

# Choosing Shaper Cutters

*Toolmakers are improving safety and quality*

by Lon Schleining





A shaper is an indispensable tool in my custom stairbuilding shop. But I had used one for 12 years before I could bring myself to try anything other than standard wing cutters. I'd heard too many stories about knives that had been thrown from old-style cutterheads to feel comfortable with them on my own shaper. Eventually, I was convinced to try modern cutters with replaceable knives—what the industry calls insert tooling. To my surprise, I found a lot had changed in cutter design.

Even with new products on the market,

**Wing cutters can be stacked and the tips staggered so only half are cutting at a time. These custom cutters are made with a shear angle to give a smoother cut.**

Photo: Alec Waters

there are still only two basic kinds of cutters: those with permanently attached cutting edges, like the wing cutters I was used to, and those with interchangeable knives. Developments in design and manufacture have produced safer, better-performing tools of both varieties. European safety standards have led to a new family of wing cutters, and insert tooling is now offered in several styles that are a big improvement over the old-fashioned cutters, which I refuse to use.

Many manufacturers make shaper cutters, and each offers a variety of profiles. Panel-raising, flush-cutting, detailing and molding (contouring) cutters are just a few of the common styles. There are also matched sets, like cope-and-stick cutters, for making rails and stiles in doors and paneling. Generally, the bigger and more powerful the shaper, the bigger the cutter you can use and the larger the cut you can take in one pass.

Most cutters have either a 3/4-in. or 1 1/4-in. bore, which are the two most widely used spindle diameters, and two to four cutting edges made of high-speed steel or tungsten carbide. High-speed-steel cutters are less expensive and can be ground to a sharper edge than carbide. But I use carbide because it holds an edge much longer. This is important because every sharpening reduces a cutter's diameter. For matched cutters, all the knives in the set must be carefully sharpened to maintain the mating profiles.

Not surprisingly, the best shaper cutters are the most expensive. But I consider cost last. The expense is only for the short-term. Over the long haul, I've found that high-quality cutters are a better investment.

### **Wing cutters are easy to set up**

Three-wing carbide-tipped cutters (see the top photo on p. 47) are just about my standard tooling choice. Solid cutters run true and require no special expertise to set up

because there are no loose parts. They are available in hundreds of stock contours, and you can stack different cutters on the spindle to produce complex profiles. In addition, cutters can be made in almost any custom profile (see the box on p. 47).

Wing cutters usually have two or three wings, but four-wing cutters are not uncommon. Two wings are best for clearing chips quickly and for removing a lot of stock in one pass, but manufacturers prefer cutters with three wings because they are easier to balance. More wings mean more cuts per minute and, therefore, a smoother cut. The cost of a cutter is directly related to the number of cutting tips.

Wing cutters often incorporate a shear angle to improve the cut quality. This is where the cutting face is angled rather than parallel with the spindle. The shearing action slices rather than chops the wood.

### **Safety cutters help reduce kickback**

The most recent development in wing cutters is a new antikickback design (see the bottom photos on p. 47), also called safety or chip-limiting cutters. Developed in Europe, safety cutters limit how far cutting edges protrude from the body of the cutter. Viewed from above, these cutters look more like a disc than a propeller. Because the body of a safety cutter is only slightly smaller than its cutting diameter and because there is no open passage behind the cutting face, these cutters require a slower feed rate. In use, safety cutters and conventional cutters are impossible to tell apart. Kickback is minor. The biggest drawbacks to the new safety cutters are high cost and limited availability. Also, local saw shops may not be able to sharpen them.

### **Insert tooling is versatile**

Replacing just the knives rather than the entire cutterhead makes insert tooling attractive to both production shops and one-

*Even with new products on the market, there are still only two basic kinds of cutters: those with permanently attached cutting edges and those with interchangeable knives.*

off operations (see the bottom left photo below). In a production run, knives that get dull or damaged are easily replaced, and having a spare set reduces down time. In addition, replacing dull knives with new ones maintains a consistent profile.

For short runs in a variety of profiles, insert tooling is economical, especially when you are using high-speed-steel knives. These steel knife blanks can be ground to virtually any profile.

As a group, though, interchangeable cutters require more care in set up and use. Every fastener must be carefully tightened. Knives must be in good condition so that

they will seat properly. And they must be sharpened as a set to remain balanced. Finally, the assembly must be checked to be sure that the knives protrude equally from the cutterhead.

