BY RON FOX

Beyond the basics 5: Spirals & downshears

The newcomer to routing soon realises that the workhorse cutters are the straights. It is truly said that you can never have too many straight cutters, and that it pays you to buy quality

The vast majority of today's straight cutters are two-flute tungsten carbide tipped (TCT), which can tackle abrasive boards such as chipboard and MDF as well as natural timber.

A relatively recent development, which is spreading from the industrial to the domestic market, are the spiral or helical cutters. These can be classed as special types of straight cutter, although they look anything but straight, and can be used wherever you might otherwise use an ordinary straight cutter.

Helical bar

Spiral cutters are machined from solid tungsten carbide (STC) or high-speed steel (HSS), and have a number of advantages over the usual two-flute straights. The ordinary two-flute cutter, however sophisticated the router set-up, effectively gives the wood two 'swipes' with every revolution. The impact of the two separate blades as the cutter rotates can create vibration and, when fed fast through the work, can cause a build-up of chips that results in a poorer finish. This is particularly noticeable with veneered chipboard where the line of cut of, say, a housing can show quite a marked degree of feathering.

1 Two types of spiral: down-cut (left) and up-cut (right)

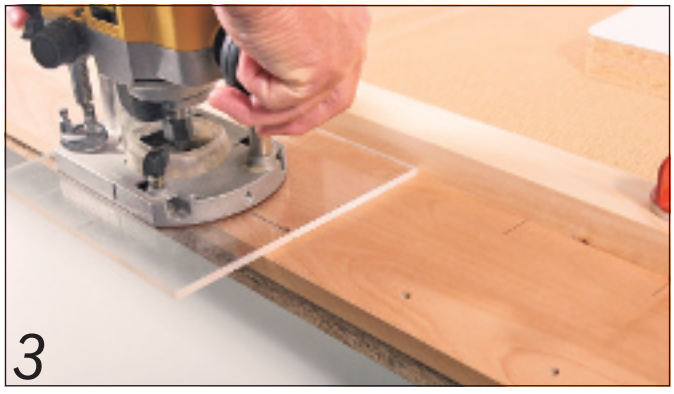
2 A combination up-cut/down-cut spiral

Continuous slice

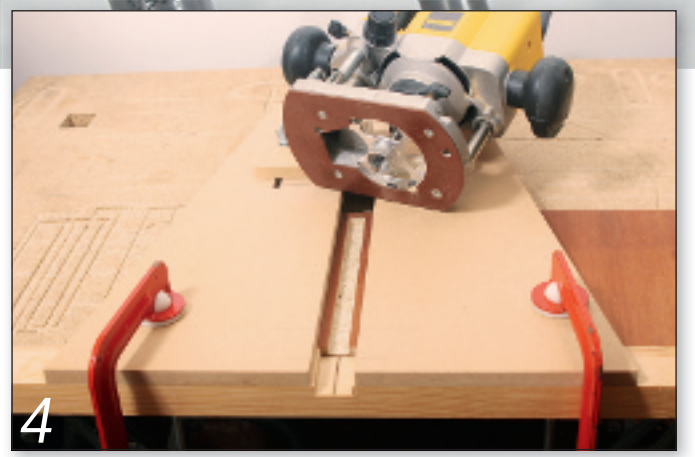
By contrast, the helical shape of spiral cutters works with a shearing or slicing action on the material. Part of the cutting edge is always in contact with the workpiece, which puts a more even load on the router and helps to reduce vibration.

A slightly unexpected benefit from this smoother action is that faster feed rates through the material can be maintained, although this is of more importance to industrial operators with power feed or CNC equipment.

Apart from the obvious factor of size, spirals are made in two main 'twist'



3 Boring holes with an up-cut spiral cutter and a Perspex base



A housing cut in veneered chipboard with a down-cut spiral; note the complete absence of feathering

A combination spiral held against double-faced Contiboard, showing the spirals cutting towards the centre of the board

varieties: up-cut and down-cut, **photo 1**. There is also a third category: the 'up-cut/down-cut' or 'combination' spiral, **photo 2**.

Cutting up

An up-cut spiral cutter is made with a right-hand twist, like a standard twist drill bit. This shape helps lift the chips and makes it particularly suitable for grooving and mortising, or anywhere where dust and chips present problems. The shape also tries to lift the workpiece, so firm clamping or downward pressure is required.

