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Straight cutters

There's a bewildering range of straight cutters available for use with a router - Ron Fox's essential guide helps you make sense of it all

he versatility of the router is due to a large extent to the range of cutters available for it. Most newcomers to routing will find this proliferation of cutters totally overwhelming at first, but the picture becomes clearer when they're divided into broad groups, classified by their main characteristics.

Straight cutters are those with which most of the basic woodworking operations are carried out, eg joint making, rebating, grooving, housing, mortising, tenoning, and most guide bush work.

Two materials

Straight cutters come in two main materials – high-speed steel (HSS) or tungsten carbide tipped (TCT). TCT cutters are usually more expensive than like-forlike HSS cutters, although these days the price gap is often quite small. They can't take quite as sharp an edge as a correctly honed HSS cutter, but do hold the edge much longer. In addition, they can be used on chipboard, plywood and MDF, all of which would rapidly blunt an HSS cutter.

Unless, therefore, you plan to double up on your cutters, using HSS for cabinet work in natural timbers and TCT for manufactured boards, in practice the choice comes down to TCT.

With cutters of ¹/₄in cutting dia or less, good quality ones are often made of solid carbide (STC) or a steel body with a solid carbide insert rather than with TCT 'wings' brazed on.

Apart from HSS and TCT there are several specialised cutter materials such

as super-high-speed steel (HSSE) and poly-crystalline diamond (PCD). These are manufactured primarily for industrial use (with corresponding prices) and aren't likely to be of direct interest to the general user.

Cutter flute

The flutes are the gullets machined in the cutter body to which the TCT blades are brazed. With HSS cutters, these gullets also provide the cutting edge. Their outer surfaces are ground and honed to produce the blades.

The most common form of straight cutter is the familiar two-flute type, but they also come in single-flute style and there are a few with three cutting edges and, therefore, three flutes.

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3. A % in cutter on a % in shank showing the problem of honing it

2. Different kinds of straight cutter. From left to right: single flute HSS, two-flute TCT, solid carbide, and carbide insert

With single-flute cutters, the edge is usually larger than each of the two edges on a corresponding two-flute, which makes the cutter stronger and gives it better chip clearance. This allows faster feed rates but gives a poorer finish than a two-flute. A selection of straight cutters is shown in **photo 2**.

Shank diameter

Most routers in use in the UK are 1/4incollet models, so 1/4in-shank cutters are correspondingly widespread. They can be used in 1/2in routers, of which the better models come with a proper 1/4in collet and the others with a reducing sleeve.

In general, however, the larger the shank diameter, the stiffer the cutter, so if you have a ¹/₂in router you should aim to use ¹/₂in shank cutters wherever possible.



Note, though, that if you have a 1/4 in or ³/8 in cutter on a 1/2 in shank you'll find it difficult, if not impossible, to hone it because you can't lay the length of the cutting edge on the hone, **photo 3**. This applies to any cutter where the shank is of larger diameter than the cut diameter.

It will therefore pay the owner of a $\frac{1}{2}$ in router to keep at least one $\frac{1}{4}$ in and $\frac{3}{8}$ in straight on a $\frac{1}{4}$ in shank so that they can be honed frequently.

With 1/4 in routers you're likely to eventually require cutters with a cutting diameter less than 1/4 in, eg 3mm or 4mm for cutting slots for biscuits or splines.

These suffer from the same problem as shown in **photo 3**. There's nothing you can do to successfully hone them, so you'll content yourself with keeping them scrupulously clean and sprayed with a lubricant fluid such as silicone or PTFE and using them with light cuts.

Fortunately, this type of cutter isn't very expensive and can be replaced when its edge finally goes.

8mm shanks

A fairly recent development in the UK is the introduction of cutters on 8mm shanks. An 8mm shank has nearly 60 percent more cross-sectional area than a 1/4in shank, which not only gives a better cut with higher feed rates but opens up the prospect of using a wider range of

5. Three different shank diameters: ¼in, 8mm and ½in larger cutters in your 1/4in router.

Virtually all the popular medium-power routers now offer an 8mm collet, either as standard equipment or as an accessory.

