should hopefully fill in all the gaps.

Alcolin glue bundle giveaway

I am also very pleased to announce that our Alcolin glue bundle giveaway is finally here! Sponsored by Johnson Tools, the sole European distributor of this ground-breaking South African adhesive brand, each month we are offering one



'Some of my favourite things from this issue'

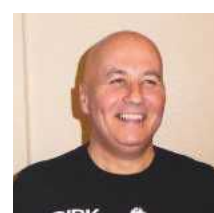
lucky reader the chance to win a set of four glues, all of which are ideal for a variety of different workshop tasks. To be in with a chance of your piece being selected as our 'project of the month', all you have to do is email a few photos of something you've made recently along with a few words about it. Just email me at the usual address - tegan.foley@mytimemedia.com - and the first lucky winner will be announced and featured in GW313, so it's definitely time to get making and sharing! We look forward to seeing what you've all been up to and extra Brownie points will be awarded to anyone who makes a Christmas-themed project!

Make furniture, win prizes

While I'm on the subject of making things, this also leads me on to the Felder competition and the pieces of furniture you've shared with us so far. Even though this has been running for a few months now, there is still plenty of time to enter. If any of you are in the middle of a build or even the early stages, we wish you the best of luck and don't forget to document the steps you take as you go along. Who knows, perhaps you could be stood on the winners podium in March being congratulated by Peter Sefton and John Lloyd? There is a combined prize total of over £4,000 to be won, so make sure you don't miss out, but in the meantime, dust off that router and get inspired by what we've got in store for you this month! Enjoy!

Tegan

Email tegan.foley@mytimemedia.com



Andy King
Technical Editor



Dave Roberts
Consultant Editor



Phil Davy
Consultant Editor

We endeavour to ensure all techniques shown in Good Woodworking are safe, but take no responsibility for readers' actions. Take care when woodworking and always use guards, goggles, masks, hold-down devices and ear protection, and above all, plenty of common sense. Do remember to enjoy yourself, though

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The evolution of routing

We find out more about our Router Special sponsor Trend, a company that has been instrumental in establishing routing in the UK since the 1950s



To celebrate their 60th anniversary, Felder are running a fantastic competition in conjunction with *Good Woodworking* and *The Woodworker* magazines to find three of the best furniture makers across the UK – there's also some fantastic prizes up for grabs. See **page 48** for further details

Good Woodworking

Special 312

• TOOLS • PROJECTS • TECHNIQUES • ADVICE

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routing technology

PROJECTS

42 Easy-make shoe rack

Johan Molarin shares a simple beginners' project with us here, which is ideal for practising your routing skills and will ensure your hallway is always tidy

52 Router-made blanket chest

Peter Bishop's routing project is designed for the intermediate woodworker – a lovely oak blanket chest made using kiln-dried English oak, which can be built in around a week

58 Pentagon table

Matthew White creates a five-sided table with a twist, using router work for the top, and experiments with partially-exposed pieces for the sides and skirts

71 Jobs in winter

Phil Davy's storage box for that lonely power tool is a simple project for the router

80 Display your turnings with pride

Les Thorne shows you how to make an attractive stand for displaying all your turnings, which includes decorative effects made using a routing jig



TECHNIQUES

22 The joys of furniture making

In the first of a brand-new series, Peter Sefton and his Long Course students embark on a 35-week woodworking journey – and what better way to start out than by learning the basics

24 Learning about hand-portable, powered routers

For the next instalment in his beginners' guide to using power tools series, Peter Bishop discusses the various different choices of router available to the home woodworker

32 Gluing up furniture

Carrying on with his beginners' series, John Bullar looks at the different types of woodworking adhesives aimed at the furniture maker and how their uses differ, as well as exploring how glues are applied and held while they set



62 The ABC of CNC

Andy King pays a visit to Wayne Mack, the man behind Legacy CNC Woodworking in the UK – machines that are not only changing lives but also facilitating the rehabilitation of ex-servicemen and women. The future of CNC routing really is here!

TESTS

Andy King tests...

15 Bosch GFK 600 router
17 DeWalt D26204K router
19 Makita RT0700C trimmer

Phil Davy tests...

75 Veritas router base
76 Fence & centre kit & precision adjuster

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PEOPLE & PLACES

46 Centrefold

Alejandro Palandjoglou's 'Piggy' coffee table uses CNC 2D router technology to create a piece that is not only functional and strong, but also beautiful to look at



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Published by MyTimeMedia Ltd.
Suite 25, Eden House Enterprise Way,
Edenbridge, Kent TN8 6HF
UK and Overseas Tel: +44 (0) 1689 869 840

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BACK ISSUES & BINDERS
Contact: 01733 688 964
Website: www.mags-uk.com

EDITORIAL
Group Editor: Tegan Foley
Technical Editor: Andy King
Consultant Editors: Phil Davy, Dave Roberts

CONTRIBUTORS
Andy King, Peter Sefton, Peter Bishop, John Bullar,
Johan Molarin, Alejandro Palandjoglou, Matthew
White, Phil Davy, Michael Huntley and Les Thorne

PRODUCTION
Designer: Nik Harber
Retouching Manager: Brian Vickers
Ad Production: Robin Gray

ADVERTISING
Business Development Manager: David Holden
Email: david.holden@mytimemedia.com
Tel: 01689 869 867

SUBSCRIPTIONS
Subscriptions Manager: Kate Hall

MANAGEMENT
Group Advertising Manager: Rhona Bolger
Email: rhona.bolger@mytimemedia.com
Chief Executive: Owen Davies
Chairman: Peter Harkness

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print & digital media publishers



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POF1400ACE				
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♻️ Milling up timber for a local order

Cleared trees provide materials for creating a living-roof arbour

Jeremy Harper is used to making something out of nothing. For 20 years he has worked as an arborist and commercial site clearer, which has taken him across the UK to remove unwanted trees and hedges, often repurposing would-be waste materials and giving them a new lease of life, but he admits that he has surprised himself with a personal project to build a living arbour in the garden of his family home in Milton Keynes, Buckinghamshire.

"The idea came from a trip through Norway and Iceland where my wife and I saw quite a few green roof structures on sheds and commercial buildings," he says. "It triggered an idea that I wanted one at home. It was my first attempt at creating something like this in the garden and we made space by removing our grandchildren's play equipment, then writing down a few rough dimensions on some scrap paper. I looked at the size I wanted and decided on 200 × 200mm uprights and 100 × 50mm joists."

On top of the structure sits the wild, green roof, which exploded with colour throughout a wet and warm English spring: "We put wooden stepping stones around the roof to avoid having to tread on the plants, then shook some wild flower mix into the top soil."

Jeremy says he was fortunate to have the materials available and the right tools for the job. He regularly mills wood for customers, creating bespoke sizes suitable for use in building, furniture and woodturning. He uses a Wood-Mizer LT40 mobile sawmill, which he bought second-hand



♻️ Jeremy in the garden with his living arbour

about five years ago. It is housed in a barn across the road from Jeremy's home. His business owns five cranes for moving wood around on site, but he says that for this particular project, he didn't make it easy for himself. "We moved everything by hand!" he says. "The uprights were the heaviest part of the timber work but the gravel we had to carry up the ladder to put on the roof was the most labour intensive part."

The upright posts are sunk into the ground and secured with soil. They bear the weight of the structure, which is crossed with the joists. On top of the joists sit 25mm boards, which form the base for the living roof, which is waterproofed with pond liner, then protected with geotextile layer to keep the roof watertight.

Then Jeremy put down the heavy gravel – bags of 30mm stone designed to improve drainage and then covered it with a root barrier topped with a layer of carpet to help with moisture retention. The green roof physically grows in a mixture of composted wood chip and screened topsoil. To improve drainage, flat roof drainage points are glued to the liner and the run-off is carried down chains, which water the plants at ground level.

The end result is not only impressive but something that the whole family can enjoy – whether that's sitting underneath it or weeding on top of it. To find out more, see www.arbwork.co.uk.

Hand tool & routing day @ Wood Workers Workshop

Wood Workers Workshop will be holding a hand tool and routing day on Saturday 10 December, from 10am-2pm, so why not visit the workshop to receive a 10% discount on your hand tools?

Meet Peter and see professional demonstrations as well as expert demonstrations from quality imported US brands, including WoodRiver – exclusive to Wood Workers Workshop – Incra, Woodpecker and Easy Wood Tools. There will be a wide range of tools for sale alongside hand

tools sourced from some of the best English tool makers, plus you can receive expert advice on buying tools and Peter will also be demoing hand tool techniques.

Visitors to the open day will all be given a chance to win a £50 voucher against their Wood Workers Workshop purchase, with the prize being drawn on the day. To find out more, see www.peterseftonfutureschool.com.

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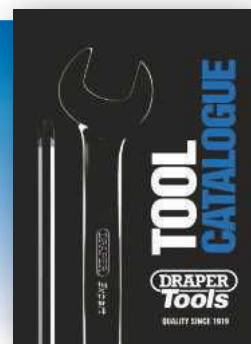
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Hitachi launches C9U3 circular saw



Hitachi Power Tools has introduced the powerful C9U3 235mm 2,000W circular saw, which is designed to cut through tough projects in double quick time. With external brush caps and a unique angle setting system to ensure the accuracy of 90° cuts, the C9U3 circular saw

is both easy to use and extremely precise. The tool is also very sturdy and practical with an aluminium blade cover and heavy-duty aluminium base. The very long 4m power lead allows the C9U3 to be taken wherever needed and the cord holder ensures the mains lead is clear of the cut line, so it doesn't get in the way of the operator.

Comfort and ease of use is always at the forefront of any Hitachi Power Tools' design and the soft grip handles make the machine comfortable to work with and a blower moves dust and debris away to ensure the cut line is always visible. The saw also comes with an adjustable metal cut line guide, spindle lock for easy blade replacement plus a dust extraction adaptor, wrench and carrying case.

As with many of its power tools, Hitachi offers a three-year warranty on the C9U3 circular saw when registered online within four weeks of purchase. For more info, see www.hitachi-powertools.co.uk.

New Axminster Precision measuring tapes



It's one of those tools that can be found in every toolbox, workshop and apron pocket. It can also be found clipped to almost every tradesman's belt and that is, of course, the ever popular and indispensable tape measure.

Axminster has introduced a new range of tape measures under the Axminster Precision brand, and all have a 5m metric/imperial tape and each have slightly different features.

The first features a self-lock button, which automatically locks the tape in position when it's extended. It is accompanied by a push release button, ensuring you have complete control when retracting the blade. The blade itself is dual printed, with the top side featuring the patented hi-viz printing and treated with a superior nylon coating for maximum durability.

The second sports a silver, stainless steel blade, perfect for anybody working in the marine

industry, underground construction and wherever water is being used to cut materials, such as stone or marble. The tape includes a secure blade lock to hold the blade in position for hands-free use.

The third is a very chunky power blade with a wide, deeply curved tape, which enables much greater extension without collapsing; it also has a magnetic end, which is useful for picking up any screws or small tools that have been dropped.

The last tape measure has a manual hold-down button, which clamps the blade in place and has been rated Class 1 (the most accurate available). This tape is ideal for cabinetmakers, joiners and anybody who needs an accurate measurement every time. The standard blade lock is complemented by a pause button, which gently holds the blade in position. Prices start from £9.96; see www.axminster.co.uk for more info.

Makita revamp reciprocating saws range



Makita has carried out a fundamental redesign of the drive mechanism of their cordless reciprocating saws by aligning the drive crank and con-rod with the motor shaft and blade holder. This new layout delivers greater stroke performance and reduces vibration in operation. The range has expanded with the launch of the new Makita DJR360Z 36V reciprocating saw powered by two standard 18V Lithium-ion batteries directly fitted to the tool to supply energy to the powerful 36V DC motor drive system.

The new Makita cordless reciprocating saws have a longer 32mm stroke – the same as the mains powered machines – giving a maximum cut in wood of 255mm and will cut through a 130mm diameter pipe. The new drive train reduces vibration levels in operation: for example, with the DJR186 model, vibrations are reduced from 19.5m/s down to 13.0m/s when cutting board, which is effectively a 30% reduction.

The Makita DJR186 18V LXT reciprocating saw will deliver 2,800 strokes per minute with the new crank mechanism, weighs just 3.8kg and is supplied as body-only or with two 4.0Ah batteries and charger.

The new Makita DJR187 is a two-speed reciprocating saw with Brushless motor that will run up to 2,300spm in low speed and 3,000spm in high speed. Blade speed is controlled by the variable trigger on the soft grip handle with the electronic two-speed controls also conveniently placed. All Makita reciprocating saws have tool-less blade holders using an easy-to-use twist lock system. This machine comes complete with LED job light, electric brake, safety lock-off switch, retractable joist hook and tool-less shoe adjustment and is supplied either as body-only or complete with two, long running 5.0Ah batteries and charger.

At the top of the cordless range of reciprocating saws is the new twin 18V Makita DJR360Z 36V Brushless motor machine, which offers all the same performance and features as the two-speed 18V model but with greater motor power and extended run time, and features an ergonomically designed handle with soft grip. To find out more, see www.makita.co.uk.

Furniture apprenticeships get ministerial

We are pleased to announce that the new Furniture Manufacturer Apprenticeship Standard and Assessment Plan, which has been developed by employers, has been approved and is now available for delivery. The standard includes the following occupations:

- General Furniture Manufacturer
- Bed Manufacturer
- Modern Upholsterer
- Furniture Finisher
- Fitted Furniture Installer
- Furniture Restorer
- Modern Furniture Service Repairer
- Foam Converter and Upholstery Cushion Interior Manufacturer
- Wood Machinist
- Furniture CNC Specialist

The apprenticeship standard and assessment plan has been published, which will replace current frameworks from 1 December 2016 as part of the Government's apprenticeship reform programme to make apprenticeships more rigorous and more responsive to employers. The apprenticeship standard and Assessment Plan can be found here: www.gov.uk/government/collections/apprenticeship-standards#furniture-standards.

Occupational Awards, who have provided support to the group, and will become the Registered Apprenticeship Assessment Organisation, said: "We are delighted about this announcement as it is testimony to the dedication and hard work which the employer-led group has put into this exciting apprenticeship reform," said Lisa Williamson, Managing Director. "The approval of the new Furniture Trailblazer standard marks a significant milestone for the furniture sector. We would encourage all furniture employers to join the illustrious list of employers already involved."



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COURSE DIARY

November is here and we have some great courses for you

November

- 4 Introduction to Leigh Jigs
- 16–17 & 24–25 Nutcracker wooden figures
- 17 Spindle moulding*
- 20–24 Windsor chair
- 21 Turn a pestle & mortar for the kitchen*
- 22 Christmas decorations & gifts (1 day)
- 23 Turning pepper mills*
- 24 Pen making
- 29–30 Beginners' routing *

* Course held in Sittingbourne, Kent
Axminster Tools & Machinery
Unit 10 Weycroft Avenue
Axminster, Devon EX13 5PH
Tel: 08009 751 905
Web: www.axminster.co.uk

- 14–17 An introduction to picture framing
- 18–20 Japanning: Western lacquerwork for beginners
- 27–2 Advanced furniture making – individual projects

West Dean College
West Dean, near Chichester
West Sussex PO18 0QZ
Tel: 01243 811 301
Web: www.westdean.org.uk

- 14–19 Make your own workbench
- 25–28 Beginners' four-day course

Chris Tribe, The Cornmill, Railway Road
Ilkley, West Yorkshire LS29 8HT
Tel: 01943 602 836
Web: www.christribefurniturecourses.com

- 13 Introduction to furniture restoration
- 19 Drills in a day
- 19 Introduction to woodturning
- 20 Spoon carving
- 26–27 Introduction to woodwork: wooden stool

The Goodlife Centre
122 Webber Street, London SE1 0QL
Tel: 0207 760 7613
Web: www.thegoodlifecentre.co.uk

- 12 Introduction to coppice management
- 12 & 13 Print your own wood-cut Christmas cards
- 13 Make a hazel stool with a woven willow seat

Weald & Downland Open Air Museum
Singleton, Chichester, West Sussex
PO18 0EU
Tel: 01243 811 363
Web: www.wealddown.co.uk

Trend-sponsored routing courses

Whether you are new to the craft of routing or a more experienced user, a routing course is the ideal way to gain professional tuition in using your router to its full potential.

Ammanford College

Courses on offer at the College are both basic and advanced. Operating during evenings and also at weekends, tradesman courses are also available upon request. Course size is a minimum of two up to a maximum of six people to a course at one time. Contact Dylan James.

Tel: 01554 748 182

Email: dylan.james@colegsirgar.ac.uk

Web: www.colegsirgar.ac.uk

Chichester College

This one-day basic course is aimed at the first time user, or those with minimal experience in routing. The emphasis is very much placed on the 'hands-on' use of the router; this includes the basic operations, use of templates, jigs and router tables. Contact Christian Nottley.

Tel: 01243 786 321

Email: christian.nottley@chichester.ac.uk

Web: www.chichester.ac.uk

Christopher Hall

Christopher Hall, The Gentleman Joiner, holds courses in his well-equipped modern workshop in Surrey. A one-to-one course is available for a single day or 2-3 days with overnight accommodation, if required, at a small charge.

Tel: 07836 205 152

Email: mail@christopherhall.co.uk

Web: www.christopherhall.co.uk

Colin Searle

Courses are flexible and individual tuition is also available upon request. There is a one-day basic course, which includes all materials, and is designed to give confidence to the beginner, or the one-day advanced course, which assumes the student is conversant with basic router functions and fundamentals.

Tel: 01732 773 145

Email: wscpfcl@larrytech.co.uk

Web: www.routercourses.co.uk

Jeremy Broun

Jeremy's courses will appeal to the design-based woodworker and those keen to adopt innovative and efficient methods. His vast wealth of woodworking and design experience now spans six decades. Tuition is priced at £35 per hour, but is negotiable.

Tel: 01225 332 738

Email: jb@woodomain.com

Web: www.woodomain.com

Kerry School of DIY

The centre runs furniture making and router courses for all levels. They run one- and two-day

courses for the complete beginner, advanced and/or the tradesperson. Evening courses can also be catered for. Contact Joe Kennedy.

Tel: 003 53879 807 180

Email: joe@diytraining.ie

Web: www.diytraining.ie

Mackays Of Cambridge

Mackays have put together a one-day practical workshop designed to teach the necessary skills and techniques to use your router on a wide range of projects. Contact Sam Wilson.

Tel: 01223 517 000

Web: www.mackay.co.uk/training-courses

Pembrokeshire College

The College delivers basic and tradesman courses. The first is designed for those new to routing and is suitable for amateur and professionals alike, and the second course incorporates demonstrations showing the use and advantages of jigs used within trade and industry. Contact Gareth Evans.

Tel: 01437 753 280

Email: g.evans@pembrokeshire.ac.uk

Web: www.pembrokeshire.ac.uk

Routing Crazy

Run by Tony Chalk, who offers a range of courses from basic one-day to advanced courses. He will also happily offer tradesman courses and one-to-one tuition, if desired.

Tel: 07957 267 647

Email: t.chalk@me.com

Samuel Abemethy Routing Courses

Located just outside of Belfast, Samuel is able to offer a routing course for the beginner, but can also offer a tradesman's course, and, if required, tailor a course to suit individual requirements. A maximum of two people can be accommodated on the course at one time.

Tel: 07725 137 718

Email: routing@hotmail.co.uk

Woodcraft Training Services

Run by Ian Coning, who has a wealth of experience in the trade and has been looking to run a course for some time, having previously taught at Middlesbrough College.

Tel: 01642 786 449

Email: ianconing2@gmail.com

Web: www.woodcrafttrainingservices.co.uk

Wrayway & Co Ltd

The company feel that offering routing courses will open up many doors for their customers, as many are not aware of the advantages of owning such a versatile piece of equipment. Contact Kevin Davies.

Tel: 01423 560 739

Email: info@wrayways.co.uk

Web: www.wrayways.co.uk



Workshop Heaven's Fine Woodworking Starter Set

Choosing which tools to buy first can be a bit daunting, especially if you are new to precision woodworking. This starter set of professional quality hand tools is designed to give you enough tools to complete a few simple projects and exercises, while forming a sound base of versatile tools that won't need replacing or upgrading.

The set doesn't include a bench plane as your physical stature is an important factor in choosing the most appropriate one: a No.5 $\frac{1}{2}$ is widely recommended, but a No.5, No.62 or No.6 would

make an equally good starting point. The price for the set is 15% less than the cost of buying the tools individually.

The set includes: boxed set of Narex 8116 cabinetmaker's chisels; Rotring 0.7mm clutch pencil; Quangsheng marking gauge; Starrett student combination square; Gyokucho 651 Ryoba saw (rip and crosscut); King 1,200/8,000 Japanese waterstone and Nagura; general purpose bench leather and Quangsheng low angle block plane (single iron). Priced at £279.50; see www.workshopheaven.com.

Don't forget the North of England Woodworking & Power Tool Show, which takes place from 18–20 November. An excellent day out with over 30 demonstrators appearing, this event also features a woodworking clinic, great prizes to be won in the free raffle and more than 70 companies exhibiting. Advance tickets on sale now; see www.skpromotions.co.uk

W H Raitt will be holding their in-store show from 25–26 November at their premises in Co. Donegal, Ireland. Including free entry and free parking, expect to see a range of demonstrators showing machinery, power tools and hand tools, offering advice and special show prices. See www.whraitt.ie for more info

After 20 consecutive years of successful trading, supplying timber to builders, architects and clients direct, Ben Sutton has taken over the running of the business directly himself. Ben is excited about the opportunity this brings him as he now controls the end to end process for the timber, starting at the identification of the logs in the woods, through to delivering the end product to his numerous clients. To find out more about the company, see www.suttontimber.co.uk



Try a Clarke Log Buster 7 this autumn

The Log Buster 7 is an ideal domestic log splitter and is able to split logs up to 370mm long and 250mm wide. It can easily split tree logs found in most domestic gardens and can be operated using a two-handed system and ram lock for increased safety. Fitted with two wheels and a pull handle for easy transportation, a handy LB7S stand accessory can also be purchased exclusively

for this model to bring this splitter to working height. The ram stroke can also be shortened to split different types of logs with Clarke's new depth stop feature, and with an extra strong welded steel frame, you can guarantee that the Log Buster 7 will serve you well for many years to come. Priced at £191.98; see www.machinemart.co.uk to find out more.

