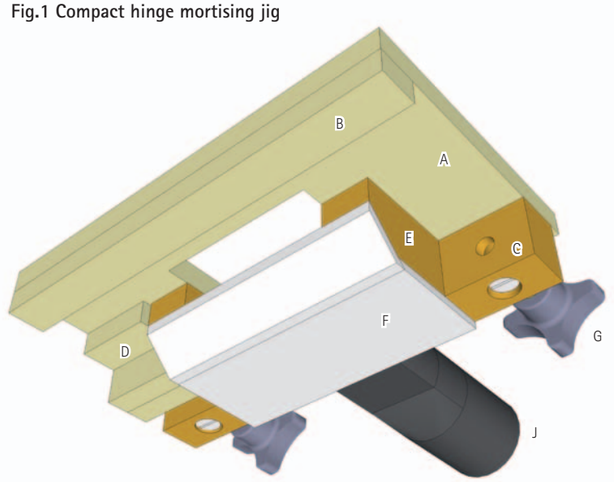
Compact Hinge Jig

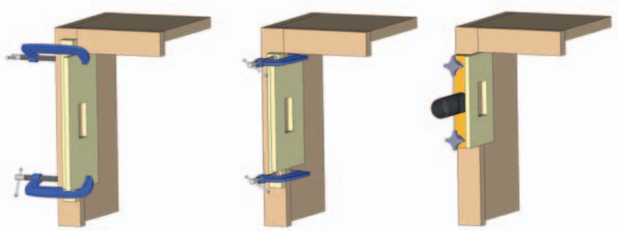
Needing to fit many hinges, **David Fellows** makes his own shallow mortise jig with extraction

Fig.1 Compact hinge mortising jig



The right-hand clamping block has been removed for clarity

Fig.2 Comparing compact (right) and conventional (left & centre) hinge jigs



A A conventional hinge jig cannot reach as close to the corner of the face frame with the jig clamped across the width of the face frame

B A conventional hinge jig has to be clamped across the thickness of the face frame when there is poor access on the 'outside' of the face frame

C With integral clamps our compact hinge jig can get much closer into the corner

Pic.1 The compact hinge jig with extraction fitted

I seldom make a router jig for a specific job because I can normally do it with hand tools in less time than it would take to make the jig. However, I was recently faced with the task of hanging 58 doors with 145 brass butt hinges in the face frames of library bookcases and cupboards. I could have used a commercial jig or made a simple one for the hinge mortises on the doors but these would not work on the face frames because of limited space and aesthetic design considerations. I wanted to align the outer edges of the hinges with the inner edges of the door rails to reduce the number of horizontal alignments. Most of the available commercial jigs would result in the hinges being too far down the stile from the corners. Also the back of the face frame was restricted by the carcase side panels and afforded little space for clamping the jig to the frame. The only jig I found satisfactory for mortising in such a restricted space is made by Milescraft, but this has to be nailed in place rather than clamped and I could not accept that. Mortising by hand with the bookcases in-situ was not an attractive proposition so I designed this compact mortising jig (Pic.1) and used it for all 290 hinge mortises. In conjunction with a trimming router it enables hinges to be placed within 50mm (2in) of the ends of the door stile and requires only 10mm of clamping width on the faces of doors and frames. The integral clamps are mounted underneath the template (Fig.1) and do not contribute to the overall space

RoundUp Trimmer Routers

There are a few trimmer routers to choose from of varying prices

You can spend up to £450 on a laminate trimming router (Lamello Profila E Plus, bottom left) or £290 for Festool's OFK500 (top right), but unless you're doing a lot of kitchen/veneer work you'll want something less expensive and perhaps versatile. The Bosch GKF 600 Palm Router Kit (bottom right) comes with three bases, the smallest of which is 95x84mm and costs £130. Unlike the Bosch, which only offers fixed bases (though one tilts), DeWalt's D26204K has a plunge base and a fixed trimmer base for £250. We think that DeWalt's dedicated trim router that David is using here (below, Pic.2) has been discontinued. The Makita 3708F (top left) costs £165 and comes with a side fence. The base tilts for chamfering. It's hard to see how any of them can compete with the Bosch for hinge cutting.

All prices & photos from axminster.co.uk.

