

<http://www.halloweenforum.com/tutorials-step-step/78087-moving-eyes-mechanism-pause.html>

Plans by DaveintheGrave

Moving Eyes Mechanism

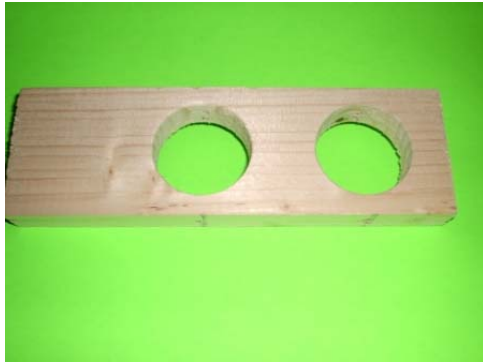
Here's the how-to for the Moving Eyes Mechanism I made for Frankie's Girl to use behind a painted portrait. It could also work for moving eyes behind a tombstone or in a static prop.

Parts List

- (1) 1 X 3" wood piece (7" long)
- (1) Plywood piece (5+1/2 X 7")
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- (2) Ping-pong balls
- (1) Small length of aluminum "L" stock (1 inch)
- (1) 12 volt DC , 5 RPM Motor (or similar)
- (1) AC/DC Converter (100 milliamp)
- (1) Small piece of 1/8" plexiglass
- (1) 1/16th" Flat aluminum stock (1+1/2 inches long)
- (1) 1/4-20 X 1/2" Machine screw
- (1) 1/4" Lock washer
- (4) 1+5/8" long deck screws
- (2) 6-32 X 3" Machine screws
- (3) 6-32 X 3/4" Machine screws
- (6) 6-32 X 1/2" Machine screws
- (6) #6 Flat Washers
- (11) #6 Lock Washers
- (17) #6 Nuts

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PART 1: EYE MOUNTING BOARD



(1) Saw a piece of 1 X 3" wood making it 7" long. Measure 2" from one end and mark that spot in the center of the board. Using a hole saw attachment on your drill, cut a 1 + 3/4" hole. Repeat these same steps on the other end of the board. This will make the eyes exactly 3" apart (center to center).

NOTE: Apparently stores are now selling two different sizes of ping-pong balls. The only ones I can find now are slightly bigger than the ones I used to buy. If you end up with the smaller balls you can possibly drill smaller holes with a hole saw in the 7" board.

(2) Take one ping-pong ball and drill a 9/64" hole along the seam in the middle of the ball. This will be the TOP hole. Drill another 9/64" hole exactly 180 degrees from the first hole. This will be the BOTTOM hole. The only tip I can give for getting the holes exact is to wrap a piece of masking tape around the ball seam, take it off and measure it. Mark the halfway point on the tape and wrap it around the ball to find the opposite side. Repeat this step for the second ball.



(3) Drill a 9/64" hole into the REAR side of the ping-pong ball, right in the center. Use an exacto blade to cut out a small section of the ball below the hole you just drilled, about 1/4" square. (This will allow us to insert the #6 screw inside the ball.)

Insert a 6-32 X 3/4" machine screw into the ball. The screw needs to come through the hole THREADS FIRST to the outside of the ball. I used a magnetic pick-up tool on the outside of the ball to pull the screw thru the hole. Hold the screw in place near the bottom with some needle-nose pliers and install in order a #6 flat washer, #6 lock washer and a #6 nut onto the screw threads. Hold the END of the threaded part of the screw tightly with the pliers and tighten the nut against the ball. Repeat these steps for the other ball.

(4) Stand the eye mount board upright. Drill a 1/8" hole into the top center of each eye

hole, all the way through the bottom of the eye hole. It's very important to make these holes as straight as possible to make each eyeball pivot properly.

(5) Insert a 6-32 X 3" screw into one of the top 1/8" holes. Screw a #6 nut onto the screw once it passes into the 1+3/4" eyeball hole. Install one of the ping-pong balls onto the screw and rotate the screw until the it exits through the bottom of the ball. Insert another #6 nut on the screw at the bottom of the ball. (There's not much room to do this. I just kind of slid the nut in between the bottom of the ball and the wood, looked thru the bottom hole, and moved the nut around with a small flat-head screwdriver until I could see it was lined up with the screw hole.) Turn the 3" screw all the way until it threads onto the bottom nut and exits thru to the bottom of the board. Keep turning the screw until the head is flush with the top of the mounting board. Use pliers to turn the top nut all the way to the top of the hole, and the lower nut all the way to the bottom. These nuts give the ball a base to pivot on. Check and make sure the ball can spin left and right freely without binding. Cut off any overhang on the 3" screw at the bottom of the board. Repeat these steps for mounting the other ball. Mark the pupil area (front, center) of each eye with a round piece of tape for the purpose of checking the movement in a later step.