FREE READER ADS

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Jig plus router for turning (e.g. barley sugar twists). Proton DB250 lathe, fuse saw, MP300 moulder, Leigh dovetail jig, 36in lathe and 9in angle grinder
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DeWalt DWS520 plunge saw plus tracks, clamps and T-square attachment – little used; £185
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Roy mortiser with six Japanese pattern bits; £400. MK1 Woodcut;

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Record 10in table saw with extension table and stand. 1,100W motor; 660 × 860mm table; blade 58mm deep at 90°. Buyer collects; call for offers
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Record Power DX4000 high filtration dust extractor. In mint condition, complete with 100mm hose and instruction manual; £175
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Vicmarc VL100 EVS electronic variable-speed lathe – the Rolls-Royce of mini lathes, complete with tools and user

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For sale – various Woodworker magazines from 1946–2013. All in pristine condition – selling due to bereavement. Please call to make an offer; collection only
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WoodRat WR5 and DeWalt router DW625EK; £500
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Palm router group test

Andy King puts three palm routers through their paces, explains the functions of each and their differences, weighs up the pros and cons, as well as showing how they suit various operations



Bosch GFK 600 router

Despite only having a single-speed motor and no fine adjustment for the fence, this is a powerful, adaptable and easy to use machine

Bosch were the first to come to market with a palm router that uses interchangeable bases, exploiting a gap in the market between the smaller routers and the laminate trimmers, coming up with an excellent hybrid. Initially it was simply a palm grip router with fixed and tilting bases as well as a laminate trimming bearing as part of the kit.

A plunge base was introduced some time after as an optional accessory and this is still the case, available only as an extra, which is a slight disappointment for anyone looking to get a full array of functions. But the cost of the standard kit along with the optional plunge base still comes in at a very good price, although I think Bosch are missing a trick in not offering the full kit as standard.

Being the first to the market and therefore the elder statesman of the group in this comparison test, the motor still keeps its single-speed status – the same as when it was launched – while its rivals have variable-speeds, so it comes up short if you're looking for finer control on certain materials and applications, but it makes up for this shortcoming in the rest of its make-up.

Plunge base

Looking at the plunge base first, it resembles the DeWalt base in operation so the springing on the lever is in resistance mode when released, self-tightening as you release it – an excellent feature. It has traditional fence rod bar holes if you wish to upgrade to a better fence than the pressed steel simple bracket version supplied. As this supplied fence is designed only for the fixed-base, in this respect the plunge base is somewhat limited.

Plunge depths can be set with the simple drop down post that is again of similar style to the DeWalt with a sliding cursor and fine adjusting foot; the rotating turret is also stepped with a single screw adjusting position for finer setting if needed.

Guidebushes play an important role in routing



but the plunge base has no facility to take any. However, if you opt for the kit version with the full accessory range included, there's a handy circular base supplied that will interchange with both fixed and plunge bases to make use of bushes. You have to unscrew the base each time to swap the bushes, which is a bit of a faff, but having the option to use them is vital for jig use, so therefore a good inclusion despite this.



The supplied fence only fits to the fixed-base but is easy to adjust

Tilt base

The tilt base is an excellent addition for making bevels and altering the way a profiled cutter addresses the work. The base tilts from an acute 45° angle through to 30° obtuse with 10 indented positions for repeat angles if needed. The fence cannot be used with this base but the square base profile is easy to run against a guide batten. The height of the cutter can be altered with the adjustment wheel on the base, which can also be >



A fine adjustment wheel on the tilt and fixed-base read against the etched scale

The router has long been a tool that has continued to impress via the introduction of accessories, jigs and other paraphernalia to cement its place high on the list of many a woodworker. With current battery innovation it can only be a matter of time before there's a step forward in this area, and in doing so, freeing up the restrictions of a cable.

Router choices

It's when you require that additional manoeuvrability that a cable, and indeed dust hoses, can begin to inhibit the router, and more so on the bigger machines with the physical size and weight along with these added

restrictions, which make it all the more difficult if you are looking to do finer work.

However, the bigger machines are still generally associated with the bulk waste removal and heavy-duty work; the use of jigs such as kitchen worktop, stairs, etc. are such areas, so if they are following a jig, then they are that bit easier to keep on track – it's the finer freehand side of things where they can start to become cumbersome.

For the more controlled type of work, the smaller routers with around 900-1,200W motors are normally considered the best choice, operating in the same manner, having plunging bases, taking a range of accessories via the fence hole slots or directly into the base for >



Align these arrows and twist the body in to fit the fixed and tilt bases

used to fine-tune the depth of cut on edge chamfers and the like.

In general, for palm-type applications the router is well proportioned and very easy to operate; the rocker switch is recessed but with no dust shroud it is simple to engage.

A couple of sculpted indents on the base allow you to place your fingers to apply pressure and to help guide the router for freehand work. Although you are in close proximity to the cutter area, a couple of lips on the indents help to restrict you from the danger area, and with the cutter in its deployed position, the danger is all but eliminated as the collet is in the open area.

Maximum cutter height adjustment on the fixed-base is around 30mm with a simple metric and imperial scale etched onto the base for easy setting. The fine adjuster wheel of the tilt base is replicated and alters the setting by 1.25mm per rotation, so you can fine-tune the cut accurately.

Fixed-base

The fixed-base also has a fence option. Nothing spectacular here: it's supplied with a simple pressed steel affair but it adjusts very easily with around 90mm backset from the collet available for working in from an edge. It fits very easily to the side of the base with a single thumbscrew; a couple of lugs on the base keeping the fence square.

This lug and screw setup also secures the laminate trimming attachment. It works especially well when cleaning off overhanging veneers and laminates without having to buy bearing-guided cutters, by setting the roller to the outer edge of any straight cutter and adjusting it with the finely set adjustment wheel to position it accurately.

The bonus here meaning you aren't wedded to one diameter cutter so you can use any straight



The round base takes guidebushes and is useful against straight edges



Dust control is excellent with the edge dust collector kit fitted

one in your kit. Having this attachment is a boon not only for trimming, but you can also offset the roller to make fine backsets for stringing.

The same setup works with non-bearing guided bevel cutters for chamfer edges as well, either altering the height or backset will adjust the amount removed as well as making a quirk profile if desired. Despite the small stature of the laminate attachment it is quite a powerful asset, especially if you are on a limited budget for cutter purchases.

Tear-drop base

The final part of this comprehensive setup is the tear-drop base, which allows full support by applying pressure back across the workpiece. The bonus with this base is the neat dust kit supplied for it; with the additional lower cup profile it collects dust from an edge mould very efficiently.

Swapping bases is common across all three bases: a simple cam clamp lever slackens the collars enough to allow free movement. In the case of the tilt and fixed-bases, this lever has to be released to fine adjust any setting.

The motor has a couple of engraved arrows that have to be aligned with the arrows on each base to engage them, sliding and twisting each



There's excellent support for the router with the tear-drop base fitted



The plunge base lever action is top drawer; very easy to access and operate

base into its correct position for use or removal. I found it can be a little tricky at first but soon becomes second nature.

In summary

Despite the limitation of the single-speed motor, the Bosch is a well thought out and powerful machine; the plunge base should be on your list, but the limitations of no guidebush retention or fence to use with it does leave it a little short.

► **Motor:** 600W

► **Speed:** 33,000rpm

► **Weight:** 1.5kg

► **Typical price:** From £178.80

► **Web:** www.bosch-professional.com

THE GW VERDICT

► PROS:

Very adaptable; easy to use

► CONS:

Single-speed; fence has no fine adjustment

► **RATING:** 4 out of 5

guidebushes and therefore becoming easier to control as a result. But with the traditional design of two side-handles on some work it can be a little difficult to keep the router from tipping; edge work and moving the router around a corner are good examples.

Palm grip

It therefore made sense to try and make the router that bit smaller again and do away with the side-handle design in favour of a palm grip. This isn't a new thing; there have long been laminate trimmers that are held in the same way, but designed specifically for the task of dealing with laminates on worktops, etc., so therefore quite limited in their use.

The newer designs of palm router are built as a router first and foremost, being supplied with a sleeve style fixed-base design that is adjusted up and down to alter the depth of cut but with a base design that lends itself to routing rather than trimming work, so you can normally fit a side-fence for traditional working from an edge, but the idea now is to include additional parts that still provide the laminate trimming function.

These new routers have essentially put the dedicated laminate trimmer out of the equation, but there's a further enhancement of a plunge base, so you now have one motor housing that can be a laminate trimmer, fixed-base palm router or a small plunge router, making it a 'Jack of all trades' – pretty much a Swiss Army router!

DeWalt D26204K router

Although it lacks the additional accessories of the Makita and Bosch, this router makes up for its shortcomings by having an excellent plunge base and twin-bar fence

This palm router from DeWalt is simply a dual-base router with either a plunge base or palm grip option – there is no additional laminate guide bearing or tilting base option – so it is limited in this respect in comparison to the Bosch and Makita. Despite the limitations it is excellently built with nice solid alloy castings, and it comes with a decent traditional rod fence for the plunge base and a separate pressed steel option for fixed-base palm routing.

Plunge base

Where the DeWalt scores especially well is with the plunge base, which is designed around the old Elu 96 configuration. Trend became big players in the routing market thanks to the Elu design, making all manner of jigs and accessories built around this base, either as direct fit guidebushes or through the fence rod positions. This router also comes with two fences: one standard rod design version for the plunge base and a second more simplistic one for the fixed-base. The plunge fence is a definite bonus for general routing work and gives this particular model the upper hand for a more comprehensive setup.

Plunge lever

One thing that immediately jumps out on the plunge base is the plunge lever. It's longer than most, and it makes sense as the springs on some levers can be very stiff, so a longer fulcrum makes it easier to release and re-engage if you have to do any controlled plunges. A further advantage is the way the lever is sprung; on this model the spring action is reversed, which means you push against the resistance of the spring to release it when plunging so that it automatically locks once the pressure is released.

I find this a safer and more intuitive option as it ensures the plunge setting remains locked under load, with a tendency to tighten rather than slacken if you encounter excessive vibration from cutting too aggressively. You can also give the lever an additional push to get a tighter lock



if you require it for general work, which is good practice.

For set plunges there's a rotating turret with a stepped incremental section as well as a simple screw jack part for finer adjusting. The turret post has a similar fine adjustment screw on the bottom as well as a simple sliding cursor for zeroing and setting depths against the scale. Although simplistic, it works very well for fast setting and fine-tuning a cut.



DeWalt have fitted an excellent oversized plunge lever to their base

Fixed-base

In palm configuration with the motor in the fixed-base it is reliant on a rotating plastic collar on top of the base to alter the depth of cut. There are lugs that clip to the top of the alloy base to engage it, thus allowing the base to rise or fall by revolving the collar and also disengage the motor unit from the base to remove it when swapping to the plunge base.

A full rotation of the collar is equal to 12mm of >



Multiple indexing points for the collet nut makes swapping cutters simple

Smaller jigs

It's really in the use of smaller jigs that the palm router has begun to make its mark as they are so much easier to control single-handed over the two-handed approach of the plunge design. Hinge jigs are undoubtedly the main area where sales have picked up and if all you want is a palm router for this purpose, but there's a basic setup on offer of the motor and fixed-base, then that's all you need. But to get the best value and adaptability, the kit versions with additional bases would be the prudent choice if you are looking to get the most out of your router.

Tracking down a multi-base palm router isn't too problematic – there are only three real options to go for but there are quite a lot of

differences in the supplied parts and the machines themselves. Good reason then to have a closer look at them on a like-for-like basis to see what sets them apart from each other as well as sussing out what you get for your money!

General consensus

Before I sum up and go on to comment on the differences and the final verdict, I have to say that all three of these routers offer great value for money in their various guises with plus points outweighing negatives. Build quality is top drawer on all three, including the accessories and base options, but surprisingly Bosch have stuck with the single-speed >



This collar screws onto the router body on a slow helix thread



The motor simply drops into the bases for very easy engagement



Fitted with the fence and steadying the base keeps it stable for edge mortising or grooving

movement so it's quick to make any fast adjustment, rotating and running sweetly and smoothly in doing so. Having a low pitched thread on the body of the motor also allows for fine adjustment by making smaller movements, read with a small pointer against a yellow scale on the collar.

To make any alteration the cam locking clamp has to be released. That is easy to do as there's little resistance, but it locks up firmly when engaged.

The plastic collar can stay on when you change bases as the motor sits up quite high in the base and therefore doesn't impede any of the plunge functions.

The baseplate it is fitted with has a square extension that allows finger pressure to keep it firmly to the work and aid freehand guiding, but there's also a second round base supplied that allows guidebushes to be fitted directly to it.

This is an important inclusion, making it fully compliant with Trend guidebushes on both bases; I'd be inclined to leave this particular one on the fixed-base for most work because of the additional guidebush option and the fast swapping it offers. The supplied fence for this base is similar to the Bosch with a pressed steel make-up, but it has a longer backset, offering up to 130mm from an edge if needed.

The motor

The motor itself has the variable-speed dial and rubber shrouded rocker switch in close proximity to each other for easy access although the rubber shroud does make engaging the switch a little trickier than normal, but it protects it from dust ingress so is a good trade off.

The inclusion of a couple of LEDs alongside the collet give the work area a good spread of



The locking levers for the bases are top quality and hold superbly

light to help when you need more control when doing freehand-type work. With 12 indent positions for the spindle lock to engage the drive shaft, it makes cutter swaps easy to achieve with plenty of position points for the spanner to fit to, and with the good quality multi-slit collet supplied, it also has the double-locking function for additional safety.

As a bonus, the motor can be fitted in a 'face forwards' or 'face backwards' position in either base; on the plunge it allows the preference of having the plunge lever facing you, or in the normal rear position while still keeping the power and speed settings in the optimum position.

In summary

Although the DeWalt lacks the additional accessories of the Makita and Bosch, it makes up for these shortcomings with its excellent plunge base and traditional twin-bar fence and if you only need the palm router function for standard work, such as working jigs or freehand routing work, then this particular



You can make micro adjustments to the plunge post with this fine adjuster

router scores highly for ease of use and all-round performance.

Specification:

- ▶ **Motor:** 900W
- ▶ **Speeds:** 16,000-27,000rpm
- ▶ **Plunge:** 55mm
- ▶ **Collet:** 1/4in & 8mm
- ▶ **Max cutter:** 36mm diameter
- ▶ **Weight:** 1.9kg

- ▶ **Typical price:** £239.95
- ▶ **Web:** www.dewalt.co.uk

THE GW VERDICT

- ▶ **PROS:**
Dual-base allows good scope; plunge base is compatible with many accessories
- ▶ **CONS:**
Power button is a little tricky to engage
- ▶ **RATING:** 4.5 out of 5

motor despite being on the market the longest. I guess 'if it ain't broke...' fits here, but it is limiting if you want to work different timbers/materials where a variable-speed option helps to control the cut for the best finish from the cutter. Equally, the plunge base isn't a standard item with this kit – you have to buy it separately – so that increases the outlay if you want this option. Even so, it still comes in at about the same price as the Makita once it's factored in. It makes up for this in the supplied accessories; the tear-drop base is certainly a useful addition in its own right for stabilising the tool on edge work, and with its additional side dust collection that doubles up as an additional safety guard, it is very efficient indeed.

The DeWalt is the most expensive tool on offer but is the most basic of the three based on the actual accessories it is supplied with. There's no laminate trimmer bearing and no tilting base supplied, nor available, so it is simply a fixed-base or plunge base, although it does feature very easy adjustment for the fixed-base, and with the supplied guidebush adaptor base for this, it is compatible with the full range of Trend guidebushes, which will appeal immediately to anyone doing inlay and template work as well as tradespeople who use lock and hinge jigs. Additionally, there's the extra fence for the plunge base, which is a decent quality rod-style version that gives more scope for plunging work. If all you need is a good quality variable-speed dual-base router

Makita RT0700CX4 trimmer

With its smaller diameter motor, this router is limited in terms of depth and the lack of guidebush facility for the fixed-base lets it down, but the handy carry bag is a definite plus

Although the Makita isn't the smallest motor of the three on test, it has the slimmest body and that is reflected in the overall comfort in palm mode; it is very easy to manoeuvre and control in any orientation so it should score highly for the hinge jig users, especially in this area. However, it doesn't have the facility to take the 16mm guidebush required for such work although the plunge base will take standard Makita guidebushes, so the work can be done but it is here that a palm router really makes its mark.

Fixed-base

Despite this, the fixed-base is a sweetly made, easy to operate part of the setup. It uses the same simple cam lock toggle-type clamping method of its rivals so swapping bases is a cinch; more so on this model with its rack and pinion adjustment for both bases. There's no fine adjustment on the fixed-base, though you are reliant on tweaking the rack and pinion knob to try and nudge the depth of cut if needed. The small diameter base does allow it to get into some pretty tight spots if needed and it makes it a very tactile machine to drive in freehand mode.

Laminate trimmer fitting

This base also takes the laminate trimmer fitting, which is practically identical to the Bosch one in this respect. It has the same adjustments available to move the guide roller for different diameter cutters or to rout fine offset rebates for banding and stringing-type applications. Additionally, you can also fit the supplied simple pressed steel fence to the base for working from an edge. It has a two-position setting for this to give a range of up to 120mm from an edge, which is pretty decent considering this is a small machine.



Tilting base

Again, Makita and Bosch are following similar designs with the tilting base that runs from 45° in an acute setting through to 30° obtuse, which gives huge scope for anyone with a limited set of non-bearing guided cutters. The square base allows you to run the router against a batten as a guide but tilt is more simplistic than the Bosch – no indented settings for quick repeat

positioning, so you have to rely on the simple scale on the side for referencing against.

Plunge base

Moving to the plunge base, it is evident that the plunge is limited in comparison to Bosch and Makita, who both hit around the 50mm mark. The Makita base only has 37mm of plunge available, which may limit it if you are looking to >



A rack and pinion allows easy adjustment but there's no fine-tuning



The simple pressed steel fence quickly fits to the fixed-base

that is of palm size for easy operation, then DeWalt have nailed it here.

By comparison to Bosch and DeWalt, Makita have gone to town with their offering. Go for the kit option and you have a plunge base as standard, tilting and fixed-base for palm grip work, laminate trimmer guide wheel and a hybrid fence system that works with both bases, and it's all contained in a neat zip-up holdall.

In use the DeWalt scores well and for ease of use it can't be faulted; the only negative being the occasional difficulty in engaging the switch, but it prevents dust ingress, so is a useful addition despite this. The Bosch bases are a little tricky to engage with the need to twist the body to position them. It does offer additional security should the

catch slacken for any reason, but it's still a bit of a niggle for me.

The other concern here is the fine adjustment on the tilt and fixed-base as it looks prone to wear on the motor body, but works well enough on the test machine.

Makita have missed a trick by not having a standard guidebush option on the fixed-base as the door jig users will be crying out for it, especially as it is such a tactile body to control. The limitation of the overall plunge available on the plunge base isn't too concerning in most instances but longer cutters may be unsuitable because of it, but the fine height adjustments on the turret post are certainly very good on this base. The plunge lever is a little stubby and needs pressure applied to lock it, which >



It also comes with an adaptor that allows it to fit to the plunge base

use some longer cutters, but in general use the depth available should be more than adequate for the sort of bits supplied in the starter sets of cutters, especially considering the motor power, which tends to dictate the work these smaller machines are designed for.

The plunge itself is smooth but here the springing of the plunge lever is in keeping with routers of old, so the router is in free movement with the spring lifting the lever when it is released, meaning you have to give it a decent shove to lock it once you re-engage as you are pushing against the spring.

The fine adjust toolpost is the best of the bunch here, following the lines of the higher-end standard Makita routers. The post is threaded to fine-tune the setting, which can be over-ridden with the front button for fast setting and this button can also be screwed down to lock any position if needed.

A knob on top of the post shows metric scaling for micro adjustments with one revolution equal to 1mm of adjustment, making fine-tuning in plunge mode the best on test in this respect.

Three-position turret

A three-position turret follows the traditional design of older routers with each setting a screw post to allow different plunge offsets to be achieved very easily if needed for specialised setups, which is a better design over the stepped turret if you require more scope in this area. With a traditional fence rod base design, Makita have supplied an adaptor to fit the same fence for the fixed-base, which works well: the two short posts locking into the base with the fence adjusted on the sliding bracket.

knocks this particular function back in comparison with the other two.

In real terms, the plunge bases on all three are very good and are on equal terms with their respective standard models here, so it's really the fixed-base where the game is on, and Makita and Bosch clear up with their tilting bases and laminate trimmer accessories, but DeWalt strike back with their guidebush compatibility. Put this alongside the twin fences supplied and the DeWalt is a great choice for general routing and



The inclusion of a laminate trimming wheel is very useful here



You can use the tilt base across a range of different angles

Again, the two positions available give it good reach from an edge – up to 160mm – but the fence won't extend fully across to the collet so its narrowest setting is 25mm from the edge.

The inclusion of dial-operated variable-speed offers additional control for different timbers and materials, and in similar style to the DeWalt, this is positioned directly above the rocker switch power supply. The switch is recessed to avoid inadvertent operation but engages very easily as there's no rubber shrouding.

In summary

The smaller diameter motor of the Makita does make a difference in freehand mode for finer control, so it's a pity Makita hasn't catered for the jig users and made it compliant with standard guidebushes for this scenario but other than this, it's certainly a well-represented piece of kit. The carrying bag is especially worth a mention as you can fit everything in it as well as loads of other bits and pieces, so this is a definite plus.



The stubby plunge lever needs to be pushed to lock it



There are comprehensive fine adjustments on the plunge base

Specification:

- ▶ **Motor:** 710W
- ▶ **Speeds:** 10,000-30,000rpm
- ▶ **Weight:** 1.8kg

- ▶ **Typical price:** from £126
- ▶ **Web:** www.makitauk.com

THE GW VERDICT

- ▶ **PROS:**
Easy base swaps; variable-speeds; great carry bag
- ▶ **CONS:**
Limited depth on plunge base; no guidebush facility for fixed-base
- ▶ **RATING:** 4 out of 5



I did some work on my son's guitar a few months back using a palm router



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PIC 1. Sycamore is a natural antibacterial and doesn't taint food, so is ideal for food preparation



PIC 2. Jack planing to flatten the board

The joys of *furniture making*

In the first of a brand-new series, **Peter Sefton** and his Long Course students embark on a 35-week woodworking journey – and what better way to start out than by learning the basics

How appropriate that I begin my regular writing for *GW* with a new intake of students on my Long Course at the Furniture School. I have eight students who have just joined us for their 35-week woodworking journey; some of them have experience and some are completely new to furniture making, going through the workshops to become highly skilled designer-makers in their own right.

Making a breadboard

The students have started straight on the workbench with us concentrating on hand tools while fine-tuning their hand-eye coordination. Their first few tasks are well on the way and with tool selection, tool care and sharpening accomplished, it's time for hand-cut joints and planing skills.

The first project introducing them to design is a breadboard; simple in form but full of techniques to be explored. The students have measured up a wane-edged board of sycamore and selected a suitable piece to hand saw out. Drawing and colour-washing a perspective sketch is the starting point to work from, before the hand planing starts in earnest.

