

# Making Shell Blinkers



This document describes how to make shell blinkers with a home-made vacuum forming table.

(I discuss only how to make the shells themselves here. Installing them onto the eye assembly is a topic for another page, not yet ready for publication.)

This project takes only about 2 hours from raw material to completion. Other than for the styrene, which you can purchase at a hobby shop, you can use stuff found in the workshop, a vacuum cleaner and a kitchen toaster oven. The total time to make a pair of blinker shells once you have the table and frame built is about 10 minutes including trimming and finishing.

## Styrene

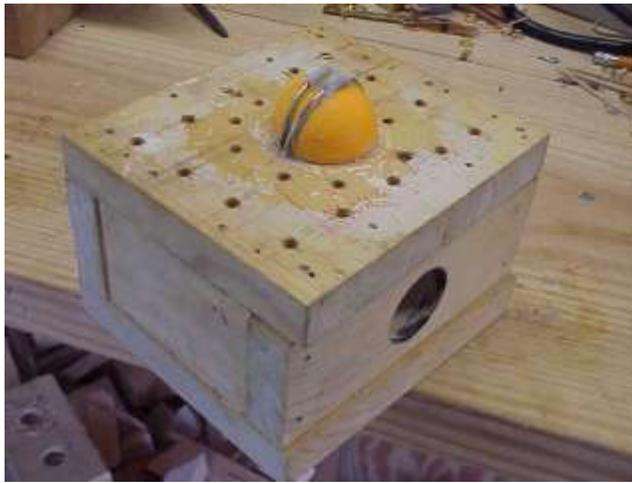
The blinkers are vacuum formed from .060 or .080 styrene. The larger size makes slightly thicker shells. I've found .060 to be optimum for the kind of blinkers I prefer. A 6" x 12" sheet of styrene costs about \$2.25 at the hobby shop. Each sheet can be used to make two pairs of blinkers.

## Vacuum Forming Table

The vacuum forming table is a small wooden box about 5" x 5 1/2" made from 1" pine shelf lumber. One side has a hole drilled large enough to take the pipe end of a vacuum cleaner.

The table top has a number of 3/16" holes drilled and one 1 1/2" hole in the center into which the blinker form fits.

The table top and sides are sealed with Elmer's Carpenter's glue and nailed to keep the table air tight.



## Blinker Form

The form, from which two blinkers is made, is one half of a 40 mm tournament ping pong ball, which is slightly larger than a 1 1/2" wooden sphere. Use this size to make the lid's inner diameter slightly larger than a wooden eyeball to eliminate drag when the lid opens and closes.

The ping pong ball half sphere is fitted over a 1 1/2" wooden sphere, which is glued into the 1 1/2" hole. This wooden inner core gives strength to the ping pong ball to facilitate adding the frame channel wires and linkage tabs.

The brass rod semicircles over the sphere form channels into which the blinker mechanism's frame attaches. The rods are offset from each other at an angle so that they each wrap around the circumference of the half ball at its logical center.

The channel rods on the form are filled in with [MagicSculp](#) or any other suitable filler material ( [DAP Wood Dough](#), [Apoxie Sculpt](#), [Plastic Wood](#), etc.) to eliminate undercuts in the formed styrene, which would make it difficult to remove from the table.

The raised sections at the center of the rods form tabs for the blinker's control linkage. I formed these sections from [MagicSculp](#).



## Vacuum Source

The vacuum forming operation requires a vacuum be created inside the table. I use a household vacuum cleaner as the source for the vacuum. The vacuum cleaner tube, shown inserted here into the hole in the table's side, is sealed with electrician's tape.

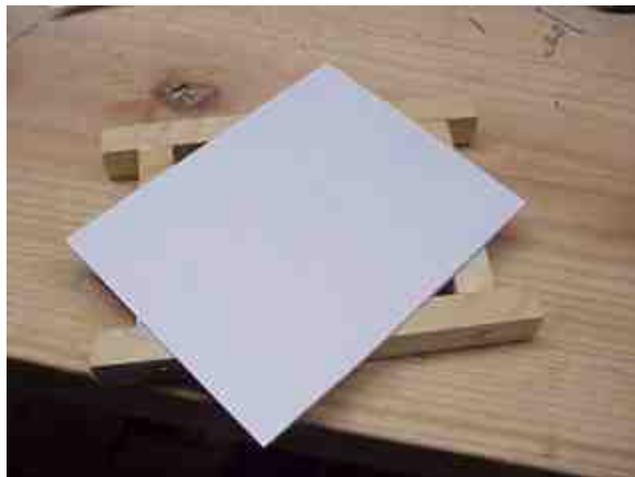


## Styrene Frame

The styrene frame is made from strips of the same wood used to build the table. It is sealed at the joints with Elmer's Glue and held together with wood screws. The frame has the same outer dimensions as the table top.



Cut out a rectangular piece of styrene with scissors to fit the frame flush with its edges.



Staple the styrene to the frame. You don't want any part of the styrene hanging over after it is stapled in place on the frame. Hanging edges would droop and create air leaks between the table and the frame. Use lots of staples. Tap them as flush as you can get them with a hammer.



Seal the styrene around its edges with masking tape. The idea is to get as air-tight a seal as possible.



## Heating the Styrene

Put the frame in the oven, styrene side up.



Heat the styrene with the bake/broil setting at 350 degrees. Watch it through the oven door's window. Leave it in there until the styrene uniformly sags down into the frame but not touching the oven rack.