Pic.2 Using a trimmer router with the jig. Beneath the clamp knobs you can just see the half-nuts that lock the knobs on the threaded rod

requirement as separate clamps would. The integral dust extraction nozzle is conveniently placed and effective.

Space saving

Although some of the space-saving comes from the use of a smaller router, shifting the clamps underneath the template and clamping on the face of the frame rather than the edge brings benefits other than space-saving. If a conventional hinge jig is clamped to a cabinet with a face frame (Fig.2, overleaf), and used with a plunge router having a standard Elu/DeWalt/Trend-size base, then the top of the hinge recess can be no closer than 90mm from the top of the frame. If guide bushes are used it will be slightly further away.

If there is a run of cabinets installed or an adjacent wall it is necessary to clamp to the face frame (Fig.2B) across the frame's thickness. This and difficulty fitting a cramp in the top corner may force you to fit the hinges even further down the frame. With the new jig and a trimmer router the hinge can be as close as 50mm to the top.

Making the jig

The jig took two hours to make, and I used it on the door stiles as well as the face frames. I would consider it worthwhile making one for a job involving more than six hinges.

However, I made a supply of the common clamp sub-assemblies so that I can make up a jig to suit any size of hinge, door and frame material thickness in less than an hour. I use only three sizes of hinge (50mm, 63mm and 75mm) and two material thicknesses (19mm and 25mm) for cabinet doors and frames, so it is entirely practical to make up a jig quickly for every situation, as it arises. If you use a wider range of material thicknesses you could make only one jig for each size of hinge and the thickest material and use wooden shims to accommodate different stile thicknesses.

The hardware cost was about £3 per jig and the ply and wooden parts were all offcuts. Similar jigs for smaller and larger hinges in different situations are described in the boxout.

In order to put the mortise close to the corner of the face frame, both the overall size of the template and the router baseplate need to be as small as is possible. Trimmer routers with their very small bases help in this respect and their light weight is a blessing when working against the vertical face of a template. I have a DeWalt DW670 trimmer router with a 90x95mm baseplate. Bosch (95x84mm), Makita (90x90mm) and other makers have similar products (see boxout). The router body is normally within the base size and will not overhang the ends of the template.

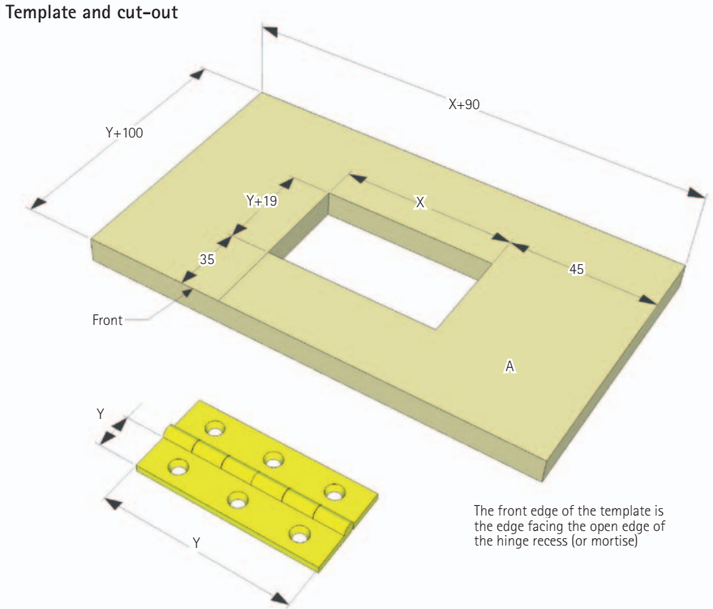
Cutter choice

In the UK and USA most trimmer cutters are supplied only with a collet for 1/4in shank cutters. I chose to use a short 1/2in diameter cutter with a shaft-mounted bearing of the same diameter for the hinge jig. This contributes to the small overall size of the template. The cutter edge length should ideally be no longer than the radius of the largest hinge knuckle. A cutting edge that is longer that this requires a thicker template to accommodate both the excess cutter length and the face of the bearing. Thick templates are more difficult to make accurately and there is a danger of sniping the edge of the template if the router is tilted accidentally.

Most standard bearing-guided cutters are far too long so I suggested to Wealden Tool Company that they should produce one with a length of only 4.7mm. This would allow cutting (even in a single pass) for all sizes of hinges up to 125mm and require a template thickness of only 9.5mm. They made me a prototype and I used this extensively and successfully with the jig. A production version is expected to be available from late August 2012, with a part number of T8024B and costing £10.50inc.VAT (see boxout). This cutter would also be very useful for making shallow recesses for inlay for all the same reasons.