Tools for the job

The plane in their toolboxes is a 5½ jack plane; great for this size of work – large

enough to flatten the board but small enough to smooth. The only way to really learn how to plane and clean a board up is to get those muscles to work, in a controlled and measured way.

Getting the board clean of those saw mill marks, flat and without twist, takes more than sheer hard work; this now calls for sharp tools, measuring and testing techniques while learning how to read the grain and work with the timber. Once the face side has been produced, it's over to either planing the face edge square and true, or getting the board down to thickness.

Some students opted for a natural-edge after removing the bark, others wanted a much more formal rectangular board, while the rest wanted a sculpted edge with natural flowing lines or incorporated finger grips. The one common theme learned by all was that a few hours using the hand plane and various other tools is a great introduction to the joys of furniture making. **GW**



PIC 3. Checking flatness with a Veritas straightedge



PIC 4. After initial planing the boards are cramped to keep them flat



PIC 6. Spokeshaving out carving gouge marks



PIC 7. Final sanding to remove any plane or finger marks



PIC 5. Initial marking out for a carved handgrip



PIC 8. A great hand carved detail accentuates the annual rings

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Learning about hand-portable, powered routers

For the next instalment in his beginners' guide to using power tools, **Peter Bishop** discusses the various different choices of router available to the home woodworker

The precursor to our modern, powered router is the 'old woman's tooth', a simple block of wood with a cutter iron protruding. The name is derived from the action of pigs that 'root' things out, thus rout out. I have never seen one and I believe they are quite rare. Their function was to rout out the waste in a trench across the grain. Because of their design, the depth can easily be set. They were ideal for stopped trenches as they were able to clean the waste right out to the end. Metal-framed routing planes are still made and are available today. They can be used but are more suited to your collection of old tools, but let's move on to looking at the modern and extremely desirable, hand portable, powered routers and leave history behind us.

Buy the best you can afford

My first router, a Stanley, was acquired a long time ago, and I still have it. It has an 1,120W motor and only a single speed of 27,000rpm. It takes cutters that have a 1/4in, 6mm, shaft. It's a fixed-body type, which requires the depth of cut to be adjusted by a screw ring. When entering a central cut a particular technique is required: the baseplate is tilted, one edge on the workpiece, and then lowered to engage and make the first, penetrating cut.

Later I bought a second-hand Elu MOF96 plunge router. The plunge action allows the cutter depth to be set, the router positioned over the workpiece and then plunged

down to start the cutting action – a great improvement over the other one. The Elu could also be inverted in its own stand. This second router also has a single speed, 24,000rpm, a 600W motor and a 6mm collet. A number of years later, as soon as funds allowed, I invested in a Bosch 1300 ACE plunge router. A smashing tool with all the modern features: variable-speed, 12–24,000rpm with soft start, 1,300W motor, interchangeable collets of 6mm, 8mm and 12mm, fine vertical and lateral adjustments, etc. More recently, another state-of-the-art router has joined the stable, this one with a 1,400W motor but I still use the old Stanley for those simple outer edge jobs. The Elu is permanently inverted in its stand ready for use and the two newer routers have to cope with everything else.

There are routers out there to suit everyone's needs and pockets. Each manufacturer will have a selection available. Most hand-held routers will have similar features. It goes without saying that you should look for and match the machine to your needs and always buy the best you can afford.

Motor size, speeds & switches

I guess you could classify motor sizes into three groupings: light, medium and industrial use. These broad categories should not be taken in isolation. The type of work to be carried out will have a bearing, but, generally speaking, motors of up to 600–700W will drop into the first group; 800–1,200 or 1,300W will drop into the



Peripheral speed chart and ready reckoner

middle group and anything over can be classed as an industrial rating. Therefore, when considering what size motor to go for, think through the amount of work you might apply it to.

Revolutions per minute, rpm or motor



Various examples of hand-held routers from a selection of manufacturers



Collets and baseplate

speed, will, ideally, be variable. The reason for this is simple: think about a small diameter cutter. Its 'peripheral' speed at which the outer, cutting edge travels in comparison to the shaft, will be close to the stated rpm. A larger cutter has a much faster peripheral speed and therefore the motor can go slower to compensate. If the peripheral speed is too fast, the wood will burn; too slow and the cut will be difficult and uneven! A comfortable range of rpm to cope with most jobs and cutters will be between 10-25,000rpm.

Most routers will have a swivel or dial speed control. Incorporated within the handles/knobs will probably be the on-off

switch. Ideally this will have a 'soft start' facility: as you engage the motor it will start slowly and increase until it reaches the pre-set speed. This is a good feature but make sure the motor has reached its full, designated, operating speed before engaging the cutter in the workpiece.

Collets & locking mechanisms

The collet is directly related to the shaft size of the cutter: usually 6mm, 8mm or 12mm. Most will have a self-locking mechanism that works as you tighten the collet nut on the cutter shaft. The majority of cutters have 6mm shafts but specialist and larger ones will be manufactured with 8mm or 12mm.

If you wish to obtain total flexibility, then a router that will accept a range of collets is a must. The advantage of the big collet is its ability to take a more robust cutter. The larger the shaft size, the better grip the collet can make on it. Small shafts can flex and distort occasionally. Whichever size of cutter fitted, the shaft should always be inserted at least three-quarters of its length before the collet is tightened. Always check that the cutter is not grounded - i.e. touching any part of the body.

Collets tend to get neglected and abused; you should take particular care of them. Always keep them clean and lightly oiled. If too much muck adheres to the collet, then it will not function correctly. Most grunge can be softened in a light oil, or diesel, and then wire brushed off. If rusted they will become pitted and you should consider replacing them. Long runs will eventually create metal fatigue leading to failure: better buy a new one rather than have a cutter fly out! Never leave your collet tightened in place without a cutter, as it may distort. Additionally, don't leave a cutter set up in the collet for too long, unless you know it's well oiled, as you may have difficulty getting it out.

To plunge or not to plunge?

I mentioned that my first routers were fixed-head and that I subsequently acquired >





Various examples of routers with interchangeable bodies to facilitate both functions: the Bosch 1617EVSPK 2.25hp combination plunge and fixed-base router and the DeWalt Dwp611pk 1.25hp max torque variable-speed compact router combo kit

a couple of plunge versions. The former went out of fashion when the plunge ones were introduced but they've had a bit of a renaissance, so much so that some clever manufacturers are making routers with interchangeable outer bodies that can be switched from one function to the other (see examples above). At the end of the day, it's a matter of choice. There's not much you can't do with one that can't be done with the other. However, I find that simple edge work is better with a fixed-head and trenching etc., is better with a plunger. Of course you can 'lock off' a plunge router so it becomes fixed, so maybe that should be your choice? If in doubt, buy a multi-function one!

A little more care is required when selecting a plunge router. The important part is to check that the plunge pillars, or legs, are well engineered and fit into their housings correctly. Check for wobble and play. The pillars should be polished or chromed. The return spring should also have enough strength to pull the router out of the workpiece when released.

ROUTING TIPS

- The pillars should be kept well lubricated with a light, thin oil for smooth and easy use. Don't use a thick oil or grease because these will attract dust

Depth gauges & side fences

Depth gauges are more sophisticated than they used to be. The majority will have a carousel or turret system of multi-level stops on the topside of the baseplate. A sliding bolt or bar can be locked against these with, in most cases, some sort of fine screw adjustment. Check out what's on offer. Can you see how easy it is to use? Will it provide the sort of fine adjustment you might need? Is it robust enough not to slip, etc.? Look to see how the depth, or plunge, setting can be locked into place. This will be via a lever, knob or one of the handles. Does it lock tight and is it substantial enough to stop any slippage? This is a critical part of your prospective router so pay attention to it.

Side fences follow a similar pattern. Most are fitted to the router on a pair of round bars. These are locked to the baseplate and the adjustment is made on the outboard side. The better routers will have a fine wheel adjustment facility: check that it works satisfactorily. The surface of the fence that runs adjacent to the workpiece is important: is it smooth enough to generate little friction? Thin, weak bars and a poor fence construction can cause a lot of grief.



Side fence assembly with fine adjustment

ROUTING TIPS

- To set up a depth quickly, use a drill bit. Place the set up router on a flat surface and depress the cutter until it touches it. Insert the appropriate bit between the turret top, bring the stop down and lock it off
- For better control, especially at the exit cut point, a longer side fence is helpful. You should easily be able to fix one onto the existing fence assembly. Make sure the running surface is smooth and blemish-free



Drill bit and turret depth gauge



My fine depth adjuster and speed dial



Baseplates & guidebushes

The baseplate is an important part of the router. They need to be securely fitted with a smooth surface at right angles to the motor drive/cutter shaft for precision routing. They may be round or, more commonly, be elliptical in shape with two parallel straight sides. The outer circumference of the baseplate has to be exactly centred, end to end and/or side to side, to avoid any slight discrepancies in moulding size during use. A lot of router work will require the baseplate to be run up a batten or guide so this is an important part of the construction. The centre hole needs to be big enough to allow the collet to pass through or, if not, have a removable section to let this happen. Some jigs will require extra projection beyond the baseplate and therefore this centre hole clearance is important. Check out the type and number of fittings: is the plate securely attached? Can it easily be inverted and fixed to a table?

Most routers will be supplied with one or more guidebushes. These you use, fixed to, or protruding from the baseplate. They allow you to follow 'formers' and patterns, which enables replication work to be carried out. They are also indispensable if you are going to use your router to cut series of dovetails in a jig.

Guidebushes of various types, sizes and shapes are available. They are fitted to the baseplate and used in conjunction with a 'follower' in various jigs and templates. Look to see how easy they are to fit or indeed if

they can be fitted. Older routers can be modified to take bushes – as mine was. Find a local engineer who can adapt the baseplate for you if you're intending to use jigs.

ROUTING TIPS

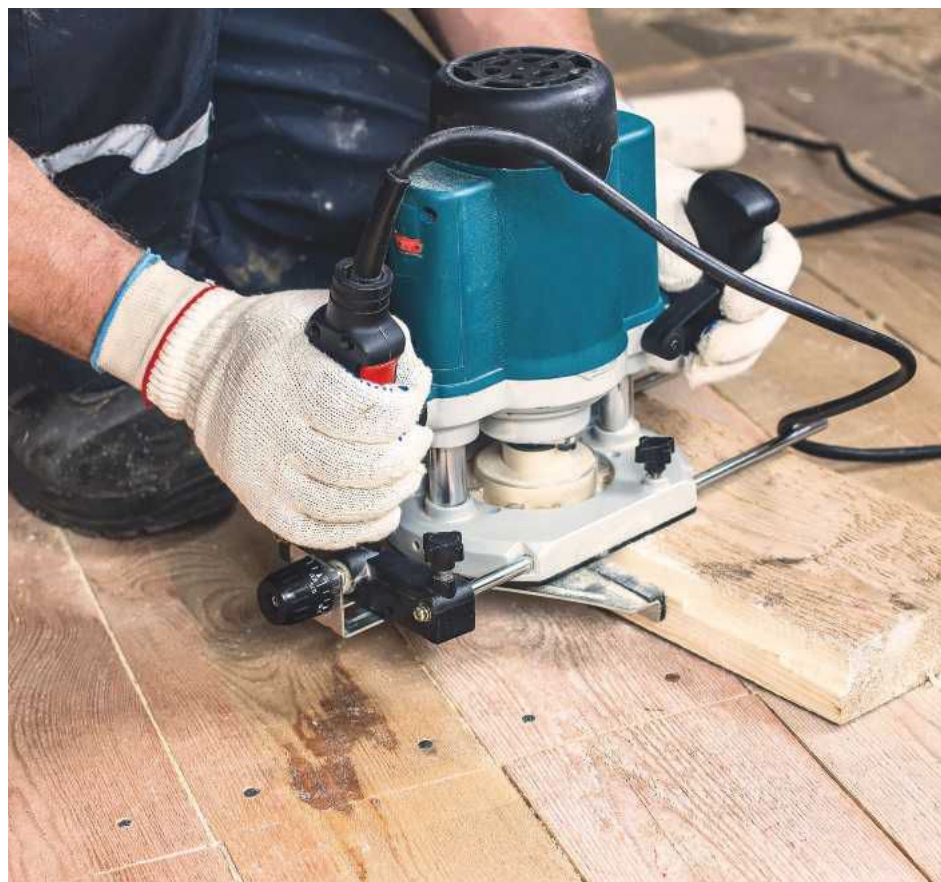
- There may be instances when a larger or different-shaped baseplate will be useful. If you make them up yourself, then try and use a clear, strong plastic of at least 6mm or thicker. Being able to see through the base will give you increased visibility

Feel, cables, visibility & extraction

Your router needs to feel comfortable.

If you are going to heft it about a lot, then it will not want to be too heavy. Conversely, a light machine might judder while in use. Trailing cables are best dealt with by hanging over a shoulder or suspended above while the router is in use; try it out to see if this can be done. Check out the cable length and size. A thin, poor looking cable will probably break down and fracture quickly. Aim for a cable length of between 3-4m long. Anything shorter will entail an extension at some point.

Check round the business end of the router to make sure there is no clutter and you can see what's going on. Routers are invariably supplied with a plastic shield to stop too much dust and muck landing up on the operator. I think it's important to see what's going on, so if you remove the shield,



Axminster APF 10 Evolution powered respirator



The 3M 6000 full-face respirator



The Trend Airshield Pro

then make sure you wear safety glasses and a facemask at all times.

Removing waste and dust from all around during operation is an important point. A good-sized extraction port is useful; one that is too small will easily clog. Think through how the extraction tube will be fitted to the port: will it get in the way while routing and impede the cut? How is the waste going to get out? Is it via that shield you have just taken off to improve visibility? If so, then put it back on again.

Dust and waste extraction is very important. Fine wood dust can be carcinogenic and waste may interfere with the quality of your finished cut or moulding. For your own protection, always wear a mask. These can be simple filter-type versions that cover the mouth and nose. I can't wear these with my glasses; I steam up. The solution to this is a full-face respirator mask with a filter and fan system. The only issue with these is that they are quite heavy and can restrict vision, but it's better to be safe than sorry!

If your router has an integrated extraction port, then fit a vacuum hose to this and suck the debris directly out of the way as you're cutting. It's especially important to take the waste away when working with a bearing-guided cutter. The loose stuff can float around and get between the bearing and the guiding edge, thus making an uneven cut. So, suck the dust out of the way and it'll help you to see more clearly as well. >



Various examples of router cutters and sets

Cutters & techniques

Where to start – there are so many! You will obviously buy the correct cutters to fit your router. With a 6mm collet their range is significant; with 8mm or 12mm the range is greatly enhanced. The choice between the smaller and larger shafted cutters should be made on the basis of the work to be carried out and the versatility required. A lot of waste removal, long and/or deep patterns require a more gutsy motor and cutter. Light, occasional work can be covered by the smaller sizes. Don't forget that larger mouldings can be built up from a series of smaller cutters.

There is a variety of different types of cutter and all will be designed to carry out a specific function or produce a unique moulding. The vast majority will have an edge tipped with hardened steel, HSS or TCT (High Speed Steel or Tungsten Carbide Tipped). Some professional cutters may be made from solid HSS and others will have some form of diamond tipping. Obviously this latter group will be more expensive. Replaceable tip cutters are another option. With these there is a main body, which houses the slip tip. These thin, straight or pre-shaped cutter tips can be replaced once worn. The cutters that keep their edges longer will generally cost more. None are cheap so look after them. Cutters tend to be supplied covered in wax, which helps to protect the edges from damage. You should also try to keep the cutters away from each other, in a rack or box, to avoid any contact; cutting edges are brittle and will chip easily.

Simple straight or profile cutters are designed for use with a fence. Roller bearing cutters are designed for freehand

operation and will follow an edge. A wide range of different sized bearings are available. By changing the bearing you may increase or decrease the depth of profile produced by the cutter. Some other edge-forming cutters will have a guide pin incorporated into the end that is used to follow a former or jig; these are most likely used with fixed-head routers.

ROUTING TIPS

- Look after the shaft of the cutter. If it becomes scored or pitted, then this will eventually affect the collet's ability to hold it firmly
- Wrap a rag around the cutter or wear gloves when taking the roller bearing off; this will avoid any damage to you

Using your router

There are a few simple techniques and rules to apply when using a portable router. Looking from above, the router cutter direction is clockwise. To get the best, in most circumstances, from the cutting action, the router needs to be moved around in the opposite direction for external cuts – anti-clockwise. Logically, the opposite rule should be applied with internal cuts: you should cut in a clockwise direction. Following these simple rules means you will have to make a positive effort to initiate the cutting sequence; if you stop pushing, then the router will go nowhere. If, however, the router is fed in the direction of cut, then the situation changes dramatically. In these circumstances, the cutter will dig in and appear to have a life of its own! As the cutter takes each chip out, it will demand more.



The whole thing is self-perpetuating and will result in the cutter attempting to remove too much waste too quickly.

ROUTING TIPS

- If you are not sure about which direction you should be cutting in, then experiment. Use a waste piece and try various techniques: the more you practice, the better you'll get at using the router
- Always test out the router cut on a piece of waste. You can check for depth, width and position, etc. By doing this you will avoid spoiling the main workpiece
- You don't have to push the router away from you when it's in operation. If you feel more comfortable pulling it towards you, then do so; just make sure you're going in the correct direction!

When you are cutting grooves, trenches or moulds along or across the grain, the action is balanced in most cases. Plunge down, in a sweeping action, moving into the direction of cut. Make sure you are at the desired depth before entering the workpiece. If executing a stopped trench, then plunge down and enter, sweeping forward again. Carry through the cut then return to the starting point, in the reverse direction, to clean up. In all these cases there are two further rules. Firstly, never try to take too much off in one go; little and often is the order of the day. Secondly, lead into the cut and keep moving; if you stop, the cutter will whizz around and burn the profile. If you have to exit, then go back or away from the leading edge.



Fixed overhead or inverted routers have similar rules to ensure you keep out of harm's way. Once more, the cutting action will grab the workpiece if it's fed in the wrong direction. There are few further helpful points to remember: when moulding around a workpiece start by cutting the end-grain first. Inevitably there will be some 'break out' as the router exits the cut and the cutter will tend to spit out the last few bits of grain. By starting across the grain, all this break out can be tidied away with the next cut. Therefore work logically: end-grain, straight-grain, end-grain and a final clean up on the straight-grain. The same applies to all types of routing - fixed or portable.

However, there are occasions when you can legitimately go in the 'wrong' direction! There may be various reasons why you choose this cut. Perhaps you can't get at or into a specific position without doing so. One thing's for sure: you will know when you are doing it

and will be prepared; hanging onto the router when it tries to run away is a good start! In most cases this cut will only, sensibly, be taking a small amount of waste off. Sometimes a finishing cut can produce a cleaner surface when you run the wrong way back around a profile. The same technique will, occasionally, remove burn or ripple marks. There are a couple of instances where it might be desirable to start a cut this way. If you are only going to mould along one end-grain edge, a reverse cut, at what would normally be the exit point, will help. Cut a bit then revert to the usual direction and as the cut finishes it will enter the pre-cut section and not break out. Housing joints across the grain can be started in the same fashion. The alternative, in both cases, is to back up the exit cutting point with a piece of waste.

Other router options

There are other options to a hand-held router:



The Minimax 600 overhead router

Fixed overhead router

These are really industrial machines but, in some cases, portable routers can be fitted to overhead slide arrangements

to create a similar effect. Generally, with a much larger working table, big workpieces can be handled. With an overhead router, repetitive production of components can be achieved efficiently and cost effectively. Simplistically, a pattern is fitted to the workpiece and this then follows a 'former' pin that projects from the table. The head of the router may be dropped into place or the work run up to the cutter. In both cases, the former pin is engaged by the pattern and the cut commenced. The job's done when the exit cut finishes at the end of the pattern.

Fixed under-table router

More useful for the general woodworker is the facility to invert his or her router in a table. Dedicated tables on the market are made by manufacturers for individual or groups of routers. Additionally, there are some specialist tables that will take a variety of different routers from different manufacturers. Basically, the cutter projects above the table by an adjustable amount, and fences, guards and pressures are then set. Subsequently the workpiece is fed through and the mould, groove or rebate is cut. Alternatively, using bearing-guided cutters, a workpiece can be moulded from all angles across a flat table.



A few examples of portable routers fixed under a table

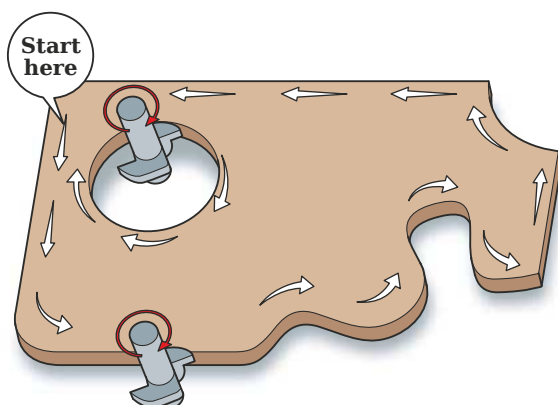


Diagram showing the direction of cut

Feed Direction Rules

- Always feed the router against the rotation of the bit. This prevents the router from grabbing the wood and self-feeding, resulting in loss of control.
- When routing around the exterior of a shape, feed the router anti-clockwise.
- When routing around the interior of a shape, feed the router clockwise as shown here.
- Begin routing across the grain end first (as indicated). This reduces tearout at the corners.

Conclusions

Our workshops can be filled with a mass of dedicated machinery, which will make the woodworker's life a lot easier - if you know how to use them! Some are essential, some are not. I'd class a router as one of the essential tools that we all need. Fitted with the correct cutters, it's so versatile and offers the user the ability to cut simple or complicated profiles, make joints and much more. I'd never not have one now. **GW**

NEXT MONTH

In GW313, moving on to looking at the plethora of power sanding options available to the woodworker, Peter talks us through the wide range on the market, offers tips for getting the most from them and also covers the broad topic of abrasives



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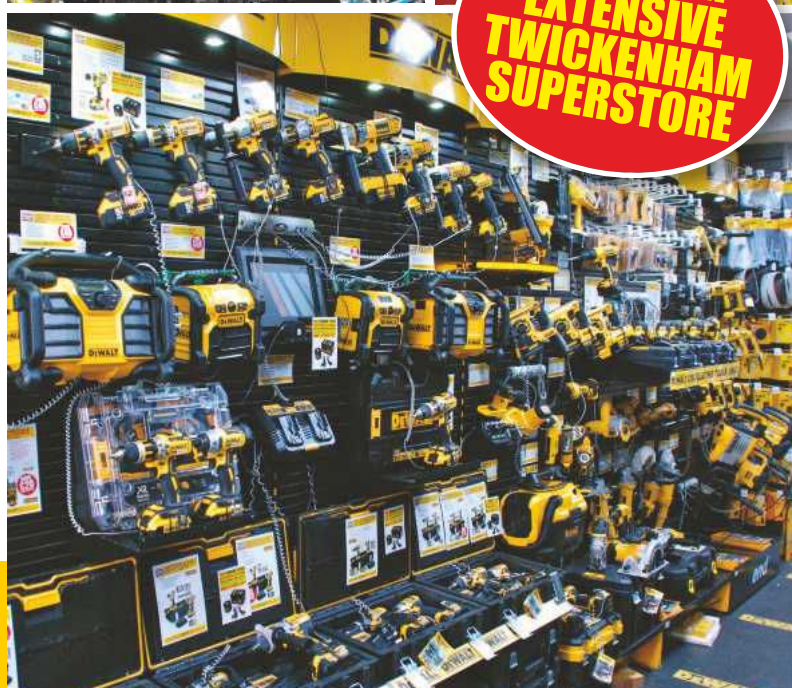
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Gluing up furniture

Carrying on with his beginners' series, **John Bullar** looks at the different types of woodworking adhesives aimed at the furniture maker and how their uses differ, as well as exploring how glues are applied and held while they set



PIC 1. Oak boards were glued edge-to-edge and then snapped using clamps. The break occurred 10mm to the left of the glue line so the glue was clearly stronger than wood!



