Molded-In-Place Grommets, Version 1.1

By R. G. Sparber

As I think about the lowly grommet, it is no wonder I never have the right size. There is the outside diameter, the slot width plus its inside diameter, and the inside bore.

Have you ever tried to wrestle a grommet into a hole that was too small or with a plate that was too thick? It doesn't take much to tear the grommet.

Sure I could buy a kit with a large selection of grommets. Murphy's law says that it would have all sizes except the one I needed. Besides, I don't use grommets all that often so the need drawer space would not be justified. And then there is the obvious – would you want to read how I bought a box of grommets?

How about making cast-in-place grommets? They are always a perfect fit for the hole regardless of plate thickness. Yes, it looks a bit rough, but it certainly protects wires that pass through it from the edges of the plate.

The hole, in this magnified view, is ¼ inch in diameter. I'm using white hot glue.

This grommet has a thicker flange plus arms radiating out. It all depends on what I want.

I am using yellow hot glue to make this grommet.

Here is my molding machine.

The lower mold is bolted to the shaft.

This ring forms up my mold release agent.

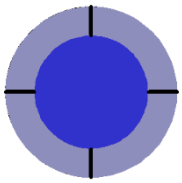
This is my upper mold.

The spring and screw apply pressure during the fusing process.

The lower and upper molds were made from 6061 aluminum and turned on my lathe. They define the shape of the flanges. These have an outside diameter of ½ inch. Both recesses were cut with a 3/8 inch end mill.

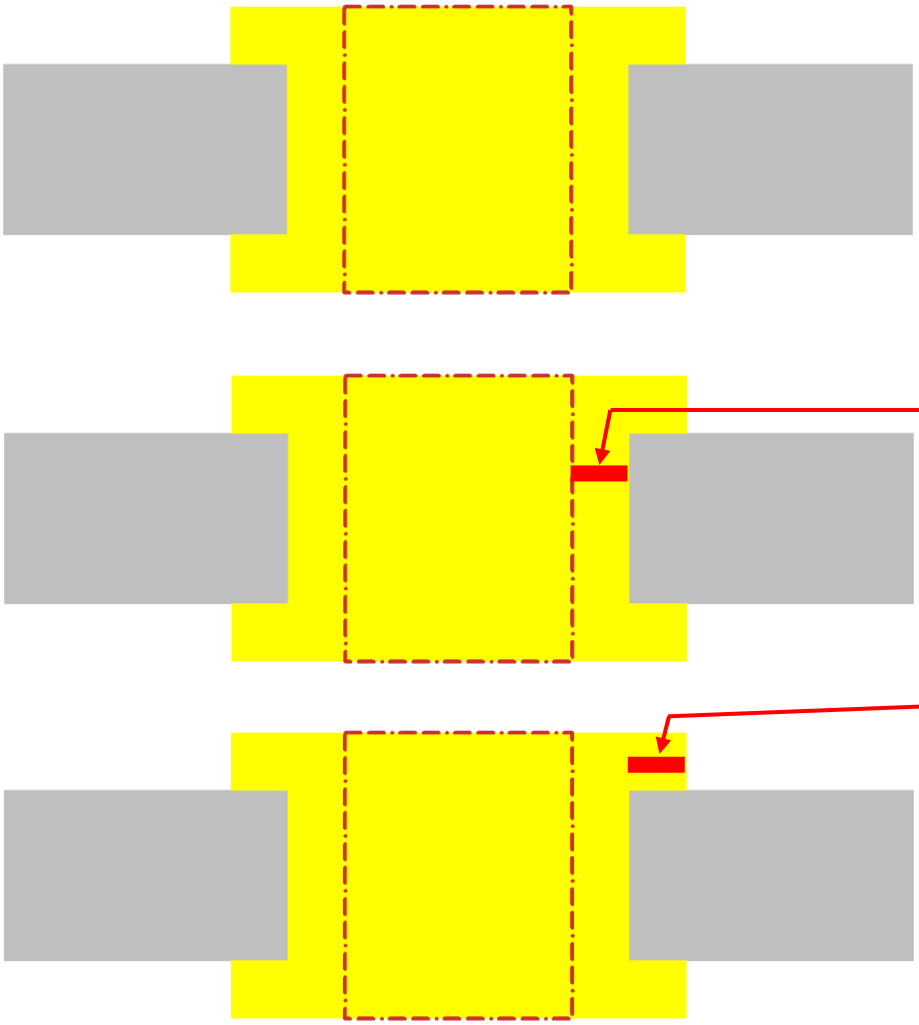
The lower mold is drilled for 6-32 clearance. The upper mold is drilled for a sliding fit on a ¼ inch rod.

To form extension arms, use a saw to cut radial slots through the mold's wall.



The mold release ring is a loose fit to the 3/8 inch bore and is drilled out for a sliding fit on a ¼ inch rod.

The shaft is ¼ inch diameter rod drilled and tapped at both ends for 6-32. It is long enough to pass through the plate and upper mold and stick out the top by at least 1/8 inch. This makes it easier to place the spring on top of the upper mold.



