Tiny Tootophone

by **Thinkenstein** on December 16, 2010

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I'm a refugee from Los Angeles, living in backwoods Puerto Rico for about 35 years now and loving it. I built my own home from discarded nylon fishnet and cement.

Intro: Tiny Tootophone

The tootophone could be the People's Instrument of the 21st Century. You don't need to learn sheet music or memorize fingering positions to play just about any melody with it. It can easily fit into a pocket, and it only costs about 25 cents to make. The basic 1 cc insulin syringe costs about 15 cents.

You can add pipe extensions to the body of the tootophone to give it a deeper, richer voice. A variety of tootophones could make some very interesting music, I'm sure.

To hear this tiny tooter in action, listen to the music samples in later steps.

Image Notes
1. Drill a hole in the syringe end cap to make a mute for the instrument. It gives a mellower sound to those using plastic reeds. I usually don't use a mute with rubber reed ones.

step 1: The Reed Material

From Wikipedia: "A **reed** is a thin strip of material which vibrates to produce a sound on a musical instrument. The reeds of most Woodwind instruments are made from Arundo donax ("Giant cane") or synthetic material; tuned reeds (as in harmonicas and accordions) are made of metal or synthetics."

Years ago, I borrowed a saxophone and couldn't get anything out of it except unmelodious squawks. As an experiment, I sanded down some PVC plastic and made a replacement reed for it. Still no great music, but at least it was easier to play. The sax got returned and I continued experimenting, mostly with PVC pipe body instruments.

Sanding PVC reeds was a lot of work, so I experimented with clear plastic packaging material I found in the trash. It came in different thicknesses and with different degrees of rigidity. Thinner material makes reeds that are easier to play. Plastic reeds can be cut out of scavenged packing material with scissors.

For your first tootophone, I suggest you go the easy route and just cut a reed out of scavenged plastic packaging material. You can make mellower sounding reeds out of rubber, but it is more complicated, since you have to make the material. (I haven't found off-the-shelf sheet rubber material for reeds yet.)

I found that the traditional cane reeds were at the stiff end of the spectrum, followed by different kinds of plastic and rubber at the other extreme. My first rubber reeds were made out of Sugru, a clay-like material that hardens like rubber. That eventually led to my present favorite, a combination of fiberglass mat material and silicone rubber.

I found that pure silicone rubber reeds were too floppy, so I increased their rigidity by adding cloth-like materials. In this step I explain how I make fiberglass and silicone rubber reed material. If you don't have the fiberglass, experiment with other synthetic cloth materials.

1. Start with a non-stick work surface, such as Teflon cloth, which I think is sold for kitchen use. What I use is a polyethylene plastic cutting board.

2. Cut a section of fine fiberglass mat material big enough to cut out the number of reeds you want to make. I usually make foot square sheets.

3. With a palette knife, or similar tool, spread out an area of silicone rubber on the work surface big enough for the fiberglass material and set the material onto the wet silicone. This eliminates any penetration problem from pressing the silicone through from above.

4. Start at the center with the palette knife and press down and toward the edges, forcing silicone from below up through the pores of the material. Make sure there is a reasonable layer of silicone on top.

5. If you want 2-ply material, or thicker, repeat steps 3 and 4. I use mostly 2 ply material.

6. Let it dry several hours, or overnight before peeling it up.

7. Cut it into strips and sections long enough to serve as the reeds. I use a paper cutter to cut the strips, which are about 1/4" wide.

step 2: Sanding the Mouthpiece by Hand

The mouthpiece consists of a rigid part, and a reed attached to it that vibrates. The rigid part is made of a 1 cc insulin syringe. Large mouthpieces made from larger tubing tend to be louder, and need more lung power to blow.

The syringe is sanded down with a curve against which the reed forms a tangent line. When finished, I tape the reeds in place with electrical tape. I wrap the electrical tape with nylon thread to keep the tape from coming unstuck.

Sanding the curve is a bit of an art. If you have trouble getting the high notes, the tip of the curve might be too straight. I usually hold the reed in place with my thumb and blow to test it before taping it down. I test it at different stages during its attachment.

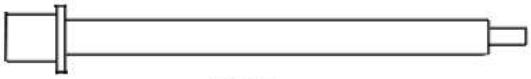
For mass production, I use a belt sander mounted to my workbench, but you can sand the curves by hand, too. For small mouthpieces, stick a piece of wood inside them to hold onto.

Try to avoid sanding your knuckles along with the mouthpiece! Sometimes I use the finger from a rubber glove as a knuckle protector. Use a forward and backward arm motion with a slight rocking motion at the wrist. Sand the curve smooth, with no flat spots.

You can use course, medium, and fine sandpaper. As a final step, I use just plain drawing paper to get a polished smooth surface.

After sanding the curve, you have to dress up the rough edges by scraping or cutting with a sharp knife. I use a pointed X-acto craft knife. Push the original plunger through to clean out any dust inside.