PIC 2. Two pieces of oak were glued in a right-angled butt joint, then force applied to snap the joint. Again, the wood broke before the glue showing that even an end-grain glue joint is strong



PIC 3. PVA-type glues are among the commonest and most easy to use for general furniture work

Nearly all furniture, traditional or contemporary, relies on glue of one kind or another to hold its joints together. If the glue fails, then the furniture fails too, so it's important to use the right type in the right way.

In this article we will look at the different types of woodworking adhesives available to the furniture maker and how their uses differ, rather than just being a matter of personal preference. We will also look at how glues are applied and held while they set. 'Organised panic' is how some furniture makers describe the glue-up process; at every other stage of furniture making you can work as slowly as you like to get things right, but once glue is applied, you must move swiftly before it starts to solidify.

Stronger than wood?

Makers may tell us their woodworking adhesives are stronger than the wood itself, so can we take such a claim seriously? To make sense of this we need to look a bit closer at how strong the wood actually is.

On the face of it the stronger an adhesive is the better, although there is more to it than this. For example, some glues need to be flexible rather than brittle even though

the brittle type may theoretically be stronger. Some have to fill gaps and cope with climatic changes in wood dimensions, while others must be removable to allow for repair.

Testing strength

Wood consists of long, thin fibres lying side by side in layers. Pulled longways, the fibres themselves are immensely strong – weight for weight they can be stronger than steel. However, pulling the fibres sideways to peel the layers apart is relatively easy. So while wood is very strong along the grain, it is quite weak across the grain.

To find out which was stronger, the glue or the wood, I edge-jointed two short oak boards using a standard woodworking adhesive straight out of the bottle. The oak was fine-grained and free from any visible cracks or defects. I gave the glued joint a couple of days to cure – if I had left it longer it would have been stronger. Even so, when I broke the board apart using a pair of heavy-duty clamps, the wood split to one side of the glued-up joint (**Pic.1**).

It is commonly said that glue does not adhere well to end-grain, but I have not found this to be the case. To find out, I repeated the test on a simple right-angled

butt joint of end-grain against long-grain. Again, it was the oak that failed to one side of the glue, not the joint itself (**Pic.2**).

These tests convinced me that the glue was stronger than the wood sideways. However, a third test, gluing end-grain to end-grain, failed on the joint every time as the glue is much weaker than the wood longways.

Synthetic glues

Most woodworking glues are synthetic 'resins' developed by the chemical industry during the last century (not to be confused with resin that drips out of pine trees!). The commonest type is white liquid glue based on PVA (**Pic.3**). It is immensely strong when applied between closely fitted surfaces but it will not fill gaps. This is also sold in a water-resistant variety, which is sometimes yellow coloured. I find the water-resistant type is stronger for dry indoor use as well. This is because when it sets it forms what is known as a 'cross-linked polymer' – a plastic material that is locked together in all directions.

Polyurethane glue is waterproof and expands into semi-flexible foam as it sets, so is good for joints with gaps (**Pic.4**). >



There are many woodworking adhesives available to the furniture maker; some are similar while others are significantly different



PIC 4. Polyurethane glues are particularly useful for joints with gaps as well as where a lot of seasonal wood movement is expected

It also works well if the wood is not completely dry or outside where a lot of seasonal wood movement is expected. Because of the way it expands, polyurethane can be messy to use on tight-fitting joints so I would avoid it for fine furniture.

Powdered synthetic resin is mixed with water to make a thick paste that does not shrink much when it sets, so it will fill gaps between rough surfaces, forming a hard layer (**Pic.5**). It is ideal for laminating sheets



PIC 7. Two-part epoxy resins are ideal for fitting small decorative features or for embedding metal reinforcements into joints



PIC 8. Pearl glue, also known as hide or scotch glue, was traditionally used by all furniture makers while it now tends to be used only for antique repair and musical instruments



PIC 5. Glues made from powdered synthetic resin are good for spreading over large areas

of this wood together, such as when forming a curved panel or beam.

Urea formaldehyde resin is supplied with a separate liquid hardener, which is painted onto the opposite surface from the glue (**Pic.6**). This means it will not start to cure until the joint is pressed together, making it ideal for complex constructions. As a testimony to its strength, this resin was originally developed and approved for building wooden frames in aircraft.

Epoxy resin is made by mixing adhesive with a hardener (**Pic.7**). Small tubes of paste mixed in equal parts are ideal for fitting decorative features. Large cans are mixed with a small tube of concentrated hardener and ideal for jobs such as embedding metal reinforcements into joints. Mixing the correct amount takes good judgement and, while good for gap filling, the cured resin is not flexible.

Natural glues

Traditionally furniture makers and other woodworkers used glues made from boiled down animal skin or bone. This is still available and sold as hide glue, pearl glue, scotch glue, etc. This natural glue is immensely strong and can be removed and replaced if repairs are necessary, making it ideal for antique repair and high quality



PIC 9. Pearl glue mixed with water is heated until it forms a thin gel that thickens within a few seconds of cooling



PIC 6. Resins with a separate liquid hardener are immensely strong for close-fitting joints where a long open time is needed

musical instruments (**Pic.8**). The disadvantages are that it must be used fresh and hot while the finished joint will decompose in damp conditions.

An alternative way of using hide glue, which is still compatible with traditional glues, is in a modern solvent-treated form. This avoids the need for heating and allows a much longer open time before it starts to set (**Pic.10**).

Flexible glues

Furniture makers often need to make temporary fixings such as to tack components in place while the joints are worked on. Hot-melt glue sticks are great for this and while the joints they make are not particularly strong, they can be carefully undone without damage (**Pic.11**).

Individual tasks, such as fitting a padded lining in a box or glass and mirrors in a cabinet, call for specialised adhesives made for the purpose, rather than making a poor job with woodworking adhesives (**Pic.12**).

Screwed & glued

One of the simplest and most reliable woodworking joints for less experienced furniture makers is the screwed and glued joint (**Pic.13**). Ideal for plywood or other manufactured boards where you do not need to consider seasonal movement, the joint is



PIC 10. Modern solvent-treated hide glue avoids the need for heating and allows a much longer open time



PIC 11. Hot-melt glue sticks are handy for temporary fixings and for sealing gaps, such as in a dust extractor

made with small blocks screwed and glued to both boards.

After careful positioning the joint can be tightly dry-fitted to test alignment, then unscrewed before applying glue for final assembly (Pic.15).

Edge joints

If you plan to use solid wood in making larger pieces of furniture, then you will need a way of joining boards edge-to-edge. Simply gluing board edges along the grain is the most effective method, but they must fit tightly together if the joint is to be strong and inconspicuous and this calls for careful planing.

With the boards clamped face-to-face, then any small inaccuracy in the angle will cancel out when they are pressed together (Pic.16). By holding the edges together before gluing with a bright light behind, you can check they will fit without any gaps, otherwise it may be necessary to plane them again.

Once the edges are true they should be



PIC 16. When preparing an edge joint the two boards are clamped face-to-face, then the edges are planed as a pair



PIC 12. Rubber-based glues can be useful for highly flexible joints, such as fixing soft fabric linings in furniture

lightly coated in glue and pressed together with sash cramps positioned every 200mm or so (Pic.17). Larger boards require more clamps, fitted alternately above and below to even out the pressure.

Edge joints made with traditional hide glue do not require clamping (Pic.19). When the freshly glued edges are slid against each other the glue forms a 'rubbed joint' that holds itself together while it sets (Pic.20).

Pinned joints

Dowels are short cylindrical rods that can be glued into drilled holes to make a basic pinned joint. Because they can be drilled at



PIC 14. Adhesive is applied to pre-drilled and counter-sunk blocks, which are positioned along the line



PIC 13. A screwed and glued joint is started by marking the position of one board against the other with a pencil line

any angle, dowelled joints are versatile and fairly simple to make, although alignment requires great care (Pic.21). In coming articles we will look in some detail at how to cut mortise & tenon joints and dovetail joints that consist of a shaped pin fitted into a matching socket (Pic.22).

In all these pinned joints there is a choice between applying glue to the pin, (which tends to get rubbed off), to the socket, (which tends to get pushed in) or to both, (which ensures there are no dry areas.

For neatness of work apply the minimum of glue to a pin, especially near the top so the glue does not ooze out of the closed joint. >



PIC 15. With glue applied to all the contact surfaces the joint is screwed together



PIC 17. The planed edges are evenly brushed with a layer of white PVA-type adhesive



PIC 18. The boards are clamped edge-to-edge while the glue sets



PIC 19. Traditional edge joints made with hide glue need to be quickly worked and do not require clamps



PIC 20. Instead of clamping, the glued edges are rubbed together for a few seconds until the joint grabs

Clamping up

Clamps (or cramps as they are sometimes known) are mechanical devices for holding wooden components together while the glue between them sets. Their job is to provide a steady, even force without causing distortion (Pic.24). Wooden blocks placed between the clamp and the furniture protect the clamped surfaces from bruising and also prevent steel coming into contact with steel, which can cause wood stains.

Because of the large number of possible component and joint shapes, clamps come in many shapes and sizes and for good brands they are expensive, especially as they can be needed in large numbers (Pic.25). For one-off jobs, simple clamps can be improvised using rope twisted around a stick, like a tourniquet.

Different glues have different 'open times' – that is the time you can allow from applying the glue to finally closing up the joints. After this time, all the clamps should be in place and adjusted to their final pressure, so there can be no small movements of the wood that would weaken the freshly formed adhesive bond. This calls for careful planning and rehearsal while laying out all the components, clamps, blocks, etc. in the positions they will be needed.

With more complex pieces of furniture, it is worth considering how frames, etc. can be glued up in steps as sub-assemblies, so as to reduce the open time at each stage (Pic.26). It is also worth remembering that increased temperature reduces the open time, so you need to work faster on hot days (Pic.27).



PIC 25. Sometimes a large number of clamps is necessary to pull evenly in both directions

When not to glue

It is not always necessary or even wise to glue joints. When there is likely to be wood movement across a joint, such as between the frame of a cabinet and its top, it is better to use slotted screw holes lubricated with wax.

Conclusions

We want glue lines on furniture to be invisible while immensely strong. Using one favourite type of glue may be acceptable for general woodworking but furniture making calls for a broader approach. Knowing which type of glue to use where, as well as how to apply and set it, will ensure your furniture making skills gain a reputation for quality and reliability.

Gluing up is the one process where we need to move quickly, otherwise all the effort and cost invested in carefully made components could be wasted. **GW**



PIC 23. It is helpful to rehearse by fitting joints dry before gluing them, but it's best not to fully fit them as they may be damaged by pulling apart



PIC 21. Dowels are versatile components for making simple glued-up joints without specialised knowledge or equipment



PIC 22. Pin and socket joints, such as this mortise & tenon, can have glue applied to some or all contact surfaces



PIC 24. An array of clamps holds components in place while the glue sets



PIC 27. On the underside of a solid wood cabinet top the use of glue is avoided by using screws in slotted holes to allow for seasonal movement



PIC 26. Awkward and irregular shapes like this chair seat can be pulled together with a strap clamp

NEXT TIME

In GW314, John will look at the best ways of making mortise & tenon joints. These simple pin and socket joints that have been proven over centuries to hold the corners of cabinets, tables and chairs together, resist the forces of nature and the stresses of everyday use

No other classic circular sawbench comes close when compared to the Scheppach Precisa 6.0. This ultimate circular sawbench boasts a massive solid cast iron table: accuracy to within 1/10th mm; 110 mm depth of cut on solid timbers: up to 1100 mm cutting width and 1400 mm length of cutting stroke with appropriate optional attachments. An adjustable 8-15 mm grooving cutterhead and pre-scoring with integral motor unit is also available on request. Scheppach Precisa Series circular sawbenches are simply the best investment you can make in a classic circular sawbench if quality, precision and performance are included in your priority list. Why would you even consider compromising?

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Precisa 4.0-P-2
Professional Series



Precisa 3.0-P-1
Workshop Series

Model	Product Group Series	Specification includes (as per quoted price)	HP 240V / 415V	Depth of cut & Length of stroke	Price Exc VAT Plus Carriage	Price Inc VAT Plus Carriage
Precisa 3.0 P-1	Workshop	Inc STC + TWE + TLE (see below for explanation)	3.5 / N/A	90 mm x 1400 mm	£1,208.33	£1,450.00
Precisa 4.0 P-1	Professional	Inc 1.4m STC + TLE (ditto)	3.5 / 5.2	87 mm x 800 mm	£1,800.00	£2,160.00
Precisa 4.0 P-2	Professional	Inc 1.4m STC + TWE + TLE (ditto)	3.5 / 5.2	87 mm x 800 mm	£2,025.00	£2,430.00
Precisa 6.0 P-1	Professional	Inc 2m STC + TLE (ditto)	4.0 / 6.5	110 mm x 1400 mm	£2,400.00	£2,880.00
Precisa 6.0 P-2	Professional	Inc 2m STC + TWE + TLE (ditto)	4.0 / 6.5	110 mm x 1400 mm	£2,600.00	£3,120.00
Precisa VR P-1	Professional	Inc 2m STC + TWE + TLE + scorer (ditto)	4.0 / 6.5 + HP scorer	110 mm x 1400 mm	£2,950.00	£3,540.00

STC = Sliding Table Carriage. TWE = Table Width Extension. TLE = Table Length Extension.

Scheppach Precisa 3.0 is designed by Scheppach in Germany but made in China where Scheppach resident engineers oversee manufacturing quality control. Precisa 3.0 has the same warranty as Professional Series. Scheppach machines have been sold and serviced in the UK by NMA since 1972. Go to nmatools.co.uk and see what users say about NMA inprecedented service.



trend[®]
routing technology

The evolution of routing

We find out more about our Router Special sponsor **Trend**, a company that has been instrumental in establishing routing in the UK since the 1950s



ABOVE: Early fixed-base router

If we are going to chart the evolution of how routing began, we need to go back to the 1950s, when the spindle moulder was well established as a heavy-duty machine for the joinery shop. However, at this time, people were realising that for light work, this machine was like using a hammer to crack a nut, and so wood engineers across the globe started to think in terms of a hand-held moulder with an adjustable base that would allow users to be able to see both the depth and width of cut. However, it took a group of engineering firms in South West Germany, whose forebears were Swiss immigrants skilled in clock making, to develop the 'plunge' router, featuring retractable spring-loaded columns and a range of guides and jigs to give versatility to routing operations.

Early beginnings & current ranges

Trend introduced plunge routers in the UK under the Elu brand in the 1950s, and over the following few years introduced a number of innovations for routing, including variable-speed control for the router, dust extraction devices, top-mounted ball-bearings for router cutters, as well as the first affordable dovetail attachment.

Trend have been at the forefront of routing technology for many years. The company offers a number of router cutter ranges to suit end user's requirements; there is a variety of router cutter sets available to those new to routing; a router cutter range for the professional; a concise range for the trade user; the CraftPro range, which is aimed at the woodworker, and to cater for industrial users, there is the Industrial range of tools that is specifically designed to be run on Computer Numerical Controlled (CNC) routers.

UK's largest range Professional

Trend's Professional range features the largest number of router cutters in the UK. These Tungsten Carbide Tipped (TCT) versions are manufactured using D-Namic manufacturing technology. The cutters have specially developed micro-granular TC tips and are designed to withstand the most abrasive of materials, therefore giving a longer life. The tool's highly ground tip face ensures perfect sharpness and gives a cleaner cut on softwoods, hardwoods, MDF, plywood and chipboard. These cutters are made using advanced automated grinding machines that improve the carbide's resistance to wear and gives longer life.

when cutting abrasive materials. The straight cutters feature radial ground clearance for greater support to the cutting edge, and straight cutters over 9.5mm diameter feature a TCT centre tip for plunge cutting. Production is fully automated on custom-designed and built machines to give the highest level of accuracy and precision. The manufacturing process also involves the continuous laboratory testing of tools.

Straight or spiral fluted solid TC tools are also available in this range, offering durability and longer life in solid wood and abrasive board, as well as faster feed rates.

The Professional range also includes single-piece High Speed Steel (HSS) for softwood and speciality tools for the window industry. These are turned and milled from a single piece and are ground with a very fine edge for superior cuts in softwood.

Trade

To suit the trade user, the Trade range comprises tools with a PTFE non-stick coating and the cutter sizes are specifically chosen and aimed to suit the particular needs of the tradesman.

The cutters are micro-granular TCT with a highly ground face to ensure a superior finish on softwoods, hardwoods, MDF, plywood and chipboard. The PTFE non-stick coating also minimises resin and heat build-up, especially on softwood for longer life. There is a bottom cut feature on straights and the cutters feature extra long shanks and etched dimensions for quick identification. The tools are also supplied in practical plastic tube storage cases, which helps to provide excellent protection.

CraftPro

The CraftPro router cutters meet the needs of the woodworker and tradesman for quality and performance and specially designed PTFE-coated TCT tooling with micro-granular TC tips ensure perfect sharpness on

softwoods, hardwoods, MDF, plywood and chipboard. The highly ground tip face also allows the cutter to maintain its edge and there is a bottom cut feature on straights.

Industrial

The Industrial range of profile and straight CNC machining tools are designed for demanding applications in the manufacturing industry. Tools available are for use in router and machining centres with CNC control and are produced in fully automated custom designed and built machines to give the highest level of accuracy and precision. This range includes Polycrystalline Diamond (PCD), Solid Carbide Spirals and Disposable Insert tools. PCD cutters give a significant increase of tool life, accuracy of cut throughout the life of the tool and allow faster feed rates, along with reduced downtime. Disposable Insert tools also help to minimise down-time.

Routing jigs

Over the years, Trend have also introduced a number of woodworking jigs for the home woodworker and the tradesperson. There are dovetail jigs to suit material measuring 300mm and 600mm wide and these jigs use a template guidebush that follows a comb on the jig that cuts both parts of the joint in one pass for lapped dovetails. Additional templates allow through dovetails to be cut.

Using the router as a tool for accurate joints led to the development of the Mortise & Tenon jig, which is fully adjustable and includes clamps to ensure the material is held securely. The jig uses a different diameter of straight cutter to cut the mortises and by adjusting the size of guidebush used, the matching tenon is created.

There have been routing jigs that can be used to rout recesses for hinges and locks in doors and frames, those



Trend's popular Mortise & Tenon jig



Examples of the extensive number of cutters in Trend's Professional and CraftPro ranges



The Kitchen Worktop Jig features markings that are engraved for the identification of pin holes

used for cutting kitchen worktop joints, grooves for draining boards, Belfast sinks and even a jig for recessing hot rods in solid timber worktops. Other specialist jigs include the unique Scribe-Master Pro that allows skirting and dado rails to be scribed quickly and accurately using a router.



Templates, sub-bases & guides

There are also numerous routing templates and sub-bases available that can be used to provide router support when edge moulding, or to allow circles to be routed; there are also templates for sign making, mortising and inlaying. Self-clamping straight guides can be used for grooving and trenching with the router, and there is also an adjustable template frame called the Varijig that allows squares and rectangles to be cut into boards.

Fixed-head routing

Hand routers have evolved from fixed-base machines to plunge machines. Fixing the router inverted allows it to become a mini spindle moulder, so this machine really has come full circle. Inverted routing allows smaller components to be machined more safely, and gives more accuracy when jointing. Having a stable platform also allows larger cutters to be used. The router can also be held in an overhead mode and this facilitates copy routing using a pin guide against a template.



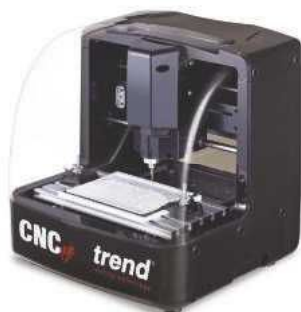
Trend's Letter & Number Templates can be used with any plunge router to write words for signs, including house names and numbers

Computer controlled routing

CNC routing has moved the router further forward: the router head is programmed to follow a path and to create the shape required. CNC routers can vary in price from large industrial machines that can accept 25mm shank router heads to small bench-top models such as the CNC Mini Engraver, which was introduced by Trend a couple of years ago.

Future developments

Trend now offer tooling with 2,000 variations in sizes and profiles, from entry level DIY to router cutters for industrial CNC machinery.



CNC Mini Engraver – miniature desktop engraving machine for 2D and 3D engravings, photo images and routing projects

TREND'S LATEST ROUTERS

Trend T4 – ¼in collet

This router is lightweight and easy to control for home use and is suitable for such jobs as hinge recessing and edge work. Dismountable from the base, the unit can be used for freehand carving, die-grinding or used in a drill stand or clamp. The 850W variable-speed motor runs between 11,500-32,000rpm and will accept ¼in, 6mm and 8mm cutter shanks. A spindle lock aids cutter changing and the base will accept standard guidebushes. Supplied complete with three collets, 34mm dust spout, 16mm guidebush, side-fence and storage case.



TREND T4: 850W light duty router

Trend T5 – ¼in collet

The compact design and low weight of the T5 make it ideal for use on intricate work and a spindle lock and hex collet nut allow for easy cutter changes. Electronic full wave variable control allows for a fine finish on all types of material and the soft-start feature eliminates sudden movement of the machine on start up. An adjustable twin-rod side-fence is ideal for guiding the router along a straight edge and new features include increased power, soft grip handles, low profile dust spout and an ergonomic spindle lock.



TREND T5: 1,000W medium duty router

Trend T10 – ½in collet

The 2,000W motor has a soft start with full wave electronic variable control for constant speed under load for a fine finish on all types of materials. The T10 has an adjustable inner plate for guidebush accuracy, a three-position revolving depth stop for fast adjustable setting and the two column precision base features large phosphor bronze bushes for plunging accuracy. The T10 also features an adjustable twin-rod parallel side-fence guide with integral micro-adjuster for straight edge work.



