

Dovetail Engraving

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Description

Dovetailing is a method of milling slots or channels that have angled side walls yielding an opening that is wider at the bottom than at the top. This type of groove is intended to hold a piece of material whose edges have been beveled at an angle corresponding with those in the slot. When assembled, the mating piece is retained within the channel, but can be moved back and forth.

A good example of a dovetail application is the master copy type and copy slide used on manual engraving machines. The copy slide is a dovetailed channel and the type blanks have beveled edges. The type is retained in the slide, but can be moved easily for insertion and removal.

Application

A practical application for dovetailing in the engraving industry is the fabrication of directory signs that have removable inserts or legend plates. Signs of this type are generally made using acrylic or flexible engraving stock and can be made to be decorative as well as useful.

Acrylic products, such as Romark Slickers, have both a clear and a colored layer, and can be used to create a wide range of options and effects. These materials can be reverse engraved and then paint filled with contrasting colors. Directories made from flexible engraving stock can incorporate inserts and backgrounds of different colors and can be equally appealing.

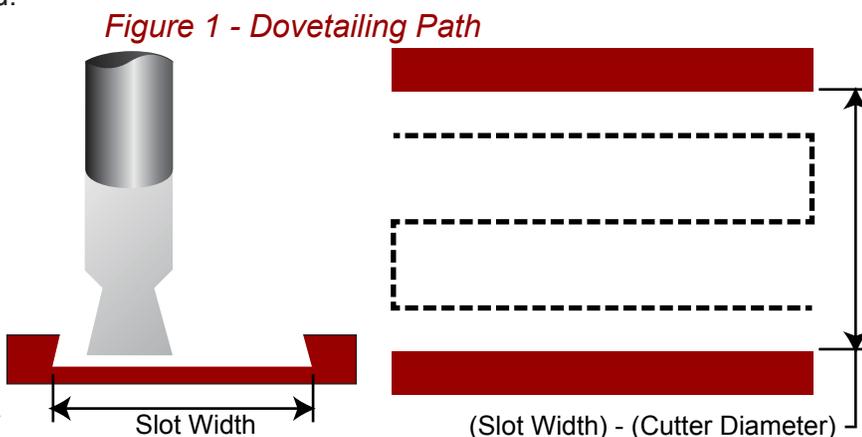
The main sign plate with the dovetailed slots should be a minimum of 1/8" thick. The insert strips are generally 1/16" thick and are recessed the same thickness so the face of the strip is flush with the surface of the sign.

Technique

Creating the dovetailed slot is a milling operation performed with a dovetail cutter. This cutter is ground with a negative angle that produces the undercut on the edge of the slot. The insert strip is cut out using a profiling cutter that has an angle that matches that of the dovetail cutter. Neither procedure is particularly difficult once the basics are understood.

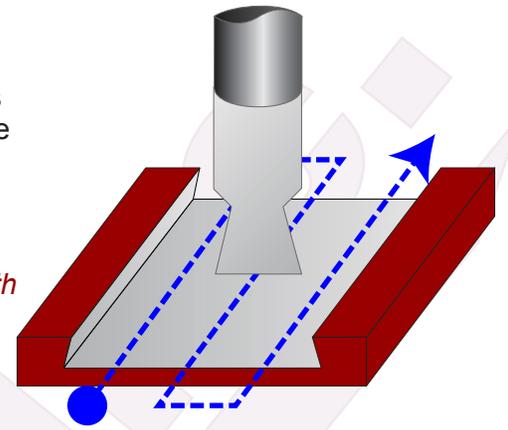
For the dovetailing operation, we first need to create a computer generated logo pattern or an engraving template that provides a series of parallel cutter passes (Figure 1). For purpose of example, assume we are making a 1.0" wide slot and are using a .250" dovetail cutter. Since the lines of our logo pattern define the center of the cut - not the edge - we must subtract the cutter tip diameter from the finished slot width. In this case, 1.0" (slot width) minus .250" (cutter width) give us a pattern width of .75".

Since each cut is .250" wide, there would be four passes required to create the full width of 1.0" ($1.0 \div .250 = 4$). However, it is desirable to have each pass overlap the previous, so the logo should be created with at least one more line than the number calculated. In the case of our example, five lines or passes should be used instead of four. This will eliminate any ridges in the bottom of the cut.



The dovetail cutter cuts wider at the bottom than it does at the top, so the cut must be made at full depth. The cutting pattern should be longer than the width of the plate so the cutter can be lowered to the specified depth before it contacts the plate. After it is lowered, the cutter enters the edge of the material, makes the pass, exits the other edge, and repeats the process for the next pass (Figure 2). It is important to remember that the cutter can only be raised when it is off the material being cut.

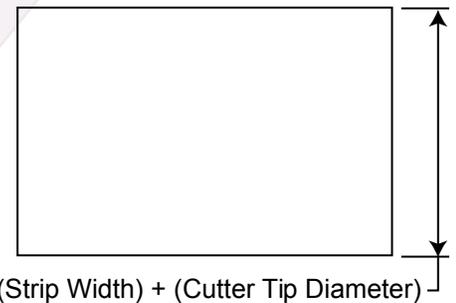
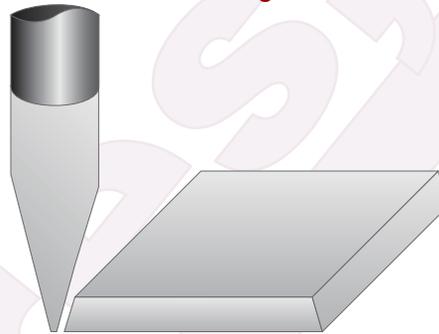
Figure 2 - Cutter Path



The dovetailing process is slower than normal engraving due to the considerable amount of material being removed. As a rule-of-thumb, cutter speed should be about 10,000 rpm and the feed rate (the speed the cutter moves through the material) should be about 15 to 30 inches per minute - slower in acrylic and faster in flexible. A slot that is 1.0" wide by 10" long can easily be produced in 3 to 4 minutes. It is strongly recommended to use water-soluble cutting oil when working in acrylic. It allows for better finishes, faster feed rates, and extended cutter life.

Figure 3 - Insert Shape

With the dovetailing complete, the next step is to make the insert strips. This is done with a profiling cutter that is sharpened to an angle matching the angle on the groove. Like the dovetailing operation, a logo pattern must be created that will yield a plate the proper length and width. A simple rectangle is all that is needed (Figure 3).



As with the dovetail pattern, it is necessary to factor the cutter tip size when making the calculations. If we are making a strip that is 1.0" x 10" and we are using a profiler with a .030" tip, we would add .030" to each dimension. The result would be a rectangle measuring 1.030" x 10.030". When making the strips, we are concerned with the inside of the cut, so the cutter width is added instead of being subtracted.

There are two methods of profiling. One is to tape the sheet of material to a scrap piece of plastic using double-faced masking tape and engrave completely through the top piece of material. The strips are ready to use after they are removed from the tape backing.

The other method is to clamp or tape the material to the machine table and engrave only partially through the material, leaving only a few thousandths of material holding it in place. The pieces are then snapped apart. However, they then must be trimmed to remove the thin web that was not completely removed during the profiling.

The fit between the strips and the dovetailing should be close enough to hold the strips snugly, but loose enough to allow the strips to slide smoothly. The fit can easily be adjusted by altering the width of the insert by adjusting the width of the rectangle pattern a few thousandths either way.