If you have a 1/2in router there's less importance attached to 8mm shank cutters. You'll continue to use 1/2in shank cutters wherever possible. There are one or two specialised areas, however, where you might find it advantageous to use 8mm shank cutters in a 1/2in router. The best known is in dovetailing where both the Leigh Jig and the WoodRat offer a set of cutters on 8mm shanks to take the place of the standard 1/2in set.

These 8mm shank cutters include both the dovetails and the straights (which is why they're mentioned here) and can be used in ½in routers with the appropriate collet or sleeve to give the additional stiffness that will make the cut easier. Different shank diameters are shown in **photo 5**.

Plunging cutters

It's widely assumed that any straight cutter can be plunged, but this isn't the case. In order to facilitate plunging, straight cutters over 1/4 in in diameter should have centre inserts. (Cutters with a cut diameter of 1/4 in or less don't need them). Many cutters, however, and not only the budget-priced boxed sets, omit this feature.



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The TCT insert, or the machined centre of an HSS cutter, enables a cleaner plunge with less burning, less strain on the router and less wandering of the cut.

In the absence of any plunging centre, the proper procedure is to enter the workpiece from the edge (normal for a housing) or to gradually plunge the cutter to its full pre-set depth as the cut progresses. The beginning of the cut is then taken to its full depth by repeating the process. The process itself is known as 'ramping'. Some plunging centres are shown in **photo 6**.

Edge & bottom cut

The vertical edges of a straight cutter are the part designed to actually cut the wood, while the size and angle of each flute and the amount of metal ground away behind the cutting edges is calculated to give the best cut and most efficient chip clearance.

However, occasionally the bottom of the cutter will do some of the cutting, and it will work quite well, as the bottom edges as well as the vertical edges are ground, but the vertical edges are the part that's designed to do the cutting. This has a practical application for a number of operations. 8. Down-cut shear cutters: Trend 53/82 and CMT 801-127

Tenons are a good example: if they're cut with a hand-held router and a jig, or an orthodox router table using the mitre fence, normally the bottom of a fairly large diameter cutter would be used.

Better results, however, can be obtained if the workpiece is held vertically – as with the tenon push blocks on the Bosch and Trend tables, or in the WoodRat – and the tenon cut using the vertical edges, **photo 7**.

I mentioned the 'vertical edges' of a straight cutter above. Not all straight cutters have vertical edges. Some cutters



are made with the cutting edges at an angle, which might be positive or negative.

Photo 8 shows two such cutters: the Trend 53/82 and the CMT 801-127, which both have a positive shear angle. This gives a downward action and is excellent for cutting housings in veneered chipboard and similar materials. The down-cutting action prevents break-out and feathering of the top edge of the board. The smaller diameters are also excellent for cutting mortises.

Cutter length

As a general principle it's advisable to use the shortest possible cutter length for the job in hand in order to minimise whip and chatter, improve the feed rate, and get a better finish.

This advice, of course, appeals more to the cutter supplier than to the user, with its implication of having to buy a longer or shorter cutter for the next job, but is nevertheless sound.

A case in point is if you keep a particular cutter for housings. Since housings rarely exceed half the thickness of your panel material you can buy an appropriately short version.

> Some routers have limited plunge and it can be a problem getting a deep enough cut in certain

situations, eg when using a template and guide bush, where the thickness of the template robs you of some of your depth of cut.

Fortunately, much guide bush work is done with straight cutters, and very long cutters on ¹/₄in and ¹/₂in shanks are obtainable from Titman and Trend. Titman simply call them 'long-reach' cutters while Trend call them 'pocket' cutters.