TREND T10: 2,000W tradesman router

Trend T11 – ½in collet

The T11 is the highest spec router produced by Trend and has many features for use either freehand or when mounted in a router table. One main advantage is being able to adjust the cutter height with the fine adjuster from above as well as below the router's base, making adjustment in a table much easier. The 2,000W motor has soft start with full wave electronic variable control for constant speed under load for a fine finish on all types of material. The 80mm plunging accuracy is assured with two-column precision and phosphor bronze bushes, with a maximum cutter diameter of 70mm through the base for the fitting of larger cutters. Other features include a spindle lock for easy cutter change, fine adjuster and three-position revolving depth stop, a quick-release dust spout and side-fence with micro adjuster. Fitting for the Trend clamp guide system is included (bracket required) and recesses for the quick-release kit, for fast fitting in Trend tables. Both clamp guide kit and quick-release kits are optional.



TREND T11: 2,000W workshop router

For the future, Trend will be developing more router cutters to add to their new ranges, as well as introducing a number of innovative new routing jigs and accessories.

"There is no stopping the advance of this fascinating tool that truly is a 'workshop in itself'," said company founder Jim Phillips, who predicted that new technology will not demise the router as we will increasingly need 'living' materials around us: "Natural wood will always hold its own in a 'plastic' world and the router will continue to provide the means of producing warm and friendly shapes in wood."

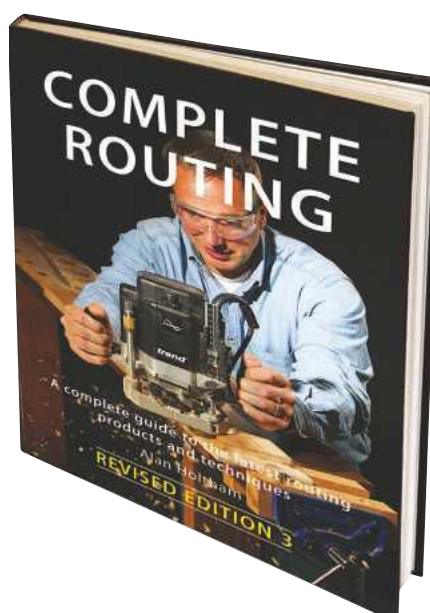
It's clear to see that the future is bright for this ground-breaking company, who continue to lead the pack in terms of routing technologies, and if their current range of pioneering machines, cutters, jigs and templates are anything to go by, then their forthcoming offerings are only going to be bigger, better, more sophisticated and ultimately, more fun to use. **GW**



The CraftPro Router Table is packed with the necessary features to maximise the versatility of all popular portable routers



As well as developing their routing technology, Trend also excel in the manufacture of personal protective equipment, such as the ever-popular Airshield Pro



Complete Routing is published by Trend and is a comprehensive guide to the latest routing products and techniques

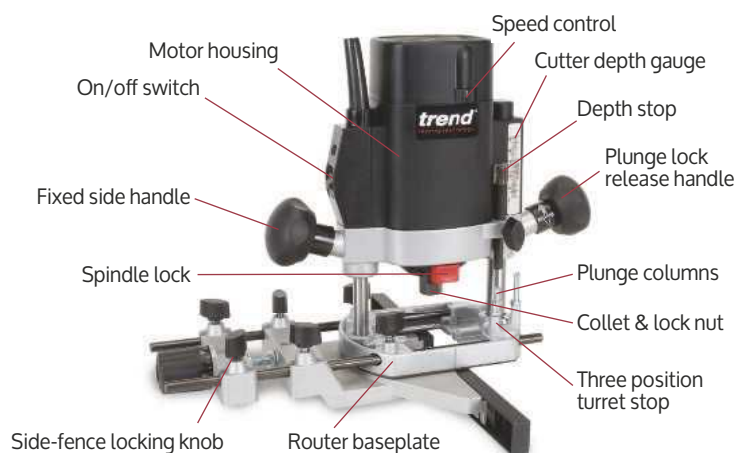
KNOW YOUR ROUTER

Driven by a compact, high speed motor, the modern electric router is a versatile and adaptable power tool, capable of machining wood, plastics and aluminium.

Modern plunge routers (such as the Trend T5E V2 shown) are designed for safe handling, easy control and reliability. A smooth sprung plunge action ensures that the cutter enters and withdraws cleanly and squarely from the surface of the work, safely retracting the cutter above the baseplate. Cutter installation is simplified by use of an integral spindle lock, while micro-adjustment of both the depth gauge and side-

fence ensure precision and accuracy when routing. An easily accessible, quick action switch allows for smooth and positive control.

Limited only by the experience and inventiveness of the user, with careful selection of the correct cutter to suit a specific application, the plunge router can be used to produce very accurate work to a fine, quality finish. Being simple and functional in its design, a working knowledge in handling the router is not difficult to attain. A little experience will quickly encourage both amateur and professional craftspeople to both intensify and extend the use and scope of routing within their hobby or occupation



The Craft Dovetail Jig allows you to create a variety of elegant dovetail joints

trend
routing technology

FURTHER INFO

Trend Machinery & Cutting Tools Ltd

Tel: 01923 249 911

Visit www.trend-uk.com for full details of their products and to find your nearest stockist

Easy-make shoe rack



Johan Molarin shares a simple beginners' project with us here, which is ideal for practising your routing skills and will ensure your hallway is always tidy as a result!

I decided to build a shoe rack for my hallway and wanted the design to look slightly different. In this article I'll take you through the steps for making your own version.

Make your own design

Firstly, be a little creative and draw your own design onto a board (**Pic.1**), cut it out using a jigsaw (**Pic.2**) and shape it by hand or on a disc sander, going through the various grades of abrasives (**Pic.3**).

The next step is to mark the other pieces for the rack (**Pic.4**). My board was a little thin so I decided to glue two pieces together, which gave me four pieces to cut out. When you cut each of the pieces, make them around 5mm wider than the original (**Pic.5**).

Time for the router

To ensure all the pieces are exactly the same size, use a router with a bearing (**Pic.6**). As you can see here, I attached the pieces together

and then cut out the larger pieces (**Pic.7**). I then glued them together, two pieces on top of the other, to give a total thickness of four pieces, before securing with several clamps (**Pic.8**).



STEP 1. Be a little creative and draw your own design onto a board

Round off the edges & paint the rack

I think that rounding over the edges gives this project a much more professional appearance (**Pic.9**). Before you make the holes for the rods,



STEP 2. Next, cut out the design using a jigsaw...



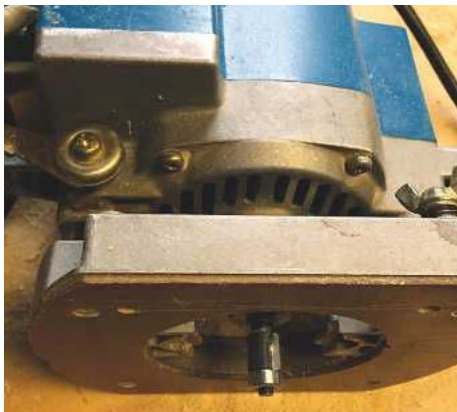
STEP 3. ... then shape it by hand or on a disc sander



STEP 4. Mark the other pieces for the rack



STEP 5. When you cut each of the pieces, make them around 5mm wider than the original



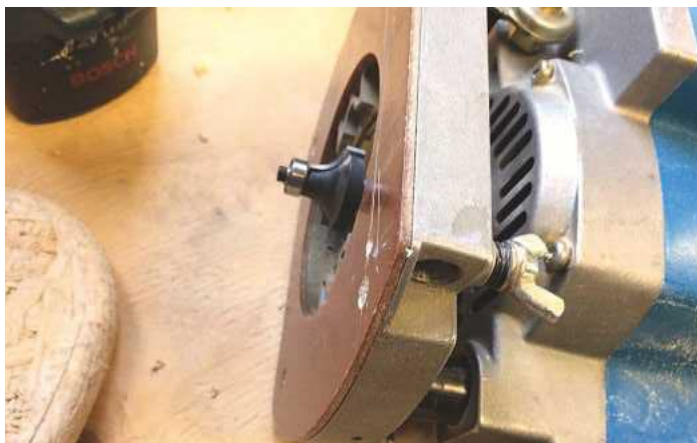
STEP 6. To ensure all the pieces are exactly the same size, use a router with a bearing fitted



STEP 7. Attach the pieces together and then cut out the larger pieces



STEP 8. Glue them together, two pieces on top of the other, to give a total thickness of four pieces, before securing with several clamps



STEP 9. I think that rounding over the edges gives this project a much more professional appearance



STEP 10. I decided to paint the ends of my shoe rack white, although you could choose any colour you wish



STEP 11. The best piece of equipment for drilling the holes is a pillar drill



STEP 12. Next, cut the dowels to length using a mitre saw

paint the sides. I decided to paint the ends of my shoe rack white, although you could choose any colour you wish (Pic.10). For the rods, I chose to use pieces of thick dowel, which hold the shoes perfectly. On my first run, I painted the sides after making the holes, but this makes the process harder as the paint then drains into the holes, which you don't want.

Next, measure the width of the dowels and drill holes the same size, but preferably slightly larger. If the holes aren't completely straight, the dowels will sit crooked and this will affect the usability of the rack – trust me, I speak from experience! But if the holes are slightly bigger, >



STEP 13. Take your first piece of dowel and insert it into your first hole



STEP 14. Repeat for the other eight holes

it's easy to twist the dowels and adjust as necessary. The best piece of equipment for drilling the holes is a pillar drill (Pic.11).

Assemble the shoe rack

Decide how long you want the rack to be (it's a good idea to measure the space it's designed for), then cut the dowels to length using a mitre saw (Pic.12). If you wish, you can

paint them to match the sides, but I think that leaving them natural contrasts well with the painted elements. Next, take your first piece of dowel and insert it into your first hole (Pic.13). If the holes are tight enough, then you won't even need glue. Repeat for the other eight holes (Pic.14). And that's it – all that's left to do now is to add your choice of footwear (Pic.15). **GW**



STEP 15. The completed shoe rack should look something like this

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'Piggy' coffee table



"I wanted to make a table that would resemble an animal; in this case a pig"

– Alejandro Palandjoglou – industrial designer

Alejandro Palandjoglou's 'Piggy' coffee table uses CNC 2D router technology to create a piece that is not only functional and strong, but also beautiful to look at

Alejandro Palandjoglou

Alejandro is an industrial designer who focuses on creating impact through his designs. He has a broad background having worked at a graphic design agency, a furniture manufacturer, founded a successful furniture company, taught at universities and co-founded a medical device startup. He has been featured in the first book on industrial design in Argentina as well as in several design magazines.

Alejandro has applied his knowledge to designing over 100 products on the market today and his designs are both simple and functional, conveying meaning and emotion. Find out more here: www.alepalan.com

As a furniture designer and maker I like to be surrounded by beautiful furniture. When I joined Instructables.com as an artist in residence at Pier 9, we had recently moved to a new office space that had no 'lounging' area except for a sofa. We really needed a coffee table to fit this space as well, so I decided to design and make one for our new lounge.

Concept: I wanted to make a table that would resemble an animal; in this case a pig. I didn't want to create a flat surface on the top because crossing the plywood every 50mm or so would give enough area to rest a plate, cup or anything you want. The overall result was a really sturdy and strong table. **GW**

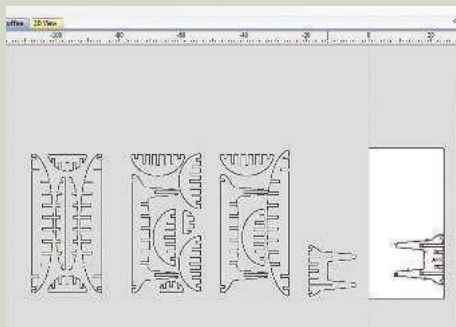
Make your own 'Piggy' coffee table

If you fancy having a go at making your own version of Alejandro's ingenious design, all the files you need can be downloaded here: www.instructables.com/id/Piggy-Coffee-Table-CNC-Router, including various Vector, .dwg and Rhino files. You can also watch a video of the table being made

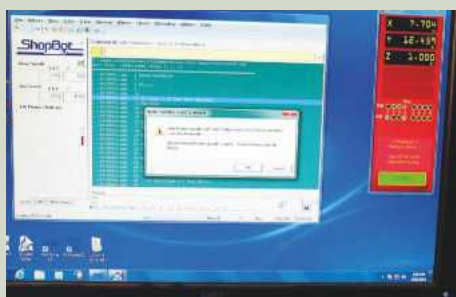




STEP 1. For the table, I used black melamine plywood in 19.05mm thickness but as you can see from the photo, it was actually 20.16mm-thick. As the design features locking parts, it's really important to make allowances for a thicker material



STEP 3. The next step was creating toolpaths using the PartWorks program and selecting the toolbit to be used – in this case a 1/4in end



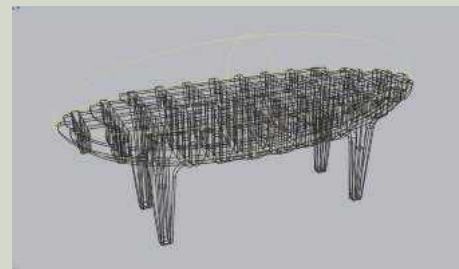
STEP 5. I then opened the toolpath file and hit start. After being prompted by a warning message to start the router/spindle, the Shopbot will then begin to make the cuts on the material



STEP 7. After I'd cut all the parts, I noticed that a few pieces were not really smooth on a few edges, which was probably due to the material not being completely flat on the worktable. I used a file and abrasives to smooth the edges away, but it would be easier to use an orbital sander



STEP 9. Using the middle section, I grabbed and marked the centre using blue tape. Next, I took the biggest 'ribs' and put them on each side. I continued doing the same with the smaller ribs and so on until I got to the leg section



STEP 2. I used Rhino to design the table. My biggest design constraint was how long the table was going to be due to the size of the Shopbot working area: 1.2 x 0.6m. I drew an ellipse with a shape that I liked and then made an ellipsoid to give a 3D view. I then decided on the grid I was going to make (viewed from the top). With that in mind, I drew some lines for each surface. Once I had all the flat pieces, I arranged them in 1.2 x 0.6m sheets



STEP 4. I then moved on to cutting the pieces for the table, using screws to attach the pieces to the CNC router's worktable. I needed to zero the machine in three axes and used the Z plate to zero the router's 'Z' axis



STEP 6. Now for the easy and fun part – sitting down next to the router and watching how the machine cuts all of the pieces. For a single coffee table, four sheets of 1.2 x 0.6m material is needed, so then I had to repeat the process for every sheet. I ran out of black melamine so I used one white melamine board that I had leftover from another project



STEP 8. Once all the pieces were machined, I organised them before I began to assemble the table. There's two of each piece, except for the one middle section



STEP 10. The remainder of the table can be finished pretty intuitively, but basically, I kept on gluing and sliding the pieces together, as shown here

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- Please outline your name, address, age and the piece of furniture you've entered at the start of the email (preferably in the subject heading)
- Please note that finalists must cover the costs of transport to the judging ceremony as well as any costs involved in transporting their piece of furniture
- Entry is open to UK residents with a permanent UK address
- The closing date for entries is 17 February 2017. Pieces will be judged on Friday 17 March 2017, so please ensure you are free on that date in case your entry is chosen as one of the final five
- All entries should be emailed to tegan.foley@mytimemedia.com and should be sent no later than 17 February 2017 – postal entries will not be accepted
- Only one entry per person; multiple entries will be discarded. Employees of MyTimeMedia Ltd and Felder Group UK are not eligible to enter this competition
- To view our competition terms and conditions in full, please visit www.getwoodworking.com/competitions

ENTRY DETAILS

To enter the competition, you must email a selection of step-by-step and process photos of your hand-made piece of furniture, which documents its build from start to finish (no more than eight photos, please), along with a short description of the piece and the processes used to make it (no more than 500 words, please).

Expert judges

Felder Group UK will select five finalists from all those who enter, each of whom will be invited to bring their piece to the Milton Keynes showroom to be judged by an expert panel, consisting of master craftsman and furniture maker, Peter Sefton; award-winning furniture and cabinetmaking expert, John Lloyd; Felder Group UK director, Matthew Applegarth; and *Good Woodworking* editor, Tegan Foley





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Letters & Makers

Letter of the month

Foggy glasses no more



⬆ Fogged up safety glasses: the bugbear of many a woodworker

Hello Tegan,
I read with interest Barrie Scott's story in GW310. I share his love/hate relationship with MDF. He mentions his issue of foggy glasses caused by dust masks; I used to suffer from that myself, until I started using a respirator. The exhaust air port is located such that there is virtually no lens fogging at all. Plus, a good respirator is a far superior choice to keep the nasty MDF dust out of one's lungs.

Cheers,
Peter in Vancouver, British Columbia

Hello Peter, and many thanks for taking the time to send me this useful tip. I have passed this on to Barrie who gives his thanks – I'm sure he will be investing in a respirator very soon! **Tegan**

To see more examples of respirators on the market, including the ever-popular Trend Airshield, see Peter Bishop's 'learning about hand-portable, powered routers' article on page 24

How much oil do you need?

Hello Tegan, I hope this may be of some use to fellow readers?

We have a plastic tank in our garden, which supplies kerosene to heat water for our swimming pool. The tank was installed as a replacement for the original metal one, which had rusted to the point at which its collapse appeared imminent. I was advised by the installer to have a Watchman Sonic device fitted, which would send information on the level of oil in the tank to a remote screen plugged into an electric socket in the garden shed.

This device worked for a couple of years and then failed; I understand the Watchman does not have a great record for reliability and installing a new battery did not bring it back to life. In any event, it did not give me a clear indication of the amount of oil in the tank but merely showed a series of horizontal bars until the level dropped to a point where a hose nozzle was displayed to indicate the need to refill.

I decided I should fit a gauge, which showed full, three-quarters, a half and a quarter. The tank is a nominal 1,000 litres, which means it can hold 990 litres with a safe ullage above. So, I can work out roughly how much space I have at any moment in time. On investigation, I found that, although the Watchman had dropped in price from over £100 to £60, a gauge would only cost £20.

When I stripped out the Watchman I found the hole which had been cut for it in the tank top was only 30mm in diameter and to fit my

gauge and float I needed a 54mm hole. The plastic of the tank top is only about 4mm-thick, so it did not present a problem. I wanted to centre the new hole on the existing one, so I used a hole saw to cut a plug about 30mm-thick and slightly less than 30mm in diameter in a piece of scrap wood. The pilot drill is quite substantial with a bore of about 6.5mm and I made sure it ran freely in the plug. I then fitted the plug in the hole in the tank and ensured it did not drop through.

I measured the diameter necessary for the threaded base of gauge to pass into the tank and fitted the appropriate hole saw to the pilot (55mm), cut a hole in another piece of scrap and made sure it was a good fit. I then pushed the plug on to the hole saw, fitted the plug in the existing hole and cut carefully through the plastic.

To my delight, when I lifted out the saw the piece of plastic was sitting inside the saw held in place by the plug! If this device fails, I will take a tanker driver's advice and make a dip stick out of a 5ft broomstick, but the gauge does look rather smart!

Regards, **Gordon Watson**

Hello Gordon – thanks very much for the handy tip. It's great to receive advice on matters not directly related to woodworking but which, I'm sure, many woodworkers will find useful in their everyday lives. I'm glad to hear that your adventures with the hole saw went well – it's not often things go so smoothly! I hope the device stays intact and that you don't have to resort to fashioning a giant dip stick, although perhaps that could make a fun project for the magazine!

Tegan

FORUM THREAD ROUTER LIFT

The UJK Technology Router Elevator from Axminster ⬆

Does anybody have any experience of the UJK Technology Router Elevator from Axminster, or any other type of router lift? I am thinking of upgrading my router table and am looking towards one of these.

Bernard Doughty

Hi Bernard,
I've heard mixed reactions regarding these types of lifts, though don't have personal experience of them. For the price, I'd be more tempted to buy a Trend T11 with built-in raiser, so giving me a dedicated table router, though if you already have a couple of routers, then the lift may be the way to go. **Doug**

Hi Bernard and all,
I was in Axminster's Nuneaton store recently

and had a look at the router lift you are interested in and was quite impressed. It's very well made and operates smoothly. It was displayed mounted in the Axminster Professional router table making a whole unit I would love to have! Whether it's worth the price depends on how much use you may have for it – and your finances of course! For now I'll stick with my little Trend router table and a trusty scissor jack to do the lifting.

Richard

Hi all,
Many thanks for your comments. I know it seems quite an expensive piece of kit but taking into account that in order to use my cupboard door making cutters, I will need to at least buy a new router base with a larger hole than I own

at present, and not to mention the need that I will have to make myself my own router table to house it, I think with everything taken into consideration, and especially after what

Richard has said, the Router Elevator looks like it will be a good buy and will certainly enhance the ease of working with my proposed new router table.

Thank you all for your combined help and views and I will let you know how my new table turns out.

Bernard



One to watch: Joshua Evans

At the age of 16, Joshua Evans began his full-time apprenticeship working for a building company renovating a manor house in Somerset and constructing a new custom home in North Devon. After three years, he completed his City & Guilds certificate. Soon after, at the age of 20, he started his own carpentry business where he mostly renovated Victorian homes, but fast forward two years, and Joshua was presented with the opportunity to move to California with a sponsorship visa through Calvary Chapel, Costa Mesa. Fortunately, the church had a fully operational wood shop, which allowed him to maintain the facilities and here he was able to make some of his best work,

including the table shown below. "While living in the UK," he tells us, "I was lucky enough to inherit a family member's tool chest, which contained perfectly preserved hand tools. During my apprenticeship, the teachers were very rigorous with teaching us how to utilise different types of hand tools when creating furniture, to carry on this aspect of the carpentry and joinery trade, thus, many of my pieces have been created thanks to the skills that I have acquired using the hand tools that I've inherited." Joshua also tells us that he enjoys designing and creating different types of projects, from a variation of tables to beds, jewellery boxes and credenzas. His favourite wood to work with is American walnut as he feels it gives the piece of furniture a certain degree of elegance, and therefore his designs are mostly inspired by a modern classical style.



Joshua's pieces have a definite charm to them and it's clear to see why he was chosen to go and make furniture in the USA – what a fantastic opportunity! We're also thrilled to hear that he inherited such a wonderful tool chest full of amazing tools, which I'm sure are in very good hands. We wish him all the very best for the future. Tegan

↑ 'Evans End Table' – includes sliding French dovetails, which extends the whole breadth of the pedestal, a book-matched top and hand sculpted legs

'Drafting Table' → features slanted maple wedges that secure the tenon in the mortise and a live edge European ash top complete with walnut butterflies



WRITE & WIN!

