PASSFIRE.COM

Log Out

Volume 4, Issue 6

Tool Tip... **Page 1**

Making End Disks

Figure 1: Cutting disks with an adjustable circle cutter.

Figure 2: A center pin circle cutting jig clamped to a band saw table.

Introduction:
With commercial cardboard disks being fairly cheap and readily available in all the most common sizes, the thought of trying to make your own disks may seem like a misuse of valuable pyro time. However, there are occasions when you need odd sized disks or very large disks that are not easily found on the hobby supply market. For example, you may be making slightly undersized bottom shots so that when you roll the shell casing around them the resulting casing will have the correct inside diameter. Or you may be building odd sized canister shells like a Maltese 7" multi-break, which requires a 6-1/2" disk. Maybe you build one or two big 8" or 10" canister shells a year and don't want to order a bunch of disks in that large of a size. Then there's always the case where you decide to build something at the last minute and don't have time to wait for disks to show up in the mail (that would be me).

There are a few types of material sold in 8 by 4 foot sheets in most hardware stores that work well for making canister shell end disks. One type is a 1/8" thick cardboard insulation that has a shiny metallic surface on one side. While paste doesn't stick well to the aluminized surface, me and others have used disks made from this material in many shells without problems. It can be punched for smaller size disks and cut for larger disks without any problems, and the cost is cheap.

The second type of material that can be used is a composite wood fiber product called hardboard, which is also about 1/8" thick. This material has the combined properties of both paper and wood. It is more brittle than cardboard and can not be punched very cleanly, but holes can be drilled through it with much less trouble than with cardboard. Hardboard resists bending more than cardboard, but it does crack in half beyond a certain stress point.

Cutting the Disks:
One method of cutting disks from thin material is to

Figure 3: Setting the pin distance equal to the desired disk radius.

Figure 4: Drilling the center hole through a stack of disk blanks.

Figure 5: Cutting the circles by rotating the square blanks into the blade.

use an adjustable circle cutter, as seen in Figure 1. The advantage to this cutter is that it can be easily adjusted to cut any size circle you want. The disadvantage to this tool is that you can only cut up to about a 6-1/2" diameter circle, and it leaves a rather large hole in the center that is too big to use as a solid disk. The hole is also too big to accept Chinese time fuse, so you could only use the disks with spolettes. While this cutter makes perfectly round circles, it leaves an undesirable beveled edge on the disk. The paper tends to dull the cutting blade quickly, so frequent re-sharpening is another drawback.

A much better way to cut circles is to use a center-pin type jig on a band saw, as seen in Figure 2. This jig is made by simply driving a small nail a few inches from the edge of a piece of scrap wood and cutting the head off to form a pivot point. Clamp this board to a band saw table so that the distance between the pin and the saw blade is equal to the radius of the disks you want to cut. Over this pin you will be placing square blanks with pivot holes drilled in the center, then rotating them into the saw blade to quickly produce your disks.

You will need a good way to cut up the large sheets of disk material into small squares equal to the diameter of the disks you are cutting (or just a hair larger). The hardboard actually cuts better on a saw than the cardboard, but a table saw or radial arm saw can make short work of either. Otherwise you can use a saber saw or other hand tool to rough out the squares. They do not have to be pretty, but make them slightly oversised if you are going to be sloppy about it.

Once you have a good many square blanks cut, mark the center point on one and place it on a stack of four of five blanks. Using a drill bit that is only slightly larger than the pivot pin on your jig, drill all the way through the center point on your stack of blanks. The top blank can be used as a template to drill out further stacks of blanks.

At this point cutting the final disks is quite easy. Simply place the blank onto the center pin and rotate it into the band saw blade until all the corners have been cut off, as seen in Figure 5. Be sure the blade tensioner is as low as possible on the blade, and make sure a fresh tension block is inserted into both sides. When spinning the material into the blade, it will want to bend out away from the disk, which will increase the cutting radius and make your disks a little oversized. Minimizing the length of unsupported blade will help reduce this, as will increasing the blade tension and using the widest blade possible.

The tiny center hole that results from this method actually comes in handy for punching holes in the disks later, allowing you to easily locate the exact center. The hole should be no larger than 1/16 of an inch, which will still allow you to use these as solid disks on the bottom of your shells as long as your paste wrap overlaps the center. If you are paranoid about potential gas leaks, just fill it with glue.

More...

PASSFIRE.COM

Log Out

Volume 4, Issue 6

Making End Disks...

Figure 6: Using a compass to draw concentric disk templates.

Figure 7: Centering the disk template guide uder the bit of a drill press.