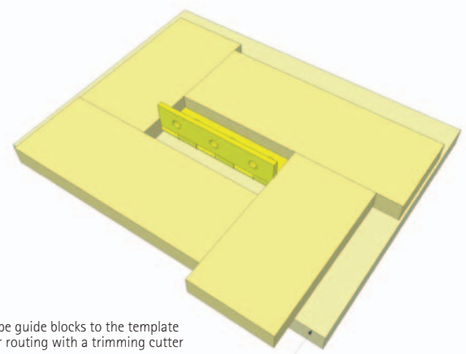
You could use a guide bush instead of a bearing-guided cutter if your trimmer router accommodates these, but that is unusual. There are also disadvantages to that approach. The minimum overall length of the template, and the length and width of the cut-out will need to be increased by the difference in diameter between the cutter and the guide bush. You will need to allow for the offset when positioning the jig for the second mortise of each hinge. Also, you will not be able to use the hinge to set up the cut-out guides as described below. I find dealing with offsets for guide bushes a tedious, time-consuming and error-prone process and avoid it whenever possible.

Fig.3 Template and cut-out



The front edge of the template is the edge facing the open edge of the hinge recess (or mortise)

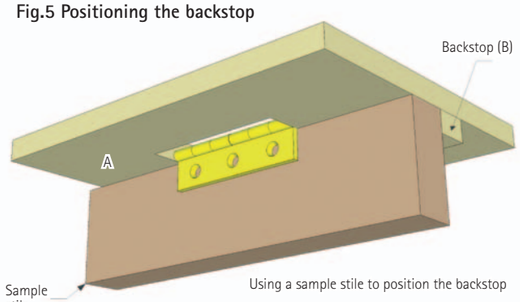
Fig.4 Using guides to rout the cut-out



Tape guide blocks to the template for routing with a trimming cutter

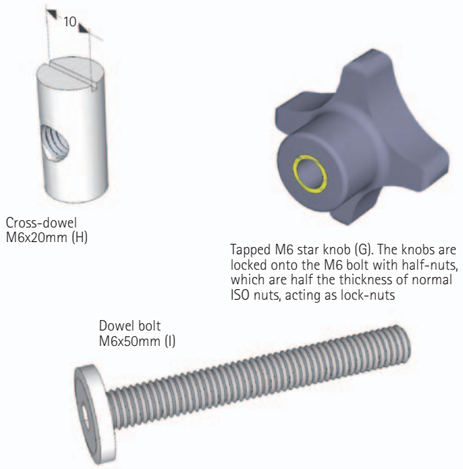
Front

Fig.5 Positioning the backstop



Using a sample stile to position the backstop

Fig.6 Materials for making the clamp blocks



Making the template

I made the template from 9.5mm (3/8in) thick Baltic ply. You could use MDF instead of ply for a short run and maybe even for a medium one, provided you harden the edges which guide the router bearing with acrylic varnish or thin cyanoacrylate adhesive.

Begin by cutting a piece of template stock to size. The minimum overall length of the template is equal to length of the hinge plus the width of the router base. This will give the router base a minimum 1/4in clearance at the corner of the face frame. Keep close to the minimum length. The width of the template is equal to the width of the hinge leaf from edge to knuckle plus 100mm (4in). The width may be trimmed later.

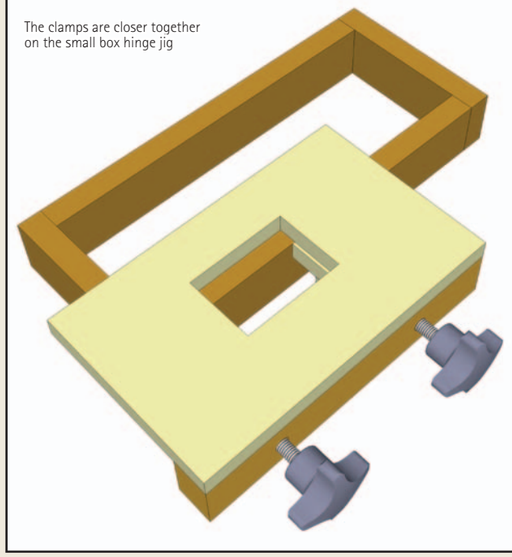
The length of the cut-out in the template is exactly the same as the length of the butt hinge. The width of the cut-out is the width of the hinge leaf, plus a clearance of 19mm (3/4in). Most trimmer routers do not plunge and need to be started without cutting, so the side clearance is necessary to start the router with the bit safely away from the edge of the work. The cut-out is half-way along the length, and the edge of the cut-out is 35 mm from the front edge of the template. The cut-out's edges must be finished smoothly and be perpendicular to the surface.