An alternative, rather sneaky, way of achieving the same result is to buy Leigh Jig straight cutters. These have long shanks to allow for the thickness of the Leigh Jig dovetail comb and are available from most cutter suppliers. They come in three diameters: 8mm on ¼in or 8mm shanks and 11mm and 12.5mm on ½in shanks. (In the Leigh Jig catalogue these cutting diameters are given in imperial measure since the jig is of North American origin. They're listed as 5/16in, ½16in and ½in).

A close look through the cutter catalogues will reveal other cutters with long cut length or long shank. Some examples are shown in **photo 9**.

Spiral cutters

A relatively recent introduction to the router cutter market are spiral cutters, which can be classed as a straight cutters although their cutting edges look anything but straight. They're made with either one or two helical flutes, ground to different angles to suit the material being cut.

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They come in both HSS and solid carbide, although the latter are more common. They also come in one of two 'twists' – upcut or downcut. Upcut spirals resemble the familiar twist drill and perform the useful function of lifting the sawdust as the cut is made.

Downcut spirals force the chips down into the workpiece but help in reducing break-out and also help to get a 'feather-free' cut by cutting down into the workpiece.

There's also a combined 'up-down' cutter, which incorporates both up and down twists and give a fine finish on both sides of material such as double-faced plywood. These are very expensive, however, and unlikely to be of much interest to the hobbyist.

Finer finish

Both upcut and downcut spirals give a finer finish to the work. The spiral blades ensure that there's always part of the blade in contact with the wood, and they cut with a slicing action instead of the 'two swipes per revolution' of the ordinary two-flute straight cutter.

Upcut spirals allow faster feed rates, but with downcut spirals, when cutting housings for example, the feed rate usually has to be reduced in order to give the chips time to clear. Dust extraction is pretty well a 'must'.

Upcut spirals are also excellent for drilling with the router – another lesserknown routing operation. If your model has variable speed, the speed should be reduced for this operation.

Photo 10 shows the difference between upcut and downcut spirals: on the left is a Trend S55/2 upcut and on the right a Trend S55/2LH downcut.

Different materials

Spiral cutters are available for cutting a range of different materials and the pitch of the spiral varies according to the material for which it's intended.

For the majority, the most likely material that will need to be to be cut, after wood, is plastic, eg Perspex for false router bases jigs etc.

Spiral cutters made for Perspex have a quite different pitch compared with those intended for wood. This is shown in **photo 11** where the selection of spiral cutters includes a Titman solid carbide plastics cutter, a Clico HSS generalpurpose cutter, two CMT solid carbide wood cutters and two from Trend.

All but the Trend on the extreme right are upcut spirals; downcut spirals are slightly more specialised and I haven't yet had much need for them.

Upcut spiral cutters are particularly good for mortising since they help lift the dust out of the cut, but are also very good as general-purpose straight cutters. They 10. Trend S55/2 upcut (left) and S55/2LH downcut (right) showing the two different twists



9. A selection of long cut and long reach cutters



11. Spiral cutters (l-r): Titman acrylic plastic cutter, CMT ¾in woodworking, Clico ¼in HSS general-purpose cutter, CMT ½in woodworking cutter, and two Trend ¼in `woodworking cutters. The Trend cutter on the extreme right is the only downcut

can't be honed, of course, but can be re-sharpened.

Not all sharpening agencies have the specialised equipment, however, and the safest thing is to consult the cutter supplier. Because they can't be honed, I'd recommend buying the solid carbide variety for maximum cutter life.

Versatility

Straight cutters, above all others, make the router the most versatile tool in the

workshop. Possibly their greatest ability is to cut nearly every woodworking joint in the book – with the obvious exception of dovetails.

Most authorities say that you can never have too many straight cutters and I largely agree with this. You can, however do a great deal of work with just the basic sizes: $\frac{1}{4}$ in, $\frac{3}{6}$ in, $\frac{1}{2}$ in and $\frac{5}{8}$ in.



ETTING UP & CUTTERS