

Build your own

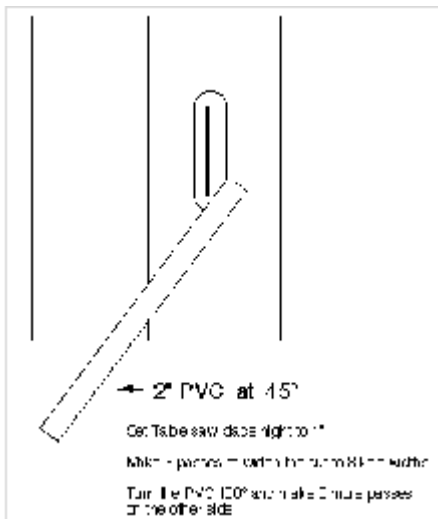
Lift'n'Turn Piston

by Chuck Rice

While wondering around the hardware store looking for parts to build one of [Carl Chetta's Trash Can Trauma](#) (For another great write up, see: [The Death Lord's TCT Page](#)), I discovered some PVC extension gizmos. (with the piston retracted) These are neat little pistons designed to patch PVC pipes that have been cut or broken. They have a piston that slides back and forth in a small cylinder. The main problem with them is that they only have about a 3 inch travel. It is hard to do much with that, so I left them.



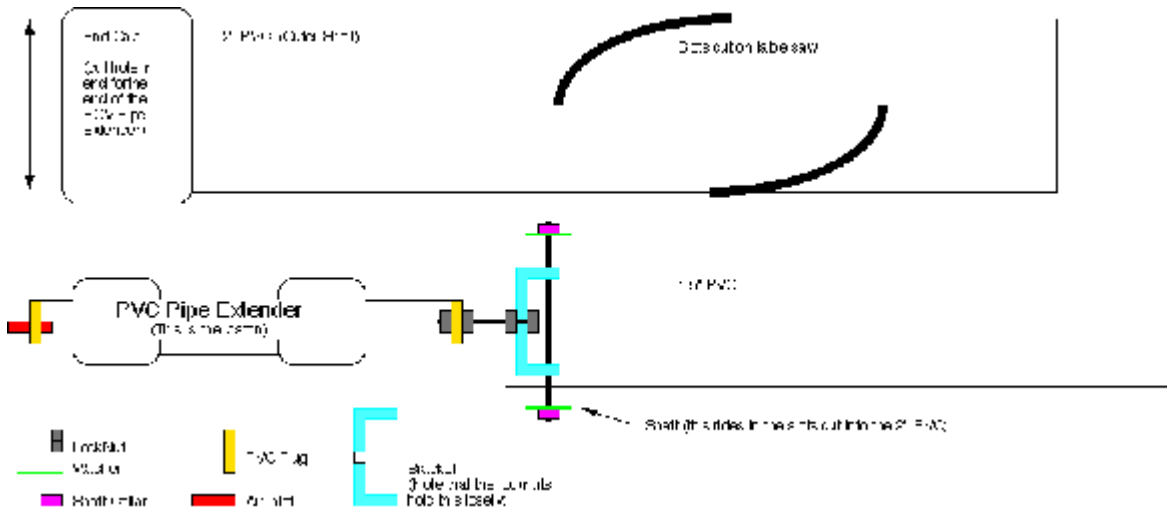
A couple of days later, I was working on the TCT and I was trying to fit the arm in the small space and thought that it would be nice if I could position the piston vertically. To do that, I needed a spiral gear. Not easy to come by. I put on my thinking cap and came up with the following device. I built it, and it works great!



To start with, I took a piece of 2" PVC to my table saw, set my miter gauge to 45 degrees, set the blade height just a little higher than 1/2 the width of the pipe (about 1 inch) and cut a slot in the PVC about 3" from the end.

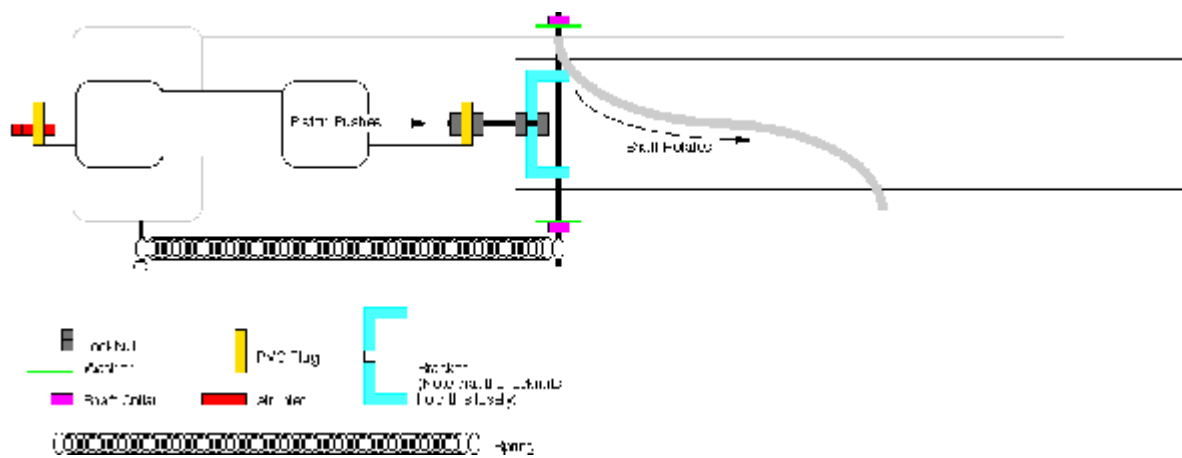
This slot was not wide enough, so I did it two more times to widen it a bit to around 3/16 to 1/4 of an inch (I have a thin kerf blade, with a wider blade, 2 passes may be enough. It just needs to be wide enough so that the shaft mentioned below can slide thru without binding).