You could mark out and

Small box hinges

Fig.7 Cutting hinge recesses in small boxes

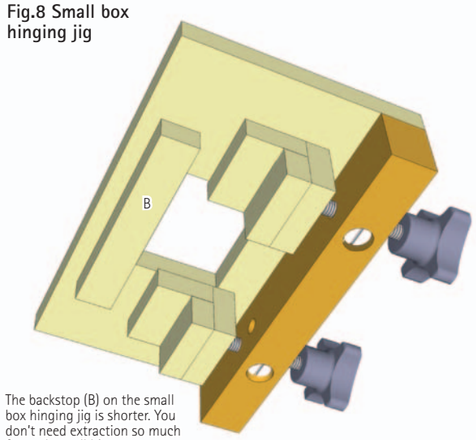
The clamps are closer together on the small box hinge jig



This jig is intended for recessing hinges in small boxes and lacks the extractor nozzle. The clamps are moved closer together and the backstop is shortened to allow a hinge to be fitted as close as 20mm to the inside corner of the box. It will work inside boxes with bottoms already fitted and with sides as little as 10mm deep as on a box lid, for example.

Since the clamps do not have to support the load of an extractor hose the backstop thickness could probably be reduced to 6mm, enabling even shallower lids to be mortised. As shown in the diagrams the rear clamp block and pressure plate may overlap the template cut-out slightly and will be cut during the first use. Very small hinges may require only a single clamp assembly and can therefore be positioned at or very close to the inside corner of the box.

Fig.8 Small box hinging jig



The backstop (B) on the small box hinging jig is shorter. You don't need extraction so much for such small hinge recesses

Fig.9 The clamping blocks

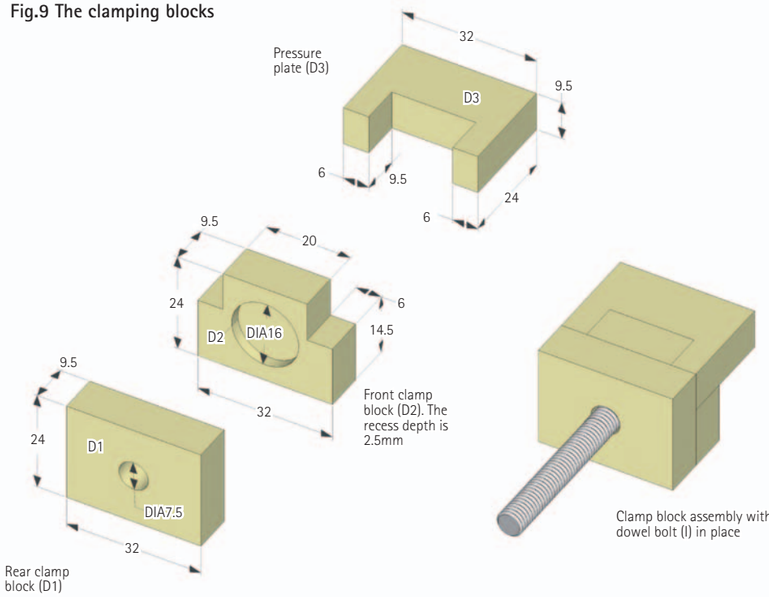
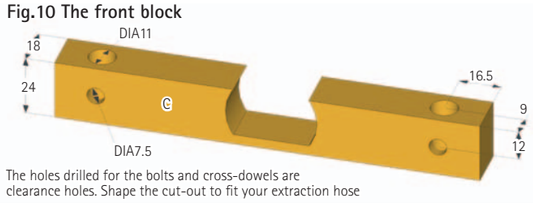


Fig.10 The front block



The holes drilled for the bolts and cross-dowels are clearance holes. Shape the cut-out to fit your extraction hose

make the cut-out with Forstner bit, chisel and file. Alternatively, you can tack or tape edge guides around a sample butt hinge (Fig.4). Bore a through hole for starting the bearing-guided mortising cutter and rout through the thickness in stages. Before removing the guides use them to chisel the internal corners square. Although not necessary for guiding the router the square corners guide the chisel for squaring the mortise and save a lot of time when the jig is in use (Pic.3).