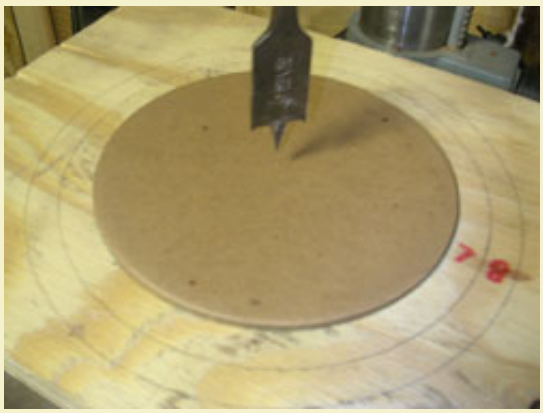

Figure 8: With power turned off, the bit is brought down to mark the center point on a

Center Punching Disks:
Even if you but your end disks from a supplier, you still usually have to punch spolette holes in them. Some people special order large quantities of disks with custom hole sizes already punched, but for the small scale hobbyist that is not really an option.

One issue that can be a pain about center punching commercial end disks is trying to get the hole located dead center. If you are off center, then your disks will not fit right over your spolette or your multi-breaks will not align with each other.

If you own a drill press, then the jig shown in Figure 6 and 7 will allow you to accurately mark the center point of various sized disks. On a scrap of wood, use a compass to draw concentric circles for the common disk sizes you use. These circles will serve as guides for positioning each disk.

To use the alignment jig, simply mount it on the drill press table so that the drill bit is aligned with the center point left by the compass. It is not really necessary to clamp the alignment board to the drill stand unless you plan to mark a lot of disks at once. It is a good idea to lock the adjustable table in place to keep it from moving back and forth though.

Once everything is aligned, simply position the disk to be marked in the corresponding circle and use the press to bring the bit down into the disk. There is no need to turn the drill on, just use a pointed bit such as a spade bit that will leave a small point in the paper, as seen in Figure 8.

Using a spade bit do drill spolette holes in your disks works pretty good when you are using hardboard, but does not work well at all with cardboard. Spade bits will cut the cardboard well enough, but the layered nature of paper results in thin disks splitting off and clogging up the blade so that it can't even make it through a 1/8" disk without stopping and cleaning it several times. Other types of drill bits will typically tear up the exit side of the disk, so that doesn't work well either.

The best way to make spolette holes in cardboard disks is with a hand punch. There are various styles of these available in sets of 1/8" increments. The one shown in Figure 9 came in a set with about 9 sizes that screw onto a single punch. Once nice feature about this punch is that it has a spring loaded center piece, which can be placed right on the center marks you made on your disks for precise

disk.

Figure 9: A hollow punch with spring loaded center pin to eject punched disks.

Figure 10: A set of one piece punches with fluted sides for disk removal.

Figure 11: The deformed back-side of a punched hardboard disk compared with a drilled out disk.

positioning. The center pin actually recoils up into the rammer during the punch operation, then the spring forces it back out and, if you are lucky, ejects the punched piece from the hollow die. Half the time the spring is not strong enough to do the job unfortunately, and you have to unscrew the die and knock it out manually.

Figure 10 shows another style of hollow punch, these being a one-piece punch with a fluted opening that theoretically allows the punched material an escape route. The problem with these punches is that the inner cavity is not tapered enough, so the disks jam up inside to the point that you have to hammer them out with a ram rod.

Another type of punch, not shown here because they are more expensive and I don't own a set, is known as an "arch punch." These have a well designed taper that actually works as designed, allowing the disks to pop out the top as you use them. If you can afford them, these are the ones to get.

When using hardboard disks, it is actually easier to drill out the spolette holes than to punch them. This also results in a cleaner hole, as seen in Figure 11. Hardboard tends to bulge out on the exit side when punching, whereas drilling gives a clean hole on both sides.

When hand punching disks, you need to have a backing material that is not too soft but also allows the punch to cut into it. There is a type of hard rubber material that is made specifically for this, but a block of good hardwood like oak or maple works well too.

I find that a 4 lb mini sledge hammer works best when punching holes in disks, especially holes that are 5/8" or larger. I've had no luck getting an arbor press to do the job except on very thin material. Even then, the hammer method is still faster than a press.

Kraft disks are considerably harder to punch than chipboard disks, which is one reason I avoid them. Even with a 4 lb mini-sledge hammer, it can often take several blows to get a 5/8" hole punched in a virgin kraft end disk. Chipboard is much easier and does the job just fine as far as shell construction goes.