Then I carefully rotated the pipe 180 degrees without changing the position and did it again on the other side.



Next I started on the piston assembly. Remembering back to the PVC extensions that I had discovered, I could see that the three inch throw would be perfect for this application. I bought a 3/4 inch PVC extension (about \$3) and plugs for the ends. Along with a few odds and ends from the junk drawer, I built the assembly. I drilled a hole for the air inlet in the end of one PVC pipe plug and screwed it in. Then I drilled another hole for a bolt in the other end cap and inserted the bolt and attached it tightly with a lock nut. Then I added a bit of plumbers grease to the inside of the cylinder to prevent wear and glued the caps onto the ends of the cylinder and piston.

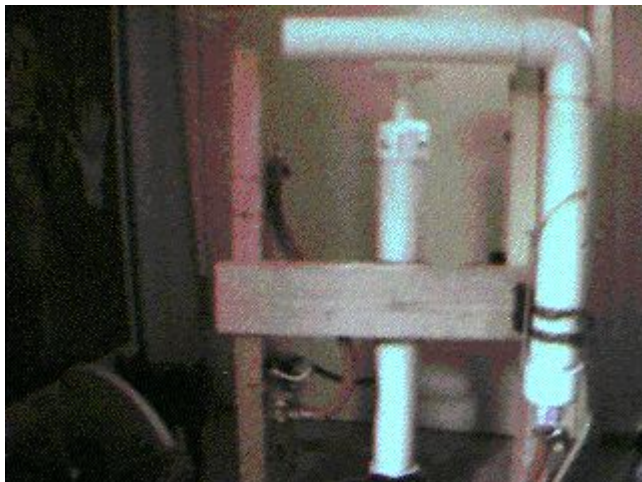
Next I cut a 10 to 12 inch length of 1.5 inch schedule 40 PVC and drilled a hole thru one side and out the other (about an inch from one end) to hold a metal bar. The bar was a piece of spring steel rod I found at the Ace hardware store. It was about 3/16th of an inch in diameter and I cut it to about 3 inches long (with a Dremel cutoff wheel). This metal bar is the shaft that rides in the 2 slots that were cut in the 2" PVC. I also took a short piece of flat metal and bent it into a U shape to use as a bracket and drilled three holes in it. The first is in the center and attaches to the bolt coming out of the end of the piston. The other two are at the ends of the bracket and are there to hold the ends of the rotator shaft. The bracket then fits inside the 1.5 inch PVC and the shaft goes thru one side of the PVC, thru both bracket holes and out the other side. The center hole of the bracket is attached to the piston with two lock nuts, but loosely so that the bracket can rotate in relationship to the piston. The locknuts (nuts with plastic inserts to keep them from turning) are important to prevent the inner PVC rotation from unscrewing them.



Finally, I inserted the piston assembly into the 2" PVC pipe. You have to remove the shaft from the 1.5 PVC to insert it into the 2" PVC, then reinsert it thru the rotator slots, the inner PVC, and the bracket. I then added two fender washers and some shaft collars to hold the shaft in place. To hold the end of the PVC Extension tightly when the air pressure is applied, I took a 2 inch PVC end cap and drilled a hole (about an inch in diameter) to hold the end of the PVC extension and glued it to the 2" PVC.



As the piston pushes forward, the metal bar rides in the spiral shaped slot. This causes the 1.5 inch pipe to twist and raise. It does this with considerable force. I fitted an elbow and another 12 inch piece of 1.5" PVC pipe to the end of the inner PVC to form the arm. It swings it with enough force that I decided to get some thin wall PVC (instead of the schedule 40 I used everywhere else) so that it was lightweight enough that if it hit anyone, it would not hurt them.



This device will move the inner PVC pipe up about 2 to 3 inches while at the same time rotating it out about 120 degrees. I have it installed in my TCT.

Here is a closer view.



Note that I have not been very exact in my measurements. This is because for the most part, they are not critical. You can adjust it to whatever your needs are. I made every thing a bit longer than I thought I needed, then trimmed things where I needed to make them fit.

Please note:

I can make no warranties on the methods and procedures presented here. I have built this device, but your tools and skills are unknown to me. Proceed at your own risk. Remember that table saws and compressed air are dangerous. Use your safety devices and ample caution.

I also do not endorse any of the products here except the [FerretTronics](#) chip. They are just the products I chose to use for this project. You may find that they work better or worse for you. Experiment for yourself. That is half the fun!

On the other hand, if there is a step or procedure here that you do not understand, let me know using the [Comments](#) button and I will see what I can do to explain it better. -Chuck-