Cut a piece of 9.5mm birch ply 15mm wide and exactly the same length as the template. This will be the backstop (B). Take a sample piece of the door and frame stile material and back-fold the hinge across the edge (Fig.5). Holding them together, insert the hinge into the template cut-out with the knuckle towards the front edge of the template and the leaf edge butted against the back of the cut-out. Cramp the stile to the template as a guide to positioning the backstop. Spread glue on one face of the backstop and offer it up to the underside of the template, butting it against the side of the sample stile, opposite the hinge, as shown. Cramp the backstop in place while the glue sets and remove the sample piece and hinge as soon as the backstop is fixed in position.

Clamp hardware

I have found a number of knock-down furniture fittings very useful for clamp components in jig-making (Fig.6). These include cross-dowels (H) and dowel bolts (I). The cross-dowels are zinc-plated steel cylinders with a M6 hole tapped across the diameter half way along their length, which is commonly 14mm, 16mm, 20mm and 25mm. I sometimes use these as a substitute for T-nuts or threaded inserts because they have several advantages, particularly in restricted spaces. They are easier to fit and are captive so they cannot become loose. If the clearances in their mounting holes are generous then the cross-dowels can rotate and slide slightly and allow some compliance for inaccuracy in the jig or even for tapered or out-of-square workpieces.

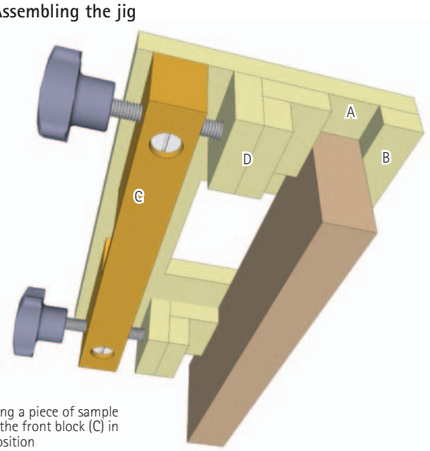
For this project I used 20mm long cross-dowels (eg. Screwfix 22009). The corresponding screws have large flat heads which could be used directly as pressure plates, but I prefer to bury them in ply pads to reduce the clamping pressure and avoid the heads rotating against the workpiece. Bolts are available up to 100mm long but the much less expensive 50mm are used in this jig (Screwfix 78664). If you should ever need bolts longer than 50mm it is more economical to use the similar dowel nuts fixed onto M6 studding with epoxy or cyanoacrylate adhesive or anaerobic thread-locking compound. You will also need two M6 star knobs (G, eg. Axminster 953478) and two M6 half-nuts per jig.

Making the blocks

Cut six pieces of 9.5mm ply 32x24mm (Fig.9). Mark the centre of one face of four of them by drawing diagonals and centre punch at the crossing point. Drill through two of the pieces 7.5mm diameter at the punch marks; these are the rear clamp blocks (D1). Bore two more pieces at the punch marks with a Forstner bit of 16mm diameter to a depth of 2.5mm to form the front clamp blocks (D2). These are all clearance diameters for the dowel bolt (I) shaft and head and are generous to avoid binding. Use a drill vice to ensure everything is orthogonal.

The remaining two pieces will become the pressure plates (D3). Recess the edge of these to leave 9.5x6mm projections at each end, as shown (Fig.9). Cut recesses in the corners of the front clamp block to form a tenon to fit in the pressure plate recess and glue both sets of these two parts together. Insert

Fig.11 Assembling the jig



Start by using a piece of sample stile to get the front block (C) in the right position

Customised jigs

How to adapt the compact hinge jig for rebates, stops and architrave on door linings

Rebates, stops and architraves present significant problems in fitting a jig to the door lining for guiding a router. The space between the architrave and the edge of the door lining affords little space for conventional clamps, which must be long enough to span the thickness of the wall.