We always love hearing about your projects, ideas, hints and tips, and/or like to receive feedback about GW's features, so do drop us a line – you never know, you might win our great 'Letter of the Month' prize, currently a Trend Easyscribe scribing tool. Simply email tegan.foley@mytimemedia.com for a chance to enhance your marking capability with this versatile workshop aid



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From GW313, our readers' gallery will be sponsored by Johnson Tools, who have recently been appointed sole European distributors for industry leading wood adhesive brand Alcolin. To be in with the chance of winning a wood adhesives bundle, all you have to do is send us a photo or two of your latest project and tell us a little bit about it. Each month, one winning entry will be chosen and notified by the editorial team. To submit your entry, please email tegan.foley@mytimemedia.com. Good luck!

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AD16/06



Router-made blanket chest

Peter Bishop shares a router project designed for the intermediate woodworker – a lovely oak blanket chest using kiln-dried English oak, which can be made in around a week

I've recently bought an expensive router cutter for a jointing job that didn't come off and wanted to see how it worked. So, with that excuse, I was able to design this project in a slightly different way.

Please note that although many of these images show machines unguarded for clarity, you should **ALWAYS** ensure that when operating equipment the appropriate guards are in place.

Making nominal components

I had some thick planks of waney-edged, kiln-dried English oak in hand, from which I chopped out the nominal components. These were all end-sealed and stashed in the house for at least a couple of weeks. I didn't have enough solid oak for the panels so I decided to try another new technique. I had plenty of 4mm-thick oak-faced MDF offcuts kicking around, and with oak on only one face I decided to stick two together to make 8mm flat panels. Over a period of a couple of days, I spread loads of PVA glue onto the face of one panel and then 'rubbed' the other into it. Each panel was then weighed down with heavy loads. With limited weights available, only a couple of panels could be glued up at a time.

Planing to size

Once all the framing and top stuff was ready to work, it went back in the workshop to be >

CUTTING LIST

Component	Pieces	Nominal length	Finished width	Finished thickness
Top	1	1.2m	510mm +	21mm
Top rails	2	1.2m	61mm	21mm
	2	600mm	61mm	21mm
Bottom rails	2	1.2m	76mm	21mm
	2	600mm	76mm	21mm
Intermediate rails	4	460mm	61mm	21mm
Legs	8	600mm	61mm	21mm
Panels to make	6	460mm	305mm	8mm
	2	460mm	405mm	8mm
Bottom brace	1	600mm	38mm	21mm
(Plus a few lengths of softwood battens)				
Bottom panel	1	1.2m	510mm nominal	6mm



STEP 1. Care needs to be taken when marking out to avoid knots and splits



STEP 2. Store the boards inside to bring them into equilibrium with the coffer's eventual climate



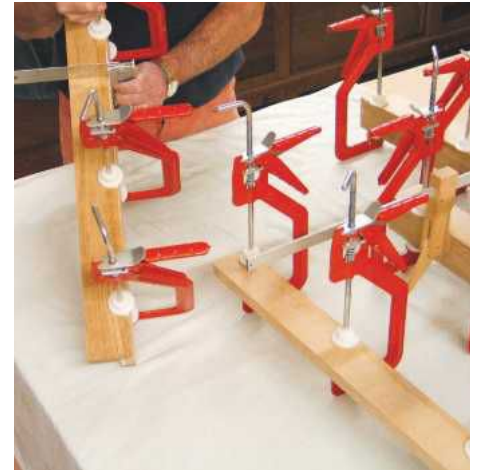
STEP 3. 'Hit and miss' is OK at the facing stage; this can be removed later on



STEP 4. The edges can then be squared



STEP 5. A multi-form router jointing cutter was used to make the leg joints



STEP 6. The two-part leg assembly is glued and cramped up. Make sure the faces are square



STEP 7. The legs are planed to their finished size along with the rest of the components



STEP 8. Marking the mortise holes on the legs



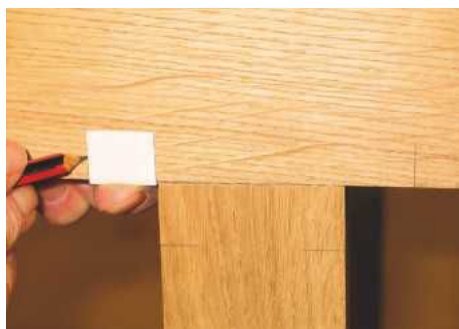
STEP 9. Pack out and chop the mortise holes



STEP 10. A straight cutter is used on the router table to cut the grooves for the panels



STEP 11. The two-part panels are then prepared and glued



STEP 12. If you fancy doing some bevelling on the frame, then mark the stop ends



STEP 13. A plastic template can be used to mark out the ends of the bevells



STEP 14. A bearing-guided bevel cutter in a router cuts the chamfers



STEP 15. Joint the front and back panels first...



STEP 16. ... then joint front to back



STEP 17. A few softwood battens are fixed in place to take the bottom

planed to size. The router cutter is a jointer that creates mirrored-edge profiles. To joint in the flat you simply mould edges and turn alternate pieces over and the joint is made. For corner jointing, a slightly different technique is required: one piece is passed flat to the bed past the cutter and the other flat to the fence. A little bit of trial and error with some gash stock of the same thickness eventually produced a good joint for me. As long as the joint is strong enough there are some advantages in creating a right-angled corner rather than a post. Firstly, you don't use so much wood and, secondly, the bottom panel is a rectangle without having to be notched to go around the corner posts.

Making the corners

Once the joints were cut the corners could be made by applying some PVA glue to the abutting faces and clamping up. The critical things here are to make sure all the excess glue is squeezed out and that, once a corner is clamped up, it is set at a right angle on the faces. I'd finished the width of the eight corner components slightly wider and longer than required. Once the glue had gone off, I then planed each corner to its finished width, to match the top rails, and trimmed to dead lengths. Now the corner posts were ready to mark out. The width of the mortise holes were then set to match the thickness of the panels. This meant that when the grooves for the panels

were cut, it would automatically form the recess for a haunch on the tenons. Care while mortising needs to be taken. Each hole must be cut parallel to the outside face so, in a machine, the clamping action forces this face against the back fence.

Tenoning the top & bottom rails

With the legs mortised the eight top and bottom rails were tenoned, trimmed to fit and this lot dry assembled. I could now work out the exact positions of the front and back intermediate, vertical rails. I also marked out and determined the length of the central, lower support for the bottom to go on. This done, the mortise holes on the top and bottom rails were cut and the intermediates tenoned to fit along with the support piece. Another dry assembly, just to check, also revealed the size of the six and two panels, which were then cut to size. The grooves for the panels were then cut on my router table using an 8mm cutter to match their thickness, then everything was cleaned up ready for gluing.

Gluing up

I glued up the front and rear panel assemblies first. The joints went up sweetly, without too much pressure, and I checked that the frame was square overall. The other important thing to check is that the corners have not gone out of square. Some adjustment to the packing for the sash cramps might be necessary to ensure this does not happen. Later, these two panels were cleaned up and then they were joined up with the ends in place. Later again, the whole lot was cleaned up ready for finishing. Some odd bits of softwood batten were then fitted >

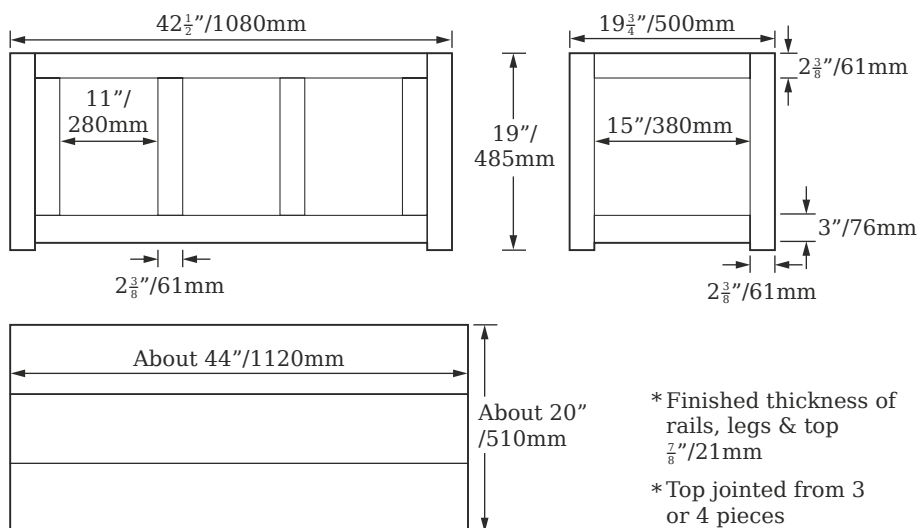
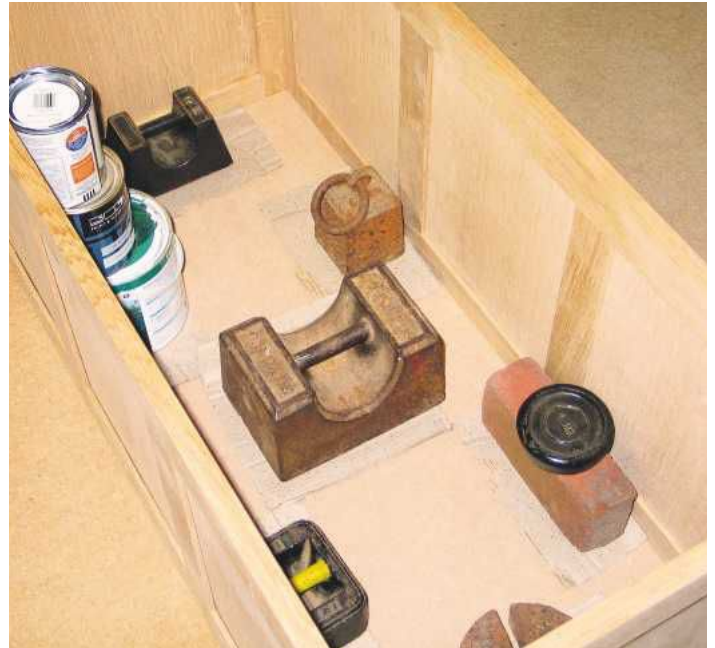


FIG 1. Blanket chest



STEP 18. Measure and finish to size the bottom from underneath



STEP 19. Apply plenty of glue on the battens, then drop the bottom in and weigh it down



STEP 20. Joining the top from a number of pieces using biscuits



STEP 21. Rub the joints and clamp the top up from both sides to keep it flat



STEP 22. A long straightedge is handy for marking the top's finished size



STEP 23. Cutting the top to width freehand on the bench saw



STEP 24. Mark the hinge positions and cut the ends

around the inside of the bottom rails to take the bottom panel. I used a piece of 6mm MDF for this, fitting it from underneath. With plenty of glue on the support battens the bottom was dropped in place and weighed down for a few hours to secure.

Making the top

While all this had been going on, I'd made the top out of three pieces. These were planed with square edges, biscuit jointed, glued and rubbed together, then cramped up. Later, all the excess glue was cleaned off and filler applied and finished flush where appropriate. With the main coffer completed, I knew the finished size of the top. I sliced a strip off one edge and planed that square. The top, at this stage, was not parallel. I marked the width and used a long sash cramp as my straightedge. This line now had to be cut freehand on the bench saw. Care needs to be taken while doing this. The edge was finished and the whole thing trimmed off to length. I left the top with square edges but they could have been chamfered.

I used an acrylic, non-yellowing, satin finish. This is great stuff but unfortunately always raises the grain more than an oil or polyurethane-based finish. Therefore, each coat had to be

sanded well back in between. On the top I applied four coats before I was satisfied; three were OK on the main chest below, however.

Fitting the hinges & chain

I fitted the three hinges to the top first. Having marked their positions, I set a straight cutter in the router and, at about 3mm deep, routed out the bulk of the waste. The rest was cut by hand and each hinge fitted and fixed. I put the top onto the main body of the chest free, not fixed, and positioned it where I wanted it. I marked the extremities of each hinge on the back rail and removed the top. The ends of the hinge recesses were cut, using a fine saw and square, and the waste chopped out with the router again. Once the recesses were finished, the top was placed safely on some supports so that I could attach it. Pilot holes and a little grease on each screw makes sure they go in smoothly. The chain, about 500mm long, and the eyes were to be used to stop the top going too far over the back and straining the hinges. Both eyes were opened and the chain fitted to one, which was then squeezed closed again. This was the eye that would go in the top. I worked out the position and screwed it in, making sure that it was clear of the side rail

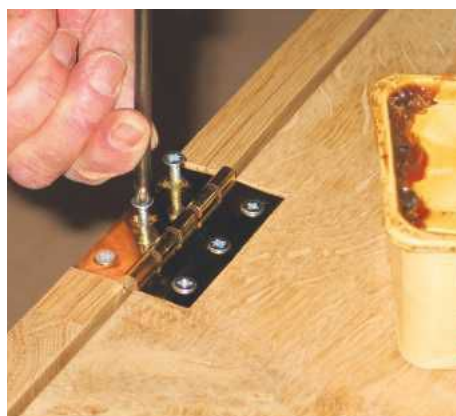
when the lid closed. The second eye was attached, the chain hooked on and the eye closed to finish. Job done! **GW**



STEP 27. Fit the eyes and chain to one or both sides of the top



STEP 25. Rout out the bulk of the waste and finish by hand



STEP 26. A little grease on each screw helps them to go in and out



STEP 28. Cut a chamfer around the top if you wish



STEP 29. The completed blanket chest, opened...



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PENTAGON TABLE

Matthew White creates a five-sided table with a twist, using router work for the top, and experiments with partially-exposed pieces for the sides and skirts



Completed photographs courtesy of @Pixl-Photography

Who here has built a four-legged table? That's what I thought; ladi dadi everybody. It's the same with three and possibly six, if you've used deployable legs to support extra leaves. What? You've got something wrong with five? Although not often seen, a five-legged table isn't too difficult by itself but provides the opportunity to expand your skills.

Design inspiration

I recently made a run through the Myst and Riven computer games and even after 20 years, I still find the artwork and style intriguing, not to mention the depth of the world imagined by Robyn and Rand Miller. Specifically, the numbering system in Riven along with their affinity for the base-5 system are unique and fairly well thought out. Since I'm working the early industrial look into the house and needed a table beside my armchairs, I thought it might be cool to sneak some gaming nerdiness in along with it.

The symbol will require a router/inlay kit, which is pretty simple but I'd recommend some practice before committing to the final product. And the legs? They're busted-out stair/banister supports from a renovation. Something told me they'd come in handy, so that's where we'll start.

Building the legs

I'm not suggesting that you should keep a supply of random stair parts lying around and I'm certainly not recommending that you procure them from your house. However, if you can reclaim some turned spindles that are relatively straight, you can save yourself a fair amount of work.

Mine came in two sizes: too long and way too long. I knew the table needed a final height of ~533-559mm, so the legs needed to be about 25mm less. Depending on the size of the skirt you'd like to use, stack cut the square ends on a mitre saw (**Pic.1**). Mine were 100mm for a 90mm

skirt. After that, mark all four at the 483mm mark and cut the round ends on the bandsaw so you don't kick anything up and make a mess. Stand them all up and check the height. If any are too long or too short, adjust as necessary.

The skirts

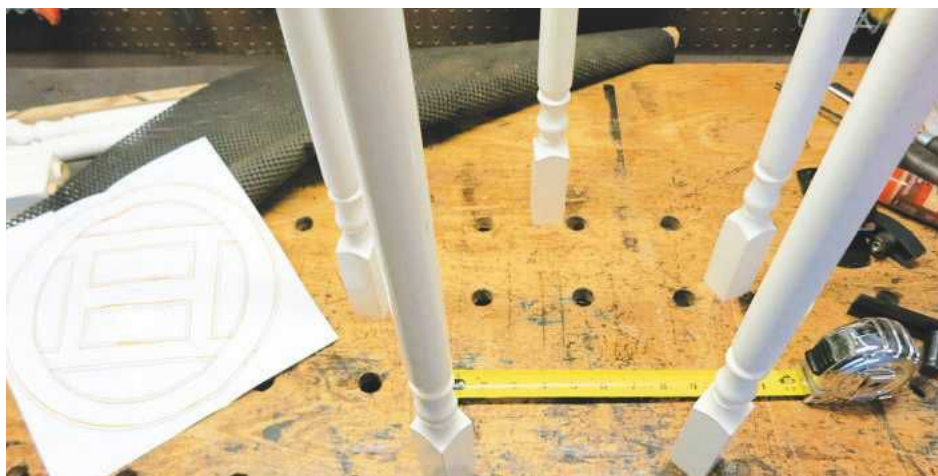
The length of the side skirts are directly dependent on the size of the top. To ensure you don't cut something too long or short, I highly recommend building it on paper or in CAD first. I find MS Publisher to be great for building primitive shapes and getting sizes right (**Pic.2**).

I planned the top to be ~255mm per side, so making room for the legs, that put the skirts at ~190mm. Rip the material for the skirts and resaw them to 13mm-thick to keep the weight down and use your preferred joining tool to attach them together.

You'll next need to mitre them to match the pentagon top (**Pic.3**). With a raw angle of 18° to cut the top, just double that to make the matching mitres (my calculations say that's 36°). The legs will be square on top so they'll just act as even spacers. >



STEP 1. I used reclaimed banisters for the table legs. Once laid out, depending on the size of the skirt you'd like to use, stack cut the square ends on a mitre saw



STEP 2. The length of the side skirts are directly dependent on the size of the top. I recommend building it on paper or in CAD before you start



STEP 3. Once ripped to length and resawed, the pieces for the top need to be mitred to match the pentagon top



STEP 4. Test fitting the side skirts and estimating the size before cutting Domino joints



STEP 5. In order to maximise material, the top will be made from several glued-up boards

STEP 6. The rough-cut top glued up and ready for trimming to final external dimensions



STEP 7. To flatten the top, I ran both sides through a drum sander. This won't be the final thickness as I'll take another pass once the symbol is inlaid



STEP 8. The Riven symbol



STEP 9. The inlay pattern attached to 6mm plywood and held with double-sided tape. Reduce the size to account for your inlay bushing



STEP 10. Making the first pass with the router inlay kit. Now the pattern is removed, use a straight bit and chisel to remove the remainder



STEP 11. The scraped-away pattern with a new set of double-sided tape attached, proving that the tape is stronger than the plywood

Since they're fairly small, the Domino XL barely fit but I used the smaller bits and spacer from Seneca Woodworking to scale it down. However, a biscuit jointer would have been just as easy. For interest, I added a small bead to the lower edge; this was made with the top of a moulding bit in my router table. Pro-tip: you don't always need to use the entire bit; we'll see this technique come up again.

Building the top

It's time to get down to business! In order to not waste a ton of material (you'd need a 394 × 152mm square to start from), I'll be making the top from several glued-up boards (**Pic.5**).

The outside angle is 108°, i.e. 18 for your mitre saw. Mark that on an end of your first board and measure the leading edge down the front, leaving a little extra for slop and continue the angle up the other side. I recommend cutting as you go to ensure the top doesn't become unmanageable.

For the last two sides, leave extra room to trim the glued-up block back (**Pic.6**). Once you're happy, break out your joint-making apparatus of choice and glue the whole thing up. From there, trim the angled sides back on the mitre saw. I suggest starting on the good side, trim to the

right, rotate the block and continue all the way around. If you want perfection, plot a circle in the centre that reaches the edges and trim back to where it meets. Don't go by measuring the outside edge since each time you make one cut, you change the adjacent sides. If you don't mind imperfections of +/- 3mm, then get close and leave it go.

Routing & the inlay

If you're not planning to add an inlay, feel free to skip ahead and I'll see you at the end. If you want to take this on, then keep reading.

The inlay kit is more for cutting butterfly keys to keep slabs from cracking apart. We're making things a little more difficult here but that shouldn't surprise anyone. The inlay uses a small carbide cutter along with a two-stage brass bushing. You'll first use the large bushing to cut the top and then use the small one to cut the piece that will be inserted.

Again, pull your reference material into Publisher and build a new version with primitives with the lines 6mm inside where they were on the original. Print the pattern and use a scrollsaw to cut it out of 6mm plywood (**Pic.9**). Use heavy-duty double sticking tape to attach the pattern to the table top – I stood

on mine for about a minute to let the glue set before continuing. From there, clamp the board to your workbench and use a plunge router loaded with the correct cutter to trace the outlines (**Pic.10**). On the table top, don't let the bit stray from the edge – this is very important – otherwise you'll end up with a large hole that you'll need to fill.

Scrape the pattern from the table and attach it to the inlay board with fresh tape (I used mahogany to complement the walnut) (**Pic.11**). Remove the outer bearing from the router and cut the pattern once more. You can cut it out completely in several passes or follow up with a scrollsaw if you're careful – as was my case since the mahogany cleared 28mm-thick (**Pic.12**).

Drop a larger cutter into your router and clean out the rest of the pattern on the table. I got within 3mm of the sides and then cleaned up the rest with a chisel. Carefully sand back the inlay until it fits, then glue it in place.

The inlay will now be sticking out of the top. I used a hand saw to cut most of it away before cleaning up the remaining bits with a plane and random orbit sander.

From there, I went back to the router table and used another subset of a moulding bit to



STEP 12. The symbol after pattern routing and due to the thickness of my stock, scrollsawing. This was later resawn by hand



STEP 13. To create a base for the legs, I applied a layer of grey milk paint and followed up with two layers of Kona/Java gel stain



STEP 14. For the top, I used a few layers of filler followed by a thick layer of gel stain. With it still sitting on the top, I dropped a load of sawdust onto the top and worked it into the crevices



STEP 15. I used a wipe-on polyurethane through a spray gun to apply the top coat



STEP 16. Sand the top between each layer at 400-800 grit to remove the last few dents and separations between the top and the symbol



STEP 17. The completed top



STEP 18. To attach the legs to the top, I used a ring of metal L-brackets on the inside to hold everything together



STEP 19. The completed table

get a table lip and bead on the edges. I also clipped the top corner off and needed to glue a new one on and try again. I'd suggest using a sacrificial backing board here.

Finishing & assembly

Since the legs were painted before and are maple, they'll need to be refinished. To create a base, I applied a layer of grey milk paint and followed up with two layers of Kona/Java gel stain (**Pic.13**). I put it on thick and didn't wipe any of it off. This helped mask the fact that they were recovered from the stairs.

The top needed a bit more work. I used a few layers of filler and followed that with a thick layer of gel stain. With it still sitting on the top, I dropped a load of sawdust onto the top and worked it by hand into the crevices around the symbol (**Pic.14**). Carefully sand everything back and get ready for varnishing.