A slip-knife cutterhead is an early example of insert tooling. The slip knives are clamped on edge between two collars, and friction caused by compression of the spindle nut is all that holds the knives.

The disadvantage, and major safety concern, with slip knives is that they can fly out of the cutterhead if the spindle nut is not sufficiently torqued down. You have to be especially careful when you install and use

these cutters. Setup is time-consuming and requires a higher level of expertise than any other type of tooling.

### **Latest insert tooling adds safety to versatility**

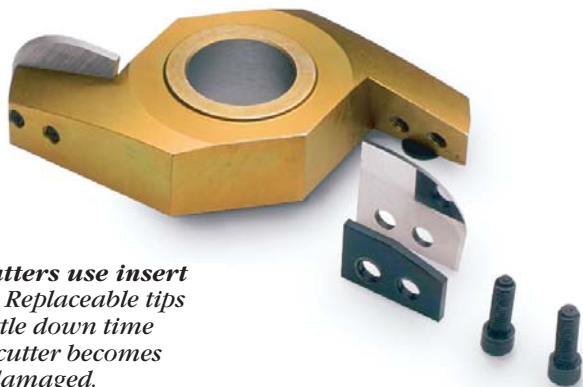
A safer alternative to older style slip knives are lock-edged knives (see the top right photo below), which have milled teeth in one edge of each knife. These teeth engage an adjusting screw in the collar. This forms a mechanical connection between the cutterhead and the knives and allows the knives to be set so they all have a consistent cutting diameter. Some toolmaking

## **Interchangeable knives**



**Chip-limiting insert tooling provides increased safety.** A plate in front of the knife exposes only a small portion of the blade to prevent overfeeding.

**Lock-edged cutterheads have interchangeable knives.** Teeth in the edge of the knife engage a screw in the cutterhead.



**Wing cutters use insert tooling.** Replaceable tips mean little down time when a cutter becomes dull or damaged.



**Wedge-shaped gibs hold the knives in place.** A pair of pins holds each knife to the cutterhead if the gib ever loosens.



shops can mill teeth in the edges of older slip knives so that they can be used in a lock-edged cutterhead.

Another type of insert cutterhead holds a pair of high-speed-steel knives in place with wedge-shaped gibs, which is somewhat similar to the setup for some jointer knives. A pair of pins registers each knife in the cutterhead and forms a mechanical safety lock (see the bottom right photo on the facing page).

A similar design also uses a wedge-and-gib screw but adds serrations across the back of the knives. These grooves interlock with matching grooves in the cutter-

head to form a mechanical connection. The serrations also provide a reference to help set the distance the knife projects from the cutterhead.

Insert tooling can be purchased with a full set of knife profiles. Or you can purchase just the cutterhead and the knives you need. A number of manufacturers offer pre-ground knives and blanks made of high-speed steel. In addition, some manufacturers sell solid-carbide knives. □

*Lon Schleining builds custom staircases in Long Beach, Calif., and teaches woodworking at Cerritos College in Norwalk, Calif.*

## Ordering custom cutters



**Custom-made, carbide-tipped wing cutters save time. Two cutters mold this large banister profile with the fewest setups.**

Despite the availability of many stock profiles, you may need a custom shape. Some toolmakers can produce a custom profile from a drawing and have it ready the next morning.

To locate a good toolmaker, call the supplier where you get stock cutters or ask at the blade-grinding shop that you use. A knowledgeable sales person can save you time and money.

It helps to remember that a toolmaker is first a metal worker. He may know a lot about tooling for woodworking, but woodworking may not be his area of expertise.

The more information you can supply, the better. Specify the basics: cutterhead type, knife-blank size, spindle diameter and machine horsepower. It also helps to know the material being worked and whether it will be hand- or power-fed.

A careful drawing is a good start. If you are trying to match a pattern exactly, send a sample of the molding itself. If you are cutting a curve, specify the radius of the curve and how you intend to run the stock through the shaper. When in doubt, ask for a return drawing with your quote so that you can see if the cutter the toolmaker has in mind is actually the tool you need. And if he has made something similar for another client, a call to that person may be a good idea. —L.S.

## Fixed knives

**Wing cutters have become the standard tooling choice. They are available in a variety of profiles.**



**Safety cutters minimize potential for kickback. The reduced gullet opening limits the stock feed rate.**