An adaptation of the hinge jig can be made that is versatile enough to cope with these situations (Fig.12). Most interior domestic doors are hung on two or three 102mm or 127mm butt hinges. Adjust the template length to accommodate the chosen length of hinge and increase the width to suit the widest door lining you will meet. (In this case the width exceeds the length).

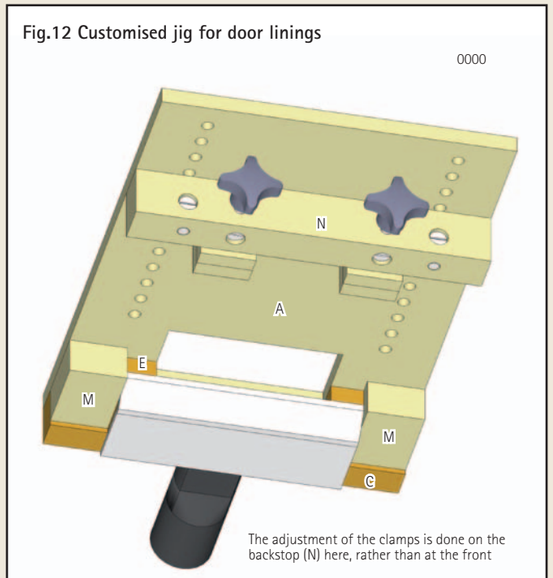
The backstop (N) is adjustable by means of the same type of fixings that are used in the clamps and by a series of holes in the template. The rows of fixing holes should extend close to the cut-out back edge so that you can use the same jig on the door stiles. The spacing along the rows of holes will be about 15mm and must be less than the range of adjustment of the clamp screws.

Attaching the clamps

The clamps are mounted in the backstop and both the backstop and clamp faces are increased in height for more reach and for the clamp knobs to clear the underside of the template (A). The pressure plates on the clamps are omitted. The fixed front block is simpler in this case because there are no clamps fitted to it. Their function is replaced by two fixed pressure blocks (M) which are mounted on either side of the guide blocks (E).

The distance between the front face of the pressure blocks (M) and the line of the back edge of the cut-out is equal to the hinge leaf width. The height of those blocks must be slightly less than the minimum distance between the architrave and the edge of the door lining plus the height of the rebate or planted stop. The guide blocks (E) and other dust baffle parts are set back to avoid clashing with the architrave.

Fig.12 Customised jig for door linings



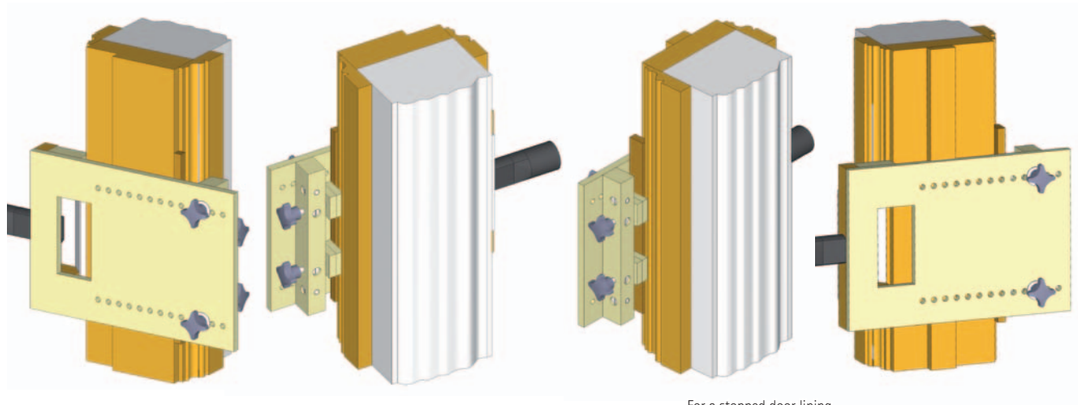
The adjustment of the clamps is done on the backstop (N) here, rather than at the front

You will need a longer reach for the router bit than for the smaller jigs; either buy one with a longer cutting edge, or move the bearing face away from it either by slipping spacers between the cutter and the bearing or an additional bearing or two under the collar. I prefer using a bit with a short cutting edge as there is less possibility of nipping the template with this.