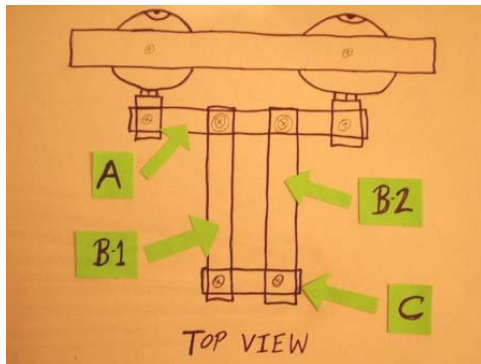
(6) I used aluminum angle "L" stock to make my own L-brackets. I couldn't find any to buy that were either small enough or lightweight enough to use. Use a hacksaw to cut two sections of the angle stock about 1/4" wide.

Drill a 9/64" hole near the end on each flat side of one angle stock piece. Use these holes in the first piece as a guide for drilling the holes in the second angle stock piece. It's important to try to make the holes match in the two pieces for proper movement of the mechanism. This completes the two L-brackets.

(7) Slide one L-bracket onto the #6 screw coming out of the back of one eyeball. Orient the bracket so that the flat (horizontal) part is on TOP. Secure it in place with a #6 lock washer and nut. Repeat for the other ball.

(8) Cut a square section of plywood or scrap wood measuring 7" long and 5+1/2" wide. Also cut a 7" long piece of 1/4" plywood, about 1" wide. This will be a spacer in between the eye mount board and the square flat piece we just cut previously. Lay it flat and

place the front of the spacer board flush with the front edge of the square piece and centered. Turn upside down and drill a 1/8" hole about an inch from each end thru both the square board and the plywood spacer. Next remove the spacer and take the eye mount board and stand it up centered on the square board and flush with the front of it. Turn both pieces upside down and use the holes in the square board as a guide to drill two 1/8" holes into the eye mounting board. Turn them right side up and add the spacer board back between the eye board and the square board. Secure the three boards together with 1+5/8" wood screws. (The spacer is needed for the proper height of the motor shaft to pivot the mechanism.)



(9) I used some leftover 1/8" thick plexiglass to make the parts for the pivot mechanism. Cut a piece 4" long and about 5/8" wide. This will be called PIECE A. Drill a 9/64" hole near one end of it, measure 3" from that hole and drill another 9/64" hole. Measure 1" (toward the middle) from each end hole and drill two more 9/64" holes. So you should end up with four holes, 1" apart along this piece.

(10) Insert a 6-32 X 1/2" screw into the open hole (from the underside--threads coming out the top) in the right eye L-bracket. Add a #6 flat washer onto the screw. Repeat for the left eye L-bracket. Place the two end holes in plexi piece "A" over the two L-bracket screws. Install a #6 nut on each screw and turn it until it is SNUG. Add on a #6 lock washer and nut on each screw. Hold the lower (first) nut in place while tightening the top nut on both screws. Check the back and forth movement of the eyeballs. There should be a slight amount of resistance, but not much.



(11) Cut two more pieces of plexiglass measuring 4" long and 1/2" wide. These will be PIECES B1 and B2. Drill 9/64" holes in the ends of both B1 and B2, about 1/4" from each end. Place one end of B1 on top a piece "A" and line up the holes. Place a #6 flat washer onto a 6-32 X 1/2" screw and insert it thru both piece "A" and B1. Secure them together underneath with a #6 lock washer and nut.

Repeat these same steps with PIECE B2 and the remaining hole. The 1/2" gap formed by B1 and B2 allow the eyes to hesitate momentarily before changing direction.