I glued the legs up with a band clamp and then used a wipe-on polyurethane through a spray gun to apply the top coat (**Pic.15**). Sand the top between each layer at 400-800 grit to remove the last few dents and separations between the top and the symbol (**Pic.16**).

To attach the legs to the top, I used a ring of metal L-brackets on the inside to hold everything together (**Pic.18**). I did consider pocket holes through the legs but this ended up being just as easy.

And that's it! Add some felt feet, grab your linking book/smoking jacket and head off to D'ni city! **GW**

WHAT IS RIVEN?

In 1993, brothers Robyn and Rand Miller produced a computer adventure game called *Myst*. At a time when PC computing power was extremely limited, *Myst* used pre-rendered images to create an immersive environment and held the title of bestselling game until 2002.

Myst's story concerns an explorer named Atrus who has the ability to write books which serve as links to other worlds, known as Ages. This practice of creating linking books was developed by an ancient civilization known as the D'ni, whose society crumbled after being ravaged by disease. The player takes the role of an unnamed person and assists Atrus by travelling to other Ages and solving puzzles.

The series' second instalment, *Riven*, was released in 1997. One of the central puzzles of the game involved deciphering an unknown written language and numbering system. The numbers were of base-5 and the associated symbols, specifically the 5, were featured prominently among the game's artwork. Since then, it has been an integral ornament for many fan projects, with rich textures and details, which range from steampunk to modern industrial – see <https://en.wikipedia.org/wiki/Riven>



The ABC of CNC

Andy King pays a visit to **Wayne Mack**, the man behind Legacy CNC Woodworking in the UK – machines that are not only changing lives but also facilitating the rehabilitation of ex-servicemen and women. The future of CNC routing really is here!

If any of you have been to one of the bigger UK woodworking shows such as Harrogate or similar, chances are you will have come across Wayne Mack and his scrollsaw demos. He's been an avid scrollsawer for about 16 years, after abandoning a career working for a Building Society due to an ongoing leg problem, which has prevented him from continuing this line of work.

Late to the woodworking show

For most of us woodworkers, our love of wood was nurtured by a family member, developed during school or a similar set of circumstances that help to reel us in, but in Wayne's case he tells me: "I used to hate woodwork at school!" So the obvious question to ask is: why change career to carve out a living in an area you never had time for in your youth? "Well," said Wayne, "a neighbour of mine had a scrollsaw and I used to go round and watch him - I was enthralled. The next thing I knew, I was going to all the woodworking shows I could, and looking at and buying tools - I was hooked!"

After becoming a scrollsaw fanatic and getting pretty adept at it, but still only as a hobby, Wayne happened to



Wayne Mack's setup has plenty of Legacy options to rent or train on



LEFT: You can use the Legacy to make these turned spindles...



LEFT: ... or replicate screw threads – this one for a customer

meet Roger Pheby (the original owner of Wood Workers Workshop) at a woodworking show where he had a stand selling his products, one of which was the Legacy Ornamental Mill. "We got chatting," says Wayne, "and it escalated from there. The outcome was that I ended up working alongside him doing scrollsaw demos, which paved the way for me to start up as a business."

During this period, Wayne also met Andy Anderson, the inventor of the Legacy, who was often in the UK promoting it on Roger's stand at the bigger shows. This side of things also grabbed Wayne's attention due to its diversity, but more so when Andy went over to a CNC version – here was a machine that went above and beyond the standard CNCs that were being developed, and he was intrigued.

CNC Legacy courses

With this now a further area for Wayne to explore, he has since expanded and developed his business and I went along to the opening weekend of his new training centre where he concentrates on the Legacy CNC system with courses aimed at getting to grips with the machine as well as the software that drives it, hence the



How about a pierced and carved cylinder?



Or an ornate carved column?



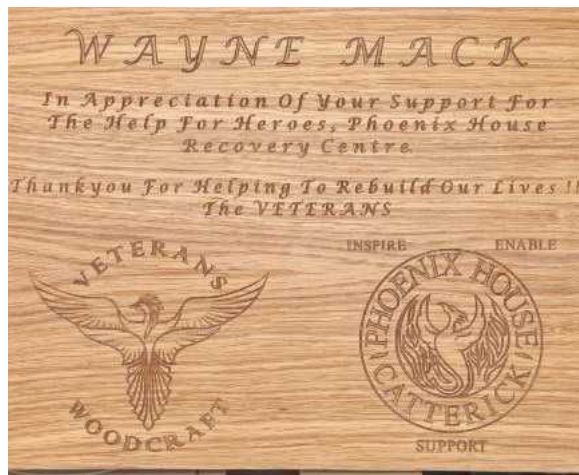
ABOVE: Perhaps you want to do some mortise & tenon work?

reason for my visit to his new premises; especially as Andy Anderson had flown in to attend.

Like Wayne, I am a big fan of the Legacy, and I met Andy Anderson around the same period as he did when Andy first came to the UK – he and Roger paid a visit to the GW workshop when we were based in Bath.

Although the Legacy hadn't evolved to the CNC stage quite yet, Andy set about showing me just a few of the things it could do, and somewhere in my workshop I still have a spindle with a barley twist middle, an octagonal end section and a candlestick acorn cup at the other end, all achieved on the Legacy in a matter of minutes. While this was merely a drop in the ocean compared to what this original concept could achieve, move on a few years and the new CNC versions are a huge step forwards, capable of flat and raised CNC work but also the turning work of the original Legacy Ornamental Mill, and a lot more in between, including repeat work for furniture making, as well as jointing.

RIGHT: The Legacy can also be used for carved lettering and engraving work – it really does do it all!



RIGHT: Wayne was ready to discuss the setup of the machines and the courses...

FAR RIGHT: ... while the inventor Andy Anderson was on hand to demonstrate any technique



The man behind Legacy

So before we got too engrossed, I managed to steal a bit of time with Andy to ask him to explain the Legacy in more detail as well as telling me about his own background. If you've ever met him, you'll know he is a very friendly and laid back sort of chap with loads of patience, which I guess you need when it comes to trying to get your head around a computer program with so many variables – it could quite easily make your head spin!

That said, Andy pointed out that his team back in the USA has designed the program that drives the Legacy machines from scratch so that the learning curve is easy for a novice to contend with, so you don't become despondent and lose interest early on.

The basics allow you to do simple CNC work to gain confidence and begin to understand what each input does, and once you are comfortable with the basic inputs needed to drive the machine, it's a program that will grow with you as you explore its abilities, allowing you to do some very clever and elaborate tasks along the way.

Even so, Andy also pointed out that any errors are not down to the program; it can only do what it's told to do! I guess it's along the same lines as the old adage of 'measure twice, cut once' so good advice is to check the inputs and tool selection on the screen before you start things rolling and all should be good. To help with this there's also a simulation program that maps all the cuts on the screen to show what the Legacy will do once it's set in motion, so you can be sure it will do what you want beforehand – very clever indeed!

The Legacy Ornamental Mill

So back to the Legacy itself and how it has evolved. I was interested to hear how Andy's interest in this area of woodworking began, but received the tongue in cheek response of: "I'm just a poor farm boy from the sticks in Utah." But pressing him further, he went on to tell me that one of his grandfathers was a cabinetmaker while the other was an engineer involved in aerospace development, so therefore it was certainly good founding to develop a machine that involved both woodworking and engineering regimes.

Andy told me that he moved on from school to train as a mechanical designer and from there the first Legacy Ornamental Mill was born in 1989. There were no such thing as computers to drive this machine, it was all hand cranked, operating a variety of interchangeable cogs and gears that advanced the router through the work while turning the work as necessary. Around 15,000 machines were made during a 20-year period, during which time the CNC-driven machines were developed.



The first models came to market in around 2005 and in their various sizes, styles and capacities there are currently around 200 made per year, which doesn't sound a huge amount but these are specialised machines that are precision engineered. Each machine is manufactured with excellent attention to detail and each one is hand-built, so they can definitely be regarded as a bespoke product, and the service that comes along with that is also extremely high-end.

Whatever the choice of machine, from the entry level Explorer through to the Gemini, which is capable of working up to 2.4m between centres, they are all capable of identical working practices, although the smaller entry level models require a simple swap over to benefit from the turning/cylindrical carving and moulding functions.

Veterans Woodcraft

With the opening event well underway it was great to see plenty of people dropping by to look at the setup as well as seeing machines running in various modes, such as flat engraving and cylindrical relief carving. A couple of customers also dropped by with requests for pieces to be made, including a replacement threaded leg, which wasn't a problem for the Legacy system or indeed Andy and Wayne's ability to set up the software accordingly. There's one avenue, however, that both Andy and Wayne are heavily involved with in their respective countries, and that's working with the disabled. They both have strong links with the Armed Forces and the rehabilitation of injured servicemen and women.

At the event I met up with the founders of Veterans Woodcraft who work alongside the Help for Heroes Phoenix House Recovery Centre in Catterick, Yorkshire, to help reintegrate injured servicemen and women back into society, and the Legacy system is a great help in facilitating this.

The founders of the company - Chris Morgan, Ted Grainger and Bob Taylor - are all ex-servicemen who have been through the mill and Ted and Bob both came through the centre with their own injuries and trained on the machines as part of their rehabilitation. It's always nice to try and work a few quotes in when you can in such situations, so I asked for a couple from them and ended up with the following: "Don't push your Granny off a bus" and "don't cross when the

green man is flashing." Yes, I should have known better, but it really is good to know that after all these extraordinary people have been through, they can still retain a sense of humour!

It's also worth remembering that a disability isn't just a physical injury; there is also the psychological and mental health injuries that require equal treatment and the guys from Veterans Woodcraft have designed a teaching system that covers all aspects of this. The aim is to help anyone who goes through the course to integrate back into society and learn how to make and sell their own pieces of work and in doing so hopefully establish a business of their own. Andy and Wayne have set up a discounted scheme for anyone coming through the programme who is looking to set up on their own with a Legacy, but there is also the option to rent a machine at the Essex headquarters.

The Veterans are also looking to expand the training and rehab scheme to cover other areas of the UK with a similar setup to Phoenix House, to allow anyone to attend training or to rent machines at the centres if needed. Phoenix House is already working its magic with the people there making benches for the Chelsea Flower Show and gaining a silver medal in doing so, plus the endorsement of many celebrities along the way in a variety of other projects - not bad for a company that has only been running for a year!

Watching the Veterans work, the ability they already have to input their own designs into the Legacy software really brings home the power of the system and what it can do for the morale of anyone who is struggling to come to grips with how their life has changed. They clicked through a whole range of designs from regimental insignia through to images of buildings,



The software allows you to import a file of your choice



Type in a few parameters such as cutter, etc. and the software will do a test run on screen



Once you're happy, click to start and let it go to work



The software tells you how long it will take to complete the design - this leopard took about an hour



The lathe allows for more intricate carved work and uses a standard fine router cutter



FAR LEFT: The software drives the cutter, raising and lowering to carve as it goes



LEFT: You can make a relief cut such as this maple leaf...



FAR LEFT: ... and then replicate a raised piece for a perfect inlay



LEFT: General turning is completed using standard router cutters



ABOVE: A basic set of cutters will cover a large range of work



RIGHT: The Veterans Woodcraft guys were also in attendance to show what they do

house signs, famous people, pets and anything in between, and it's easy to see just how a business can be set up offering individual custom designs, which can quickly grow as you become more proficient with the software. One of the reasons behind the Veterans attending the event was so Andy could talk them through how to move on from the engraving side of things and making joints on the machines, and in no time at all, as if by magic, a mortise & tenon soon appeared!

The CNC revolution

That's the beauty of the Legacy machines; they can be set up to do anything from jointing to engraving, 3D carving to batch work and so much more. The only parameter is how far your mind wants to go with it. Best of all, once the timber is positioned and you run a simulation, you can set it running and leave the machine to do its thing: you only need to swap cutters

if needed. The program allows you to store setups as well so if you have a particular project, then you can input all the data including the cutters and it's ready to go with just a few mouse clicks.

The entry level Explorer machine costs around £4,000, which isn't a huge outlay if you consider just what can be done with it, and just how little room is needed to set up a business. Recalling a comment from Wayne to a visitor who said the machine was great but you'd need to do a lot of work using it to justify the outlay, Wayne responded by pointing out that a house name in oak, with two lines of text, sells for around £80, and on the Legacy it doesn't take long to complete such work. You could easily set it going, make a cup of tea and it would be done before you drank it, so you are well on the way to recouping the outlay, and that's just one small area where it would find its niche.

The CNC revolution is a relatively slow burner for the lower end of the market but the bespoke and diverse services offered by the Legacy should enable it to quickly establish itself, especially as it allows anyone of any ability, or indeed disability, to integrate back into society. With both Wayne and Andy's commitment to helping in this particular area, along with the Veterans Woodcraft team, I wish it all the success and support it deserves. **GW**



LEFT: This is just one of the many designs the Veterans have made using the Legacy



RIGHT: You can achieve excellent definition with good timber selection



BELOW: Here are just a few of the things Wayne sells – it's easy to see how a business can quickly be built up

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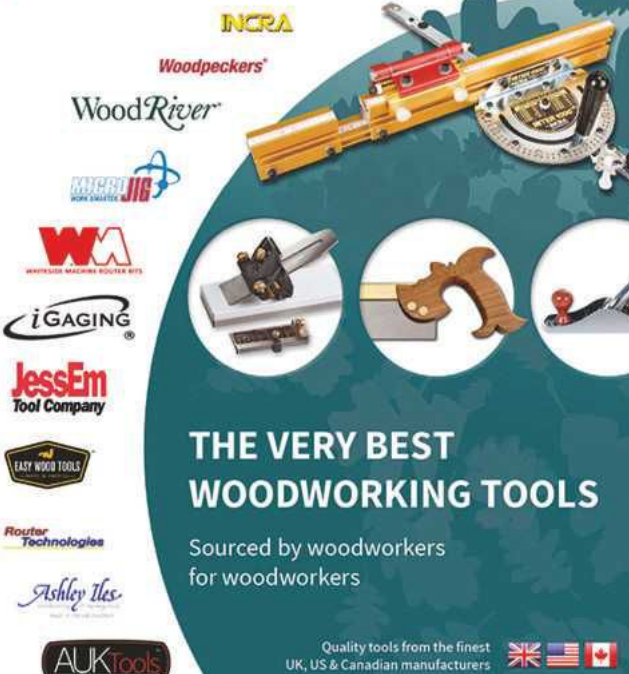
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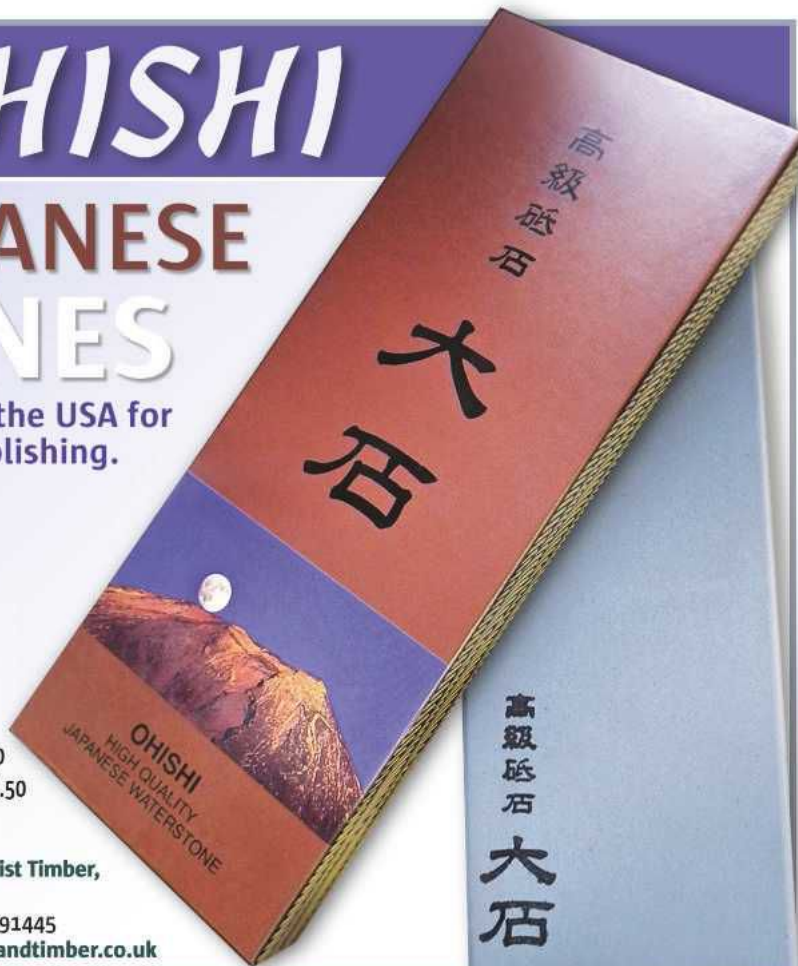
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AROUND THE HOUSE with Phil Davy



I can't be alone in wondering exactly what the definition of 'shed' is. Channel 4's *Amazing Spaces* in conjunction with Cuprinol's Shed of the Year competition (featured in GW308 and GW310) must have got more than a few viewers shouting at the TV.

Maybe there should be a limit on cost of materials (surely a £40K budget is guaranteed to create a unique structure?) Or perhaps maximum size. A replica medieval longhall that's more barn than shed may be hugely impressive, but when it takes 15 years to build how can the lone builder compete? You'll know that the winners in each category were decided by public vote, so who am I to argue!

OUT & ABOUT: East Enders

Who would have thought that a few boxes of screws could be so fascinating? Sad, I know, but coming across these items when clearing the workshop recently brought back great memories of college days. The screws are tiny (gauges 1, 2 and 3) and were probably unavailable in most common hardware shops when purchased. Labels on a couple of older boxes indicate they contained a gross (144), while the newer GKN screws were sold in quantities of 200. I recall buying them from a specialist supplier in the vicinity of London's Old Street.

These boxes of old screws certainly brought back great memories of college days



The screws are tiny (gauges 1, 2 and 3)



These brass-headed screws were probably unavailable in most common hardware shops when purchased



An eye for exotics

As a student at the London College of Furniture, our group discovered all sorts of amazing tool shops and merchants, long since gone. Shoreditch once had a thriving population of timber and veneer merchants, cabinetmakers and related trades. I well remember a few of us visiting a stockist to buy Brazilian rosewood and ebony for musical instrument making. Boards of exotic wood were piled high in the yard. On a meagre student grant I could only afford to buy one small length, even then. If only we'd known what this beautiful, rare timber would be worth today!

A visit to Crispins veneer suppliers was like stepping back in time, with dark rooms and dustsheets to prevent light damaging the stacks of leaves. A lovely beech bow saw was bought from a tool shop in Brick Lane, more for its aesthetic appeal than its function. Sadly, this tool eventually succumbed to woodworm and ended up in the woodburner.

Astonishingly, you could even buy ivory from a supplier in the East End. I remember visiting a warehouse (called Friedlein, I think) where there were tusks lying on the floor. Back then, the concept of wildlife poaching, endangered species and conservation generally was virtually unheard of. In case you were wondering, ivory was traditionally used for nuts and saddles on top quality stringed musical instruments. Fortunately for elephants and rhinos, there are several alternatives these days.

Anyway, what to do with those screws? All have slotted heads, either rounded or countersunk, and are brass or steel with various finishes. Surprisingly, more than 40 years on, the mild steel screws show no sign of tarnishing, probably because their card boxes seem to be impregnated with oil. Even though I still don't have a use for them yet, they take up little space so I can justify keeping them. And just in case you're wondering, they're not looking for a new home!

Examples of beautiful kingwood, ebony and Brazilian rosewood, once easy to find in London's East End



WINTER PROJECT – POWER TOOLS STORAGE BOX

TAKES: A few hours

TOOLS NEEDED: Tape measure, square, marking gauge, chisel, straightedge, bench plane, shoulder plane, hammer, nail punch, sash cramps, router and bits, (sliding mitre saw)

Jobs in winter

Phil Davy's storage box for that lonely power tool is a simple project for the router

Most professional power tools are supplied with a plastic storage case these days, but there are plenty of budget tools that are sold in cardboard boxes. These have a limited life and don't offer much protection if tossed in the back of the car or left lying around the workshop. Plastic crates are a quick solution, but I've found these can shatter if dropped and their hinged flaps can sometimes come adrift. If you've got a spare few hours, building a storage box for that lonely power tool is a simple project for the router.

Of course, you can use virtually any timber or sheet material, but the advantage of MDF or plywood is that it's stable and ideal if you have machinery in the workshop to saw it. If buying a sheet from a DIY shed, then make use of the vertical panel saw facility if the store has one. Take along the cutting list and you could save yourself a lot of sawing! These saws are pretty accurate, so with one or two cuts it's possible to get all the box components to the exact width.

On the downside, MDF is relatively heavy and takes its toll on edge tools, especially hand tools. If using MDF, always use adequate extraction and wear a dust mask. I prefer to use softwood as it's much more pleasant to use, but unless you have a reliable timber supplier, finding clean, straight boards can be a bit of a lottery.

Cupping & lap joints

The biggest problem when using such wide pine boards is that they're guaranteed to cup. One way around this is to rip planks into two or three pieces. Rearrange the narrower boards, then re-glue to make up the required width. For a project like this it's hardly worth the effort involved, but if building furniture or built-in cabinets, it should be considered. Alternatively you could use laminated pine furniture boards, but these are quite expensive.



I used 200 × 25mm PAR, which finishes at around 190 × 20mm. To reduce weight you could pass boards through a thicknesser before cutting them to length. Don't go any thinner than about 16mm, though, as the timber will be even more susceptible to cupping. If you are not cutting the joints and assembling the box within a few hours, cramp boards tightly together when you've finished working, preferably to a bench top; this will reduce the tendency for them to cup and makes joint cutting easier.

An advantage of using softwood is that you can show off your jointing techniques if you wish. This is a great time to practice those hand-cut dovetails. If you have a dovetailing jig for the router, you'll get professional-looking joints in a fraction of the time. If using MDF or ply, you could simply use butt joints with biscuits for speed and strength, but where's the fun in that if using real timber?

A simple joint to make with hand and power tools is the lap. Stronger and neater than a butt

joint, it's glued and pinned together and suitable for solid timber or sheet materials. Two-thirds of the depth of the wood is removed at the end of each side panel by cutting a rebate. The shorter end panels are cut square and sit snugly in the rebates. When marking out the boards, allow about 3mm on the overall length of each side panel. Mark and cut the rebates so the sides slightly overhang the end panels when the box is assembled. This provides a couple of millimetres of waste wood, which is planed flush once the glue is dry.

I used a sliding mitre saw for cutting the lap joints, but these can easily be routed or cut with a tenon saw and chisel. You cannot use a regular mitre saw for lap joints or housings as it will not have a trenching facility (adjustable blade height). Although a shoulder plane is not essential, it's very useful for tidying up the saw cuts. If you rout the joints you can probably make do without this hand tool. It's not necessary to apply a finish, although a couple of coats of varnish will keep the box looking clean.