## Vacuum Forming the Styrene

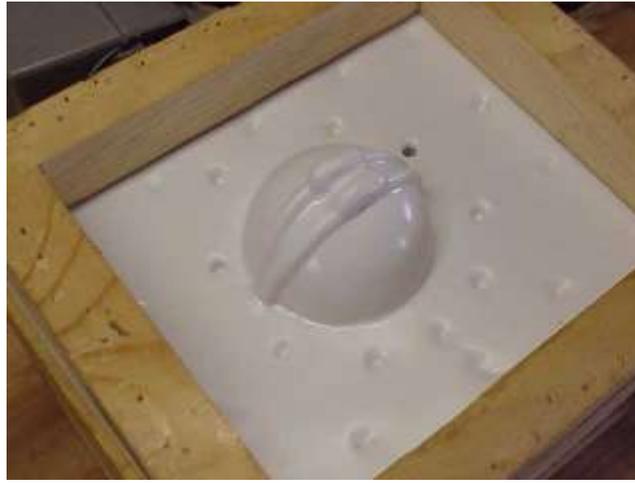
Put on some gloves to keep from burning your hands. Remove the frame and push it down onto the vacuum forming table styrene side down with the frame edges flush with the table edges. Make as tight a seal as you can between the styrene and the table. The styrene, being pliable from the heat, will stretch over the form.



Turn on the vacuum cleaner right away before the styrene can cool.

(If you are doing this project alone, you'll need a foot switch because it takes both hands to press the frame down on the table. If your vacuum cleaner does not have a foot switch, use a power strip with a rocker switch positioned on the floor where you can reach it with your foot.)

Almost immediately after you turn on the vacuum cleaner, the vacuum forms the styrene into the half sphere with two offset center frame channels.



## Finishing the Blinkers

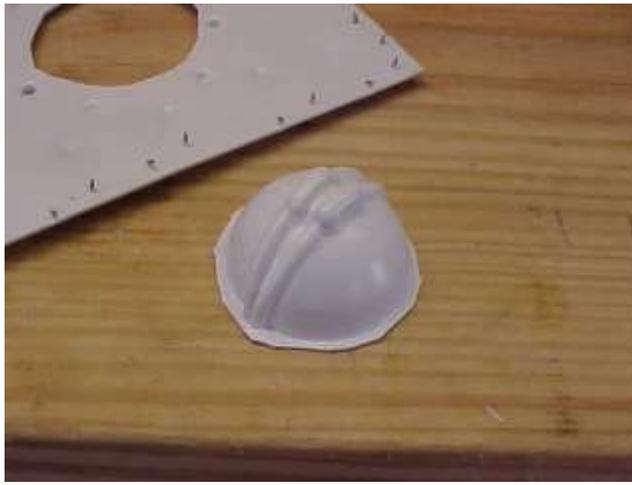
When the styrene has cooled, remove the frame from the table and form. You'll have to pop it off.



Remove the styrene from the frame.



Cut out the half sphere with scissors.



Cut the half sphere into two quarter sphere eyelids splitting between the two frame channels. I find it simplest to use a band saw to separate the two eyelids although you can do it with an Xacto knife. Make sure that the channel edges are intact at the back of the lids so the frames fit snugly. Trim the eyelid front edges with scissors and sand them to smooth edges.

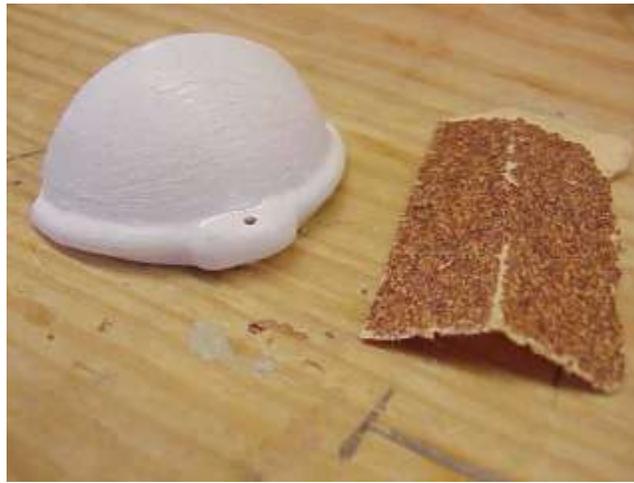


Trim the corners of the blinkers so they don't interfere with the bends in the frames.

Drill 1/16" holes through the linkage connecting tabs. These holes will receive the linkage rods when you build the blinker assembly.



Sand the blinker surfaces with 60 grit sandpaper to roughen the surfaces to receive paint.



The channels across the tops of the blinkers are where you will glue the wire frames of the mechanics at the back of the blinkers.

## A Styrene Blinker Ready to Install

This picture shows how the frame fits inside the blinker's frame channel. To ensure that the lids line up with the eyes properly, it's best to postpone permanently gluing the frame into the blinker frame channels until you have assembled the complete mechanism.



## Gluing Styrene

Use [Zap](#) from the hobby shop to glue the brass frame and linkage to styrene. I've experimented with many kinds of glues and epoxies, and Zap is the only one that forms a permanent bond with styrene. Others seem to adhere, but a less-than brisk tap makes the lid separate cleanly from the frame. If this happens after the mechanisms are installed and the head closed, you can have a major repair on your hands.

I tested two kinds of Zap and both worked. Zap CA is meant for tacking applications and sets up in just a couple of seconds. Zap-A-Gap is meant for filling gaps. Zap-A-Gap is thicker and less runny and works well by itself. Zap CA works well if you sprinkle some baking soda on the parts to be glued before applying the Zap. The baking soda absorbs the Zap and tends to keep it from running all over the place. It also combines with the Zap to form a hard crust that you can cut with an Xacto knife to unglue the connection in case you make a mistake.