This is a cut-away side view of the grommet (yellow) molded into a plate (gray). The dashed red line is the hole through the grommet.

I want a grommet wall thickness of at least 0.02 inches which means the hole in the plate must be at least 0.25 + (2 x 0.02) = 0.29 inches in diameter.

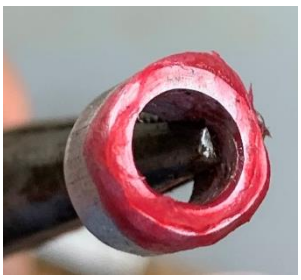
I also want the flange to have at least 0.02 inches of plate under it. This means the maximum hole size is 0.375 – (2 x 0.02) = 0.335 inches. If you know the size of the hole, you can work backward to design the upper and lower molds.

There are a few other bits:

I need a release agent. For hot glue, I found that synthetic grease worked well.

Optionally, I have a water sprayer and a cup of water. They quickly cool the molds so I don't have to wait as long before I can see the results.

Of course, I need my hot glue gun. I also need a length of ¼ inch diameter rod bent in an “L”. I’m holding it in my homemade pin vise because it will get rather warm.



The first step is to evenly coat the lower mold with the release agent. This is accomplished by coating the end of the ring. There must be no bare spots but I don’t need to worry about having too much.

The ring slides onto the shaft with the greased end facing the lower mold.

After pushing the ring down into the lower mold, I rotate it a bit. This evenly distributes the release agent into the mold plus forces it against the inside bore and the bottom.

Any excess grease is forced out the top where it can be wiped away.

After the ring is again coated with the release agent, it is pushed down into the upper mold. The goal is the same – evenly coat the bore and bottom of the mold.

The red color of the grease makes it easy to identify any bare spots. There are none here.

I use my pin vise to hold the shaft.

Then I use my heat gun to warm the lower mold. If in doubt about how much heat to apply, put a dab of hot glue on the mold. When it melts, it is ready.

Feed hot glue into the mold by applying it in layers. The goal is to not have any voids. A quick blast from the hot air gun and I get an even cone between the top of the mold and the shaft. This cone centers the grommet in the plate's hole.

I coat the end of the “L” shaped rod with the release agent and also hold it in my pin vise.

The upper mold is then placed on the rod. That fancy shape of the mold is left over from a previous project.

I again preheat the mold with my gun, apply hot glue into the mold, and formed a cone. After it cooled, I pulled the mold off of the rod. The bit of flash over the hole is harmless.

Showtime! The lower mold with rod slides up from below. The cone of glue centers it in the plate’s hole. Then the upper mold slides in from the top. Next comes the spring which is followed by the ring. And finally, I screw in the thumbscrew so gentle pressure is applied through the spring. This force must be enough to pull the lower mold up to the plate.

Recall that the lower mold is full plus has that cone above its lip. The lower mold is also full and has a cone above its lip.

By applying heat to the two molds and the plate, the molds will move together and the hot glue will reflow.

After applying heat, you can see the excess glue forms a ring around the mold.

The ring is easily teased away from the mold and discarded.

The same process is applied to the upper mold.

The upper mold easily lifts off to reveal the upper flange. A thin coating of flash is around it. This can be removed with a razor blade.

The lower mold and rod also easily slide out. It has a similar ring of flash.

This close-up shows how the grommet fully covers the edges of the plate. The hole is ¼ inch in diameter.

Admittedly, the grommet is not pretty. There are bits of flash in the bore. It is tempting to hit them with a blast from my heat gun but that could damage the grommet.

I suspect that using silicone caulk would give nicer looking results. So would white hot glue.

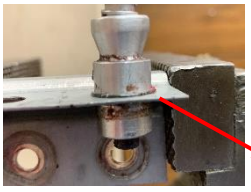
Gregg Kricorissian also suggested coloring the yellow hot glue with black pigment. I didn't know how to do this but it brought me to realize that I had some white sticks of hot glue. The problem was, cleaning out all of the yellow hot glue would be near impossible. So I could I apply the white hot glue without using the gun?

I chucked up a stick of the white hot glue in my lathe and drilled a ¼ inch hole.

Then I used a razor to slice off two wafers about 1/16 inch thick.

The wafers slid onto the shaft.

The assembly is ready to be heated.



After using my heat gun, the molds move together and the wafers of hot glue enter the molds.

This method of applying the hot glue has a few benefits.

- The hot glue can be precisely metered out to minimize flash.
- It is easy to change hot glue sticks because they are not in the gun.
- Oh yes, there is no hot glue gun.

There is one disadvantage – without the cone in the lower mold, it is hard to center the grommet.

The best of both worlds would be to use a wafer for the top mold and form the cone with the glue gun in the lower mold.

Gregg Kricorissian suggested using Form-A-Gasket. I'll report back on how it works.

Acknowledgment

Thanks to Gregg Kricorissian for all of his insights.

I welcome your comments and questions.

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