In use

To clamp the jig to the door lining fit shim pieces to the faces of the clamps using double-sided tape to keep them in place. In the case of the rebated lining the width of the shim should fit from the edge of the architrave and the face of the lining and be thick enough so that the clamp faces clear the architrave moulding.

Fig.13 Using the jig on door linings with rebates and stops



For a rebated door lining

For a stopped door lining

Shallow cut

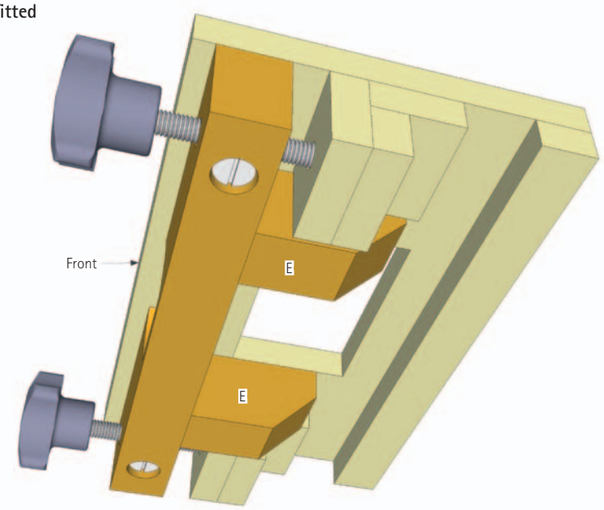
Wealden's new T8024B

The edges are 4.5mm long and the cutter is 12mm diameter

There are many advantages to using a shank-mounted bearing cutter, notably because you can place the template on top of the workpiece. However most such cutters have edges at least 8mm long, with the obvious hurdle that they are likely to eat into your template. In the making of his hinge jig David Fellows asked the Wealden Tool Company (wealdentool.com) if they could make a shallow cutter. Their solution is the T8024B (below), which will be available from the end of August for £10.50inc.VAT.

Fig.14 Guide blocks fitted

The guide blocks (E) are so named because the cross-dowels are a sloppy fit and David thought that it may be necessary to keep the blocks running square to the bolts and not binding. They are probably not necessary for that, but they support the extraction baffle and help to control the airflow. The chamfer on the guide block starts 10mm up from the bottom of the template



a dowel bolt (I) through each of the rear clamp blocks and test the fit of the bolt head in the front clamp block (D2) recess and the alignment of the edges of the plates; the bolt should rotate freely. Glue the rear clamp blocks (D1) on to the front blocks, ensuring the glue does not squeeze onto the bolt. Sand the edges flush.

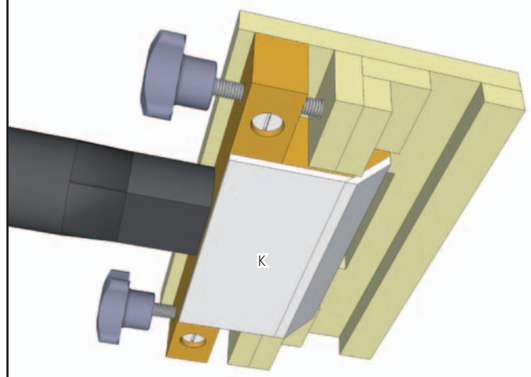
Prepare some suitable hardwood (eg. beech, hard maple or oak) for the guide blocks (E) and front block (C) to 24x18mm section. The front block is cut to the length of the template (Fig.10); the offcut will be used for the guide blocks. Make a cut-out half-way along the front block to suit the crevice nozzle of the vacuum extractor that you will use with this jig. The nozzle should be a reasonably tight fit.

Square round each end of the block 16.5mm in and centre punch on the midlines as shown for the cross-drilling (Fig.10). To minimise breakout where the bores intersect drill the 7.5mm holes first and then bore the 11mm holes with a Forstner bit. The bores and cross-holes are a loose fit on the cross-dowel and connector bolt.

Assembly

Insert the cross-dowels (H) into the front block (C) with the slotted ends on the opposite side to the nozzle cut-out. These slots are a useful guide to the position of and means of turning the axis of the threaded bore in the cross-dowel. Thread on the two clamp assemblies so that approximately equal lengths of the bolt thread are on either side of the front block. Screw on the star knobs (G) until the bolt bottoms lightly; they will be fitted permanently later. You can break the plastic top off the knob if you tighten too much.