PART 2: MOTOR ASSEMBLY



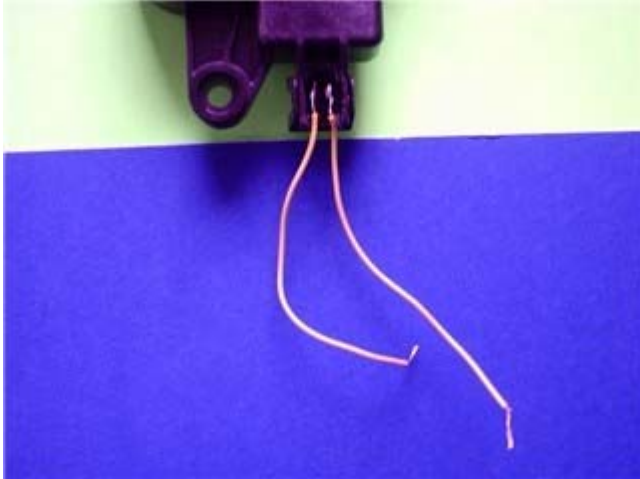
1) Take the 1/4-20 X 1/2" screw and hold it on top of the square hole in the motor shaft. You will see the screw is slightly bigger than the square hole in the shaft.

We will use a screwdriver to force the screw into this square hole, basically "tapping" a threaded hole for this screw, which will later hold the crank to the motor.

Use a pair of pliers tightly around the outside of the motor shaft to hold it while using your screwdriver and turn the screw clockwise and force it into the square hole. It might help to brace the motor against a wall or table top (while still holding the shaft with the pliers) to be able to use enough force to get the screw started. Be patient, sometimes it goes easy, sometimes it takes a while. Once the screw starts to rotate into the shaft hole, try to keep the screw as straight as possible as it goes further into the hole. Keep turning it until the head of the screw is about 1/8 inch above the top of the motor shaft. Just leave the screw in for now.

2) Use a pair of cutters to snip away the top portion of the black plastic that covers the two copper colored pins coming out of the bottom of the motor. Take some needle nosed pliers and carefully bend each pin upward slightly. This will give us more room to use soldering iron. Cut the round plug off the end of the DC voltage adapter, separate the two wires and strip them back about ¼ inch. (I usually solder a short section of wire to each pin and then later solder my DC voltage adapter onto those wires. However if you prefer, you can solder the wires of the DC adapter straight to the pins.

If you have someone to help you, have them hold each wire to its respective terminal pin while you solder them. If you are doing it by yourself, try to melt a blob of solder onto the end of the wire, then hold the wire to the terminal pin and hold the soldering iron on the **UNDERSIDE** of the pin to heat the pin and melt the solder at the same time. This is frustrating sometimes, but it will work. I don't usually put any heat shrink or tape on these motor terminals after soldering, but you can if you want.



3) Cut a piece of the 1/16" flat aluminum stock 1+ 1/2 inches long. This will be the CRANK for our motor.

Drill a 1/4" inch hole near one end of the crank. Measure one inch from the center of this hole and drill a 9/64" hole. Insert a 6-32 X 3/4" screw into the 9/64" hole and secure it with a #6 lock washer and nut.

Remove the 1/4" screw from the motor shaft and slip a 1/4" lock washer onto it. Make sure the #6 screw threads are facing UP on the motor crank. Insert the 1/4" screw through the large crank hole and then screw the crank onto the motor shaft.

The motor shaft should be centered 3 inches from the back side of the eye mount board. Mark that spot and lay the motor assembly flat (shaft up) and slide the #6 screw attached to the crank into the 1/2" gap between pieces B1 and B2. Slide the motor to that 3" mark. Plug in the motor power and allow the shaft to rotate, thus moving the eye mechanism side to side. Observe the front of the eyes and slightly move the motor by hand to different positions until the eyes move an equal distance left and right. When satisfied, use two 1+5/8" wood screws through two of the motor mount holes to fasten the motor to the board.

PART 3: FINAL ASSEMBLY

(1) Cut a final piece of plexiglass measuring about 2" long and 1/2" wide. This will be piece "C" and is used to connect pieces B1 and B2 at the rear of the pivot mechanism. Lay "C" on top of the open holes in B1 and B2 and mark holes. Drill the two 9/64" holes in "C". Use two #6 screws, lock washers and nuts to fasten "C" to B1 and B2.



(2) Plug in and test the operation of the mechanism.

(3) The eyes stick out the front of the mounting board about 1/2". If you plan to mount them against something flat (like the back of a painting or tombstone), make 2 small spacers out of 1/2" wood. Screw them onto the front of the eye mounting board (one on left side and

one on right). Lay the mechanism flat (eyes down) and attach 2 or 3 "L" brackets to the eye board for mounting purposes.

(4) Paint the eyes as desired.

That's all! The End.

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