SANDING THE CURVE



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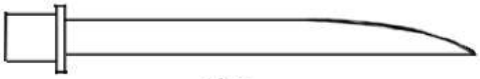

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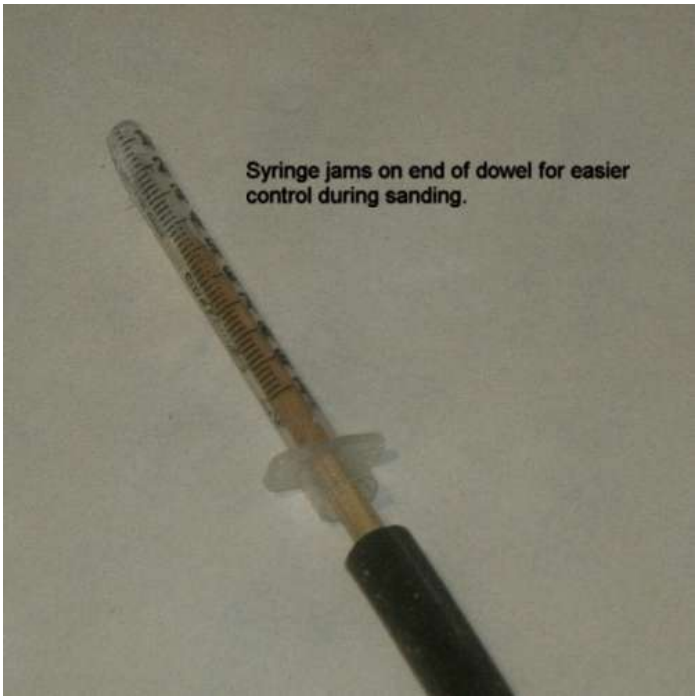
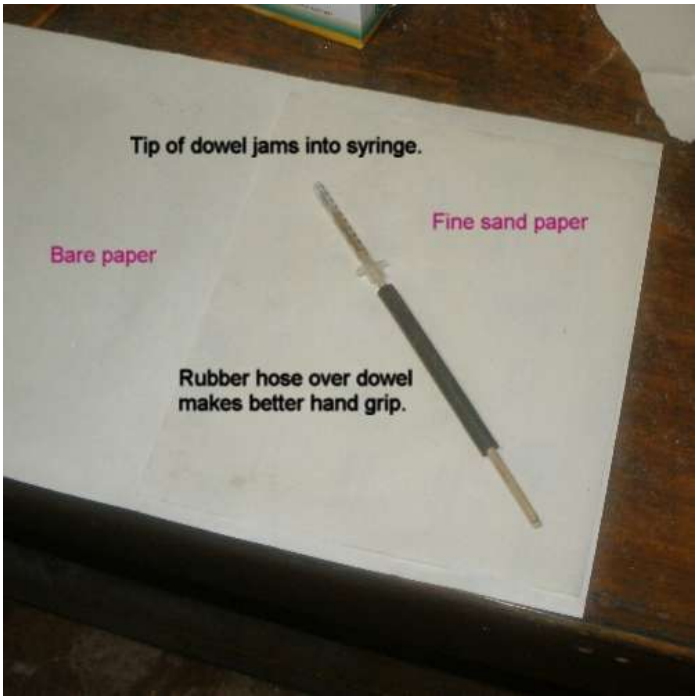




step 3: Sanding with a Power Sander

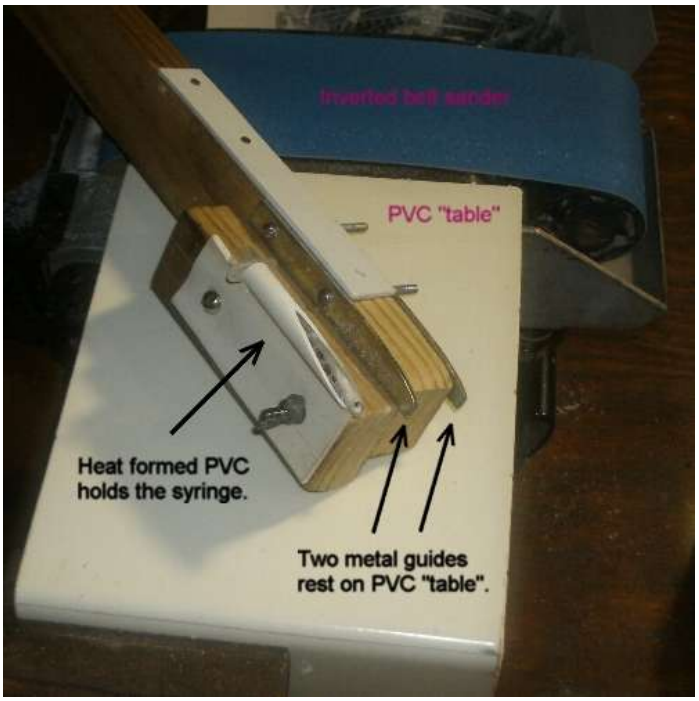
I make a lot of tootophones, so I came up with some special equipment to help with mass production.

I mounted a belt sander to my workbench, upside-down, by drilling holes in the table and using wire to tie the belt sander down. I made a small PVC "table" next to the sander, held in a vise, to position the metal guides of the sanding tool on the same level as the sand paper.

The syringe slides in and out of the tight-fitting, heat-formed PVC holder on the side of the tool. By rocking the metal guides on the flat PVC surface, the syringe is sanded down to a curve that matches the guides.