Fig.15 The complete jig with dust baffle



You can use thin ply or sheet metal for the baffle

Take the template (A) and the sample stile and offer up the clamp assembly so that the faces of the pressure plates (D3) are against the sample stile. Check that the front block (C) is parallel to the template front edge and adjust one of the knobs, if necessary, to achieve this. This block supports the weight of the nozzle and vacuum hose, as well as resisting the clamping force and needs to be fixed rigidly to the template with glue and screws. If the protrusion of the front edge of the template over the front block is excessive or interferes with the knobs it can be trimmed back before gluing.

Remove the front block (C), apply glue to the top surfaces either side of the nozzle cut-out and cramp the block to the template. When the glue has set reinforce the joint with two countersunk screws fitted between the cross-dowels and the nozzle cut-out. Ensure that the screw heads are countersunk below the template surface.

Measure the distance between the sample stile and the front block and cut the guide blocks (E) to 3mm less than that. Chamfer one end of each of the guide blocks at 45°x10mm (Fig.14) and glue them to the template (A) and front block (C). They should clear the sides of the clamp assemblies by 0.5mm or so. It does not matter if the guide blocks slightly overlap the edges of the template cut-out. This will occur if the template is made for very small hinges. The tops of the guide blocks within the cut-out will be cut by the router on the first occasion the jig is used.

Pic.3 Squaring out the corners of a hinge recess

Cut two pieces of thin ply, chamfer the edges and glue them to the guide block and face block to form a dust baffle (K). As an alternative, thin metal sheet could be screwed in place. Remove the knobs, fit two half-nuts (Pic.2) and replace the knobs, tightening the lock-nuts back against them. If space is tight you could fit the knobs using epoxy or cyanoacrylate adhesive and omit the nuts.

If necessary, cut the angled end of the extractor nozzle square and push it home into the front block.

Using the jig

Clamp the jig to a sample of stile material. The stile or frame edge must always be tight against the underside of the template. The depth of cut must be set to half the hinge knuckle thickness less half the desired frame-to-stile clearance. Make up a stack of shim material to this dimension and insert it between the router base and the surface of the template. Extend the cutter so that it touches the surface of the stile. Remove the shims to rout the recess.

Place the router with the bit away from the edge of the stile and with the router base held firmly against the face of the template. Switch on the extraction and router and cut progressively in from the edge. Keep up the pressure on the template face to avoid tilting the router. The initial cut must be light and straight along the stile edge to prevent breakout. Move the router in a clockwise looping path, gradually extending toward the template guide edges. When the bearing runs against the edges there is no more waste to remove so return the router to the starting position away from the material. Switch off the router and wait for it to stop before lifting it away from the template.

Cleaning up

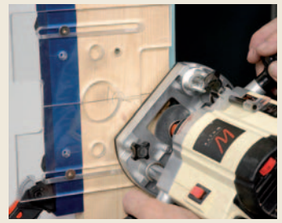
Make perpendicular cuts with a chisel to square off the corners (Pic.3) of the mortise using the template as a guide before removing the template. Pare out the corner waste, test the fit of the hinges and adjust the cutter extension as required.

Trim all the doors to the frames and record their locations. Recess the hinges into the hanging stiles of the doors using this jig at the desired and consistent locations. Provided the edge of the jig does not overlap the end of the stile then the jig will also fit within the face frame. Mount each door in its location with wedges to equalise all the gaps around the periphery. Transfer the location of both ends of each hinge recess to the face frames with a marking knife. Remove the doors, mount the jig with the cut-out aligned to each mark and rout away!

Alternative jigs

You can buy a hinging jig where access is fine

As David says, the trouble with proprietary hinge jigs is that they don't offer the access of his own compact version. Axminster's Universal Hinge Jig (right), costs £25, and their ProGrip Hinge Mate £51. Rutlands sell a similar jig (DKW11, Dakota Hinge Mate, below) for £60. Rutlands' Dakota HInge Mortice Jig (DK1105), incorporates integral clamping, like David's jig, but Rutlands say that their DKZ25 is better suited for cutting recesses on door frames. It costs £100. For professional door fitters, Trend offer a two-piece hinge jig for £217, so that you can cut more than one recess at a go.



Jigs From Axminster (above) and Trend (below)

Rutlands There are three hinge jigs at Rutlands, including the HInge Mate (above) and the DK1105 (below)