Slight feathering might occur with difficult materials such as veneered chipboard. This can often be overcome by scoring through the veneer with a sharp knife first, or by using the alternate 'down-cut' spiral cutter (see below).

Up-cut spirals are also very useful for boring holes with the router. This is not a widely-known application of the router, but it's very efficient because the router has 90° entry to the work and a precise depth stop. If you need to bore holes further from the edge of a panel than the throat of your pillar drill allows, the router is also more stable than the average hand-held drill.

I make special bases from Perspex for my router for this purpose, **photo 3**, and reduce the router motor speed to about 10,000 rpm.

Cutting down

Down-cut spirals have a left-hand helix, so they twist in the opposite direction to the up-cuts. This causes the spiral to slice down on the workpiece and gives a better finish than with up-cuts, although the feed rate is a little slower. Feathering on veneered or laminated boards is virtually eliminated, which makes this type of cutter a good choice if you do much work with this type of material, **photo 4**.

Combination spirals

The combination up-cut/down-cut spiral has most of its length made with an up-cut spiral, but the bottom part – 10mm (⅜in) or so – is twisted in the opposite direction. This provides down-shear cutting on the top and up-shear cutting on the bottom of boards, which makes it particularly useful when working with double-faced boards such as many of today's veneered chipboards. Cutter depth is set so that the bottom twist bears on one of the board faces with the

JOBS FOR YOUR SPIRALS

We've already seen one application for each type of spiral (photos 3, 4 and 5). Other bread-and-butter jobs for spirals include:

■ **grooving**: an up-cut spiral is excellent for grooving boards – for example, to take the bottom of a drawer. The cutter shape helps lift the chips out of the groove being cut, and leaves a clean edge compared with an ordinary straight cutter, especially in softwood, photo A.

■ **mortising** is another excellent application for the up-cut spiral, where its ability to lift the chips from the cut is particularly valuable, photo B. Note the fine adjuster to set the fence, the levelling foot on a packing piece to prevent tilt, and the clamps, which hold the workpiece and control the length of the mortise.

■ **tenoning** works beautifully with spirals if you can use the length of their blades. They work exceptionally well in my little horizontal routing table, which I made primarily for cutting mortises and tenons in material of small cross-section, photo C. Spirals are also useful in the Trend Craftsman table, WHEN used in conjunction with the vertical push block, photo D.

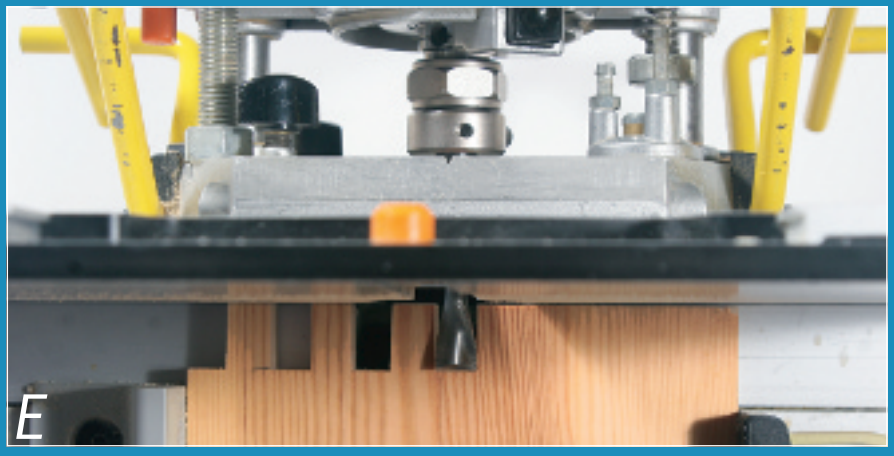
■ **pins and fingers** can also be cut successfully using spirals with dovetailing/finger jointing devices such as the Leigh jigs and the WoodRat, photo E. In the WoodRat, they also come into their own for all the standard joints where a straight cutter is usually called for.

Cutting a groove for the bottom of a drawer

Cutting a mortise with an upcut spiral

Cutting a tenon on my horizontal routing table

Cutting a tenon on the Trend Craftsman table



Cutting a finger joint in softwood on the WoodRat

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A Titman acrylic-cutting spiral; note the different pitch of the helix and the intricate shape behind the blades

upper twist bearing on the other, **photo 5**.

These are very expensive cutters, and as a result they are much less likely to feature in the amateur's toolkit than the simple up-cut and down-cut spirals.

Which material?