STEP 1. Mark out the panels, allowing extra length on the sides; this allows you to trim the end-grain once the box is assembled



STEP 2. Set your marking gauge to one-third of the timber thickness. Running a pencil along the line helps it to show up clearly



STEP 3. If using a sliding mitre saw, set the blade depth to cut rebates that form the lap joints. Check the depth on scrap timber first



STEP 4. Cramp the two end boards together and place in a vice or Workmate. Plane the end-grain and check for square



STEP 5. Cramp side panels down to a board and clean up rebates with a shoulder plane. Work from each end towards the centre



STEP 6. Rout a groove for the sliding lid, which is made from 6mm-thick MDF. Set this about 12mm down from the top edge



STEP 7. Check the MDF fits in the slot snugly and adjust the groove if necessary. Cut one end panel down so the lid slides over it



STEP 8. Mark out the shelf housing on both side panels. Rout out to the same depth as the groove for the lid



STEP 9. Make sure the shelf is a sliding fit in the housing. A tight joint will add strength to the box when glued



STEP 10. Saw the shelf to the same depth as the end panel cut earlier, cleaning up the edge with a bench plane



STEP 11. Spread glue across the rebates, assemble the four panels and cramp together. Use scrap wood under the cramp heads



STEP 12. Check the carcass is square by measuring across the diagonals, adjusting cramps if necessary

WINTER PROJECT – POWER TOOLS STORAGE BOX (continued)



STEP 13. Pin the joints together, having pre-drilled holes first to prevent the wood splitting. Punch below the surface



STEP 15. Cut a piece of 6mm MDF slightly oversize for the back. Glue and tack to the carcass with 20mm ring shank nails



STEP 17. Cut a piece of 6mm MDF to size for the front panel. Check it slides neatly, then glue on a small block for a pull grip



STEP 19. The handle is a piece of 12mm diameter polypropylene rope. Drill two holes in the top for it to pass through



STEP 14. Plane excess end-grain, working from each side towards the centre, then plane the upper and lower edges



STEP 16. Trim the MDF edges flush with the sides of the box and make sure all nail heads are flush



STEP 18. Fill the pin holes and sand the outside of the box, then remove any sharp edges with a sanding block



STEP 20. Cut the rope to length, then very carefully melt the ends with a flame to prevent fraying and pulling through the box

USEFUL KIT/PRODUCT

VERITAS plunge router base



PIC 5. An opening on one side of the base gives a clear view of the cutting action

There's no doubt that rotary multi-tools (such as Dremel and Proxxon) are ideal for many small-scale jobs such as grinding, sanding, cutting, polishing and so on. Their compact size makes them suitable for box making, musical instrument building, modelmaking, plus fine cabinetmaking and general hobby use. For woodworkers, their scope can be increased by turning them into mini routers with the addition of a plunge base or shaper table (enabling the tool to be used inverted). All well and good, except that Dremel's router base is made mostly of rigid plastic and is pretty lightweight. Although this keeps the price down, the plunge action can lead to slight play when the tool is working at maximum depth. Perhaps not a problem for occasional freehand routing, but when using a fence for inlay work or circle cutting, the cut may not be quite as precise as you'd hoped for. Proxxon's router base is cast aluminium and sturdier, though as far as I'm aware it won't fit Dremel tools.



PIC 1. The Veritas plunge router base...



PIC 3. In the case of Dremel, you remove the nose end cap to reveal its threaded collar and screw the tool into the housing



PIC 2. ... which enables any rotary tool with a compatible $\frac{3}{4}$ in $\times$ 12tpi threaded collar to be inserted



PIC 4. Fitted with a pair of stainless steel posts, a bridge spanning these two supports the rotary tool



PIC 6. To set the plunge action there's a steel depth stop located in the bridge, with thumbscrew locking and built-in fine adjuster



PIC 7. Beneath the depth stop is a steel insert set into the base, so the rod does not mark the aluminium



PIC 8. The red plunge locking lever is flipped up (rather than down) to lock the cutting depth

Solid feel

Canadian manufacturer Veritas has solved the problem by introducing its new plunge router base, which enables any rotary tool with a compatible $\frac{3}{4}$ in $\times$ 12tpi threaded collar to be inserted. In the case of Dremel, you remove the nose end cap to reveal its threaded collar and screw the tool into the housing. A couple of shims are included to enable the on/off switch position on the tool to be centralised, if necessary.

The base itself is made of cast aluminium and has a really solid feel. Fitted with a pair of stainless steel posts, a bridge spanning these two supports the rotary tool. Two external plunge springs will attract dust and ideally need to be cleaned after use, a problem with any router where these are exposed. Plunge action was stiff initially, though a squirt of dry lubricant quickly sorted this out. There are no side-handles as such, although grooves machined into the shaped aluminium provide a firm grip when

grasping the base below the posts. An opening on one side of the base gives a clear view of the cutting action.

Plunging in action

To set plunge action there's a steel depth stop located in the bridge, with thumbscrew locking and built-in fine adjuster. This gives very precise control of cutting depth, which is essential for detailed work. Beneath the depth stop is a steel insert set into the base, so the rod does not mark the aluminium. Threaded holes each side of the base enable the optional fence or centre guide to be fitted. The only plastic you'll find here is the red plunge locking lever, which takes some getting used to as you flip it up (rather than down) to lock cutting depth. Maximum plunge depth is a respectable 35mm.

I used the base with a 10.8V cordless Dremel 8200, plus a 230V Dremel 4000. Both were rock-solid when fitted and made precise

routing that much easier and consistent. Changing a cutter is easy enough without removing the tool from the base, though you'll need to use the Dremel wrench rather than its quick-change end cap.

Conclusion

As you'd expect from Veritas, this router base is beautifully made and a real precision tool. If there was some way of attaching an air hose for clearing away debris it would be the icing on the cake.

THE GW VERDICT

► **RATING:** 5 out of 5

► **PRICE:** £52.46

► **WEB:** www.brimarc.com

USEFUL KIT/PRODUCT

Fence & centre kit

To get the most from the router base you really need to add the comprehensive fence kit. Not only does this enable you to make cuts parallel to an edge but it increases the scope for curved work, too. Included are a pair of substantial fence rods, aluminium guide body and arm, two 150mm fences, curve and circle guides and various mounting points for radius routing.

Fences are made from torrefied maple, a heat treatment that increases timber stability. Two sizes suit shallow and deeper material and are secured with a couple of screws. Knurled screws attach the fence assembly to the router base and these only need to be finger tight. Maximum distance from fence to cutter is 115mm.

For routing against a curved edge, you remove the fence and substitute a couple of domed screws. These work well enough and mean you don't need to insert a bearing-guided router bit for profiling.

Mounting options

There are three mounting options when it comes to routing an arc or circle. First, you need to fit the triangular-shaped circle arm to the guide body. A hole at the end enables you to insert either a point or a steel post (to fit a 1/4in drilled hole in the workpiece). A steel disc is also included and allows the trammel arm to rotate easily. This disc can be temporarily attached to the timber with double-sided tape. You simply reverse the circle arm to point inwards for small diameter cutting.



Included are a pair of substantial fence rods, aluminium guide body and arm, two 150mm fences, curve and circle guides and various mounting points for radius routing



Knurled screws attach the fence assembly to the router base and these only need to be finger tight



For routing against a curved edge, you remove the fence and substitute a couple of domed screws



First, you need to fit the triangular-shaped circle arm to the guide body



A steel disc allows the trammel arm to rotate easily



For small diameter cutting, reverse the circle arm to point inwards



In use, the fence assembly helps to create accurate grooves and profiles, however it's set up

In use

In use, the fence assembly helps to create accurate grooves and profiles, however it's set up. Although all adjuster screws are slotted, I found a screwdriver unnecessary when locking them in position.

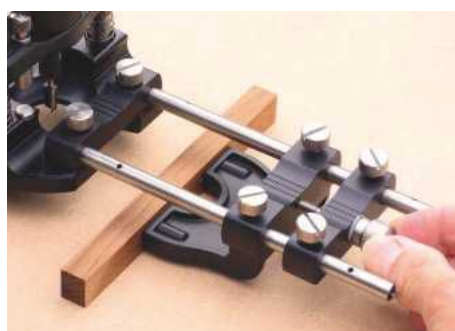
USEFUL KIT/PRODUCT

Precision adjuster

If you need to rout grooves an exact width for inlay or stringing, then it's worth adding the Veritas precision adjuster. This simply slides over the end of the fence rods, a threaded screw locating in the guide body. With two locking screws, the knurled thumbwheel adjuster gives you incredibly precise control. Notches 180° apart enable you to fine-tune the fence setting, a full rotation creating less than 1mm of lateral travel.

Conclusion

Buying both the base and fence kit is not a cheap option, actually costing more than a decent quality rotary tool alone. But if you're



looking for precision routing on a small scale, then I doubt you'll regret the decision.

Using a cordless rotary tool for routing is not ideal as the battery will drain surprisingly quickly, so a second power pack is essential. That said, cordless tools are popular and this should not put you off buying the Veritas router base if that's what you have already. It's a superb accessory and will transform any suitable rotary tool. **GW**



If you need to rout grooves an exact width for inlay or stringing, then it's worth adding the Veritas precision adjuster

THE GW VERDICT

- ▶ **RATING:** 5 out of 5
- ▶ **PRICES:** Fence & centre kit – **£44.96**
Precision adjuster – **£16.96**
- ▶ **WEB:** www.brimarc.com

PLANET

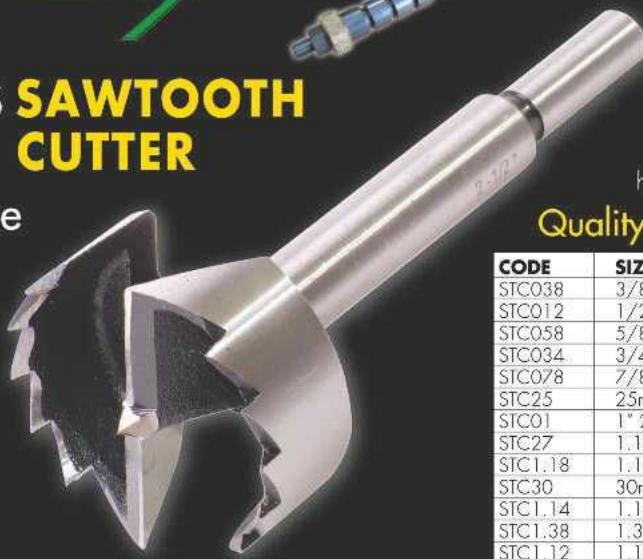


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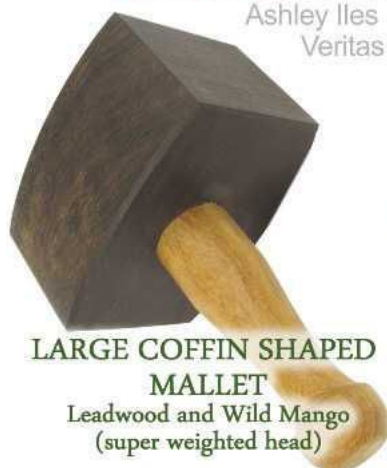
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Display your turnings with pride

Les Thorne shows you how to make an attractive stand for displaying your turnings, which includes decorative effects made using a routing jig

Many years ago I used to demonstrate tools and machinery for BriMarc associates at the national shows. At that time I was working with another turner called Phil Irons. Phil makes fantastically coloured hollow forms and he liked to bring a sample of his wares to the events to show off what can be achieved with the right equipment, and to display his pieces he made a decorative turned stand.

Sometimes these articles just fall into place and when the Editor told me that this issue was going to be a Router Special, I thought this was the perfect opportunity for me to make one similar to Phil's but with a few 'bells and whistles' – time to dust off my router jig! I'm going to use this stand at various events and shows that I have coming up.

For a project like this, I generally make two of the same item, with one being quite different to the other – so I'm treating this version very much as a prototype. The stem on this stand was made all in one piece, which meant that the shelves had to slot in. The next one will come apart and the stem will fit through the holes in the MDF. I haven't decided on a finish for the stem as yet so have left it 'au naturel' and will work out what to add to it after observing the stand for a period of time; I am getting an urge to colour it but everyone else seems to like it just as it is (plain oak) – we'll see! **GW**





STEP 1. Oak and MDF: the stem is around 1,700mm long and 75 x 75mm. In hindsight, I could have done with it being a little bigger in section



STEP 2. Turning a piece this long to round, straight from the square, will cause problems so I am taking the corners off on the bandsaw. When I bought my bandsaw many years ago, the speed at which I could tilt the table was a major factor in deciding which one to buy



STEP 3. I am lucky to have a lathe that allows me to fit long lengths between centres. The first step is to rough the wood to the round using the spindle gouge and then mark up where the shelves are going to be placed



STEP 4. The shelves are made using 15mm MDF and I made a sample one to try in each slot. I could have used plywood or even real timber, but as they are going to be sprayed, MDF is fine



STEP 5. The slots are cut with the 10mm multi-purpose tool using a pair of Vernier callipers to gauge the size. This needs to be accurate, as if there's any slack in the joint, the shelf could fall out



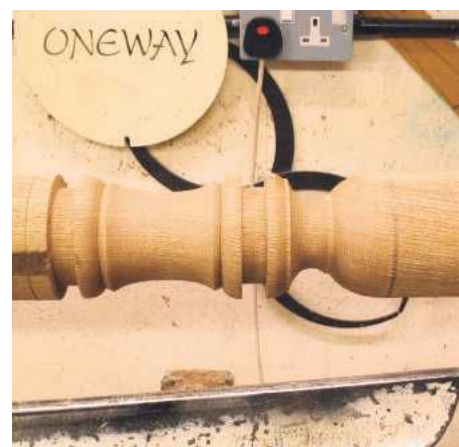
STEP 6. This one fits in brilliantly – almost too well as I had trouble removing it. I had to try and gauge how much thicker the shelf will be once it's painted



STEP 7. You want to try and keep the piece as strong as possible during the turning process, so finish each short section before moving along. If you're confident, then support the timber with your fingers to stop any vibration



STEP 8. Let the shaping begin! This is great fun as you can pretty much make it up as you go along. The spindle gouge is used for shaping the half beads, which will sit above and below the shelves



STEP 9. The top half is completed except for the finial on the top. If you turn too much wood away on the top at this stage, then you run the risk of weakening the spindle, which will make completing the turning difficult



STEP 10. What a difference a quality cut makes! The left-hand side is cut using a skew chisel with the bevel in contact with the wood, whereas the right-hand side is cut straight off the spindle roughing gouge



STEP 11. I use the Paul Howard router jig regularly in the workshop – this is the best currently available for woodturners. Fluting and reeding are easily completed using this jig



STEP 12. The depth of the cut is governed by adjusting the steel ring in and out. The liner is a 'shop-made insert that's held in place by a screw in the bottom



STEP 13. I am lucky that the Oneway lathe has fantastically accurate 48-point indexing, but even on a machine this costly, you still need to add a piece of masking tape!



STEP 14. The base of the jig slides along the bed of the lathe. You need to keep a little pressure on the sole plate so the router doesn't ride up on the timber. A firm stance and moving the jig with your body will afford you more control



STEP 15. This piece was indexed 16 times to give the correct spacing on the beads. If you take your time they will require little sanding, but may need to be rounded over slightly on the top



STEP 16. The end needs to be rounded over to complete the effect. This is normally done by the customer as carving is not my forte, but I thought it would be good practice for me. I use a carving tool that fits the curve of the bead



STEP 17. My Sand-O-Flex attachment for the drill is the best thing for sanding this detail quickly. Doing it this way saves a lot of hand finishing. The wheel is 180 grit and has brushes behind the abrasive, which help to make the cut less aggressive



STEP 18. As I thought, the length of the work meant that I experienced some vibration; this will cause a spiral to be left on the surface of the timber, which, although not perfect, will luckily sand out quite easily



STEP 19. I decided to use the steady. The rollers, which are actually skateboard wheels, will not mark the timber, so they can be placed on an area that is already finished



STEP 20. A quick and easy way to get a piece parallel is to use a wide piece of coarse abrasive; this will level off all the humps and bumps left by the tool. This is a good enough surface for the next routing process



STEP 21. Flutes are the next detail to add to the spindle. The cutter is a bull-nosed one, which means there is a lot of timber to remove so it needs to be done in more than one pass otherwise the hole where the cutter sits will fill up with shavings



STEP 22. A selection of router bits are useful to cover the different designs that I have to do. Although many are normal router bits, a good source for the specialist cutters is a company called Wealden Tools



STEP 23. Because this is a one-off, I just roll a piece of abrasive to fit the shape of the groove. If there were lots to do, I would machine a piece of wood to the shape of the groove and wrap the abrasive around it



STEP 24. Time for some more shaping. Even though the piece is quite large, I like to add some small details. The 10mm spindle gouge will cut some small coves towards the bottom of the stand



STEP 25. As the piece needs to look balanced, getting the relationship between the stem and the stand correct is very important. A bead on the base of the stem will hide the joint into the base



STEP 26. After cutting the spigot to fit in the base, it's time to go right back to the top. My favourite finial is this flame-type – the last bit at the top just needs to be finished off the lathe



STEP 27. This piece of laminated MDF is the centre of a large mirror frame that I made a little while ago. It was even already mounted on the faceplate for me, which was lucky!



STEP 28. MDF turns really well and produces long, streamer-like shavings. Here you can see the dust on my hand so do always protect yourself from the dangers of fine dust, especially MDF



STEP 29. A sawtooth machine bit is perfect for drilling the base. The drill bit is mounted in a Jacobs-style chuck in the tailstock. The bar fitted into the hole in the chuck stops it twisting



STEP 30. Time to play! I bought this can of limestone effect paint for a future project but I thought it would add something to the stand. A couple of coats applied with a light rub down between each is all that's needed



STEP 31. The shelf template seemed to work well so I marked out the position of the hole on eight pieces of MDF. The balloon shape is a perfect addition and doesn't over-balance the stand



STEP 32. Use a 60mm sawtooth bit to make the initial hole in the shelf. Clamp the board securely and remove the drill frequently to clear out the build up of shavings



STEP 33. Carefully cut out the shape using the bandsaw. I decided to do this freehand as I quite like the fact that they're not symmetrical. If the stand is perfect, then people may not look at the turnings displayed on it



STEP 34. Having access to all the kit in the workshop next door is a huge bonus. The big disc sander makes short work of smoothing off the edges before applying the limestone effect, which is also used for the base



STEP 35. The length of the lathe allows me to use it as a clamp. I used PVA, but in hindsight I may have been better off using polyurethane. This whole project has given me lots of ideas for future display stands I can make in the future



STEP 36. The completed display stand, with added turnings

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Aesthetics for amateurs

In his final 'musings', Michael Huntley sets himself the challenging task of discussing the analysis of beauty in only 500 words

As this is my last musing, I thought I would do something really stupid: an analysis of beauty! Aesthetically and philosophically this must be one of the most argued over subjects in history, so my solution is to allow myself only 500 words, which means there will be no room for waffle.

I am attempting an analysis of beauty. Yes, I know Hogarth did it first, but in the last 20 years of writing for amateur woodworking magazines, I have been struck by the problems of identifying what is and isn't beautiful, or, at the very least, pleasing to the eye. One problem with amateur woodworking is that some projects are well made but not attractive. The maker is pleased with their work but has not included an aesthetic analysis or assessment at the design stage.

Design ratios

One often hears that plants grow according to mathematical principles. I am neither a mathematician nor a botanist, but I thought that I would investigate this idea with regard to drawn design and setting out woodwork. A look at https://en.wikipedia.org/wiki/Patterns_in_nature gives an overview of the subject, which saves space here! However, after reading several books and scholarly articles (see references sidebar opposite) it is quite clear that one of the ways to produce likeable shapes is to use the Golden Ratio (1.618) or Fibonacci numbers. Select your dimensions for cabinetry with the sides in those ratios to the tops. Likewise, if graduating drawers,

start with a small drawer and make the height of the next drawer 1.618 times bigger. Having said that, always draw them up full-size on card or ply and check that they look good to you. By the way, Workshop Heaven - www.workshopheaven.com - sell a Golden Ratio steel rule for £7.50.

Before I leave ratios, it is worth investigating square roots, especially root 2, which is 1.414. The ratio 1:1.414, where the top of a carcass is 1.414 times longer than the side, is another design ratio that is pleasing to the eye. Then of course there is the Fibonacci sequence, but I'm afraid you'll have to Google that!

Ornamentation

That's enough about carcass shapes, but what about ornamentation? Well, the first rule is not to mix and match styles. One excellent way to learn about proportion is to copy by drawing known well designed pieces. In my day, all students had to do this. Select a catalogue from a museum - *Good Citizen's Furniture* from the Cheltenham Museum Collection is a prime example. The sizes of the objects illustrated are printed in the descriptions. Trace the outline of the item and then scale off the sizes of components; this will help you decide how thick a leg should be in proportion to the mass above that it carries.

Form & proportion

If you want to find out more about form and proportion, then I recommend a DVD made by Lie-Nielsen - *Unlocking the Secrets of Traditional Design*, which

is available from Classic Hand Tools - www.classichandtools.com. The presentation is American, and the pronunciation is 'US' but as the author says: "Designers speak a common language," and he then goes on to explain classical proportion rules that are as applicable today as they were in the 18th century. Start with the section called 'Training the Eye'.

Sorry, but that is about all there is room for on this final musing. If I find out more and if anyone is interested, I am sure the Editor will let me have a page in a future issue to share my findings with you, but in the meantime, happy woodworking! **GW**

REFERENCES

BOOKS

- *Geometry of Design*, K. Elam, New York, 2011 - a good inexpensive introduction but with some historical errors, although the principles are correct
- *The Geometry of Art and Life*, Ghyka, M; Dover, 1977 - this is a reprint but has good content

WEB LINKS FOR THE ART OF GEOMETRY

- www.en.wikipedia.org/wiki/The_Analysis_of_Beauty
- www.archiv.ub.uni-heidelberg.de/artdok/1217/1/Davis_Fontes52.pdf
- www.leicacamemonkey.com/uploads/5/4/2/6/54263701/elements_of_dynamic_symmetry_hambidge.pdf - for a PDF of *The Elements of Dynamic Symmetry* by Jay Hambidge, 1926



Various examples of patterns in nature: photographs courtesy of Wikipedia Commons

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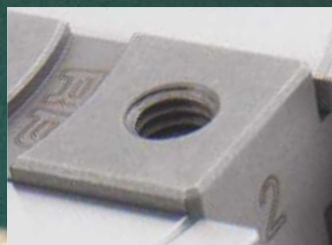
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