As I mentioned earlier, spirals are made in solid tungsten carbide (STC) and high-speed steel (HSS). HSS up-cuts are recommended for a fine finish on softwoods. The up-cut shape also prevents burning in plunge cuts such as mortises. STC spirals can also be used on hardwoods and abrasive materials as well as softwoods.

For me, and I think for most amateurs, the choice has to be STC for general work. It will be apparent that whatever else you do with a spiral cutter, you are not likely to hone it successfully. Given that HSS wears much faster than STC, and given that you cannot hone them, there doesn't seem to be much argument as to which to buy.

Remember that although you can't hone them, there's nothing to stop you keeping your spirals clean and lubricated with one of the 'dry' lubricants on the market.

Specialist service

One factor to take into account, however, is whether your supplier offers a re-sharpening service should you ever require it. Not all saw doctors are equipped to do this – it's more of a precision engineering job. Most suppliers will undertake to have their own cutters re-sharpened; Wealden state in their

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An assortment of downshear straight cutters

catalogue that a specialist re-sharpening service is available for their solid carbide spirals.

Cost versus size

Spirals are more expensive than corresponding quality straights, but not spectacularly so until you get to the large sizes such as a cutter with a ½in shank, 12.7mm (½in) in diameter, and offering 50mm (2in) cut length. With the large sizes the cost of the spiral might be 3-4 times the cost of a same-size quality straight. Part of the extra cost arises from the cost of the solid carbide rod from which the cutter is machined. Another key factor is that the manufacturing process is more complicated and therefore more expensive.

I have a few spirals in the smaller diameters for grooving and mortising, plus one prized 12.7mm (½in) diameter up-cut with a cut length of 50mm (2in), and one combination spiral. I've never used this last one in anger, but keep it as an example.

Special spirals

The spirals described above are for general cutting of wood and wood products, but manufacturers such as Titman also offer special spirals for cutting materials such as acrylics, aluminium alloys and so on. These specials are made with the pitch of the spiral varied according to the intended material and, usually, a complicated shape immediately behind the blades, **photo 6**.

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Combination spiral and up-down shear cutters

Downshear cutters

There is a type of straight cutter which comes somewhere between the ordinary straight and the spiral. This is the downshear straight, in which the TCT blades are straight, rather than spiral, but are angled, with the top further forward than the bottom, **photo 7**.

Apart from straights, the downshear cutters range also includes trimming cutters. Here the angle of the blades gives a cut which goes some way towards mimicking the slicing cut of the spiral. The size range is limited, compared with the other cutters, but the most useful diameters – 6.35mm (¼in), 9.5mm (⅜in), and 12.7mm (½in) – are available at a price comparable with the corresponding ordinary straights.

Downshear cutters are excellent for grooving, housing, and trimming veneered and laminated boards. The angle of the blades drastically reduces break-out on the top surface.

Up-down shear cutters

Just as with spirals, there is a version of the downshear cutter that reverses the direction of the shear at the bottom. These are intended, as are the combination spirals, for trimming double-faced boards and plywood, **photo 8**.

The cutter action shears the two board surfaces towards the middle, giving a clean cut without feathering, at a cost little more than that of the corresponding ordinary straight cutter.

A SIMPLE TEST

I conducted a small and strictly non-scientific experiment by cutting a 12.7mm (½in) wide housing across a piece of veneered chipboard with three top-quality 12.7mm diameter cutters: a Titman TCT 2-flute straight, a Trend TCT downshear straight, and a CMT STC up-cut spiral, (above, left to right).

All three cutters gave first-class results with no feathering, and it would take a good eye to spot the differences. However, these were brand-new cutters, and I would expect the advantages of downshear and spiral to show up more noticeably with extended use. In other words, as usual, it depends on how much use you're going to give the cutters.

Making a choice

Spiral cutters are an interesting innovation, and are finding increasing acceptance among non-industrial router users. The basic sizes aren't a lot more expensive than similar quality straights, although the price differential increases with the larger sizes.

You don't have to rush out and buy them, but I think it's worth giving the basic sizes a try, especially if you do much work with veneered and laminated boards.

A less expensive alternative to the larger sizes is the downshear straight cutter, but remember that these come in a much more limited range of sizes.

FURTHER INFORMATION

- Titman
- 01255 220123
- www.titman.co.uk
- Trend
- 0800 487363
- www.trend-uk.com
- Wealden
- 0800 328 4183
- www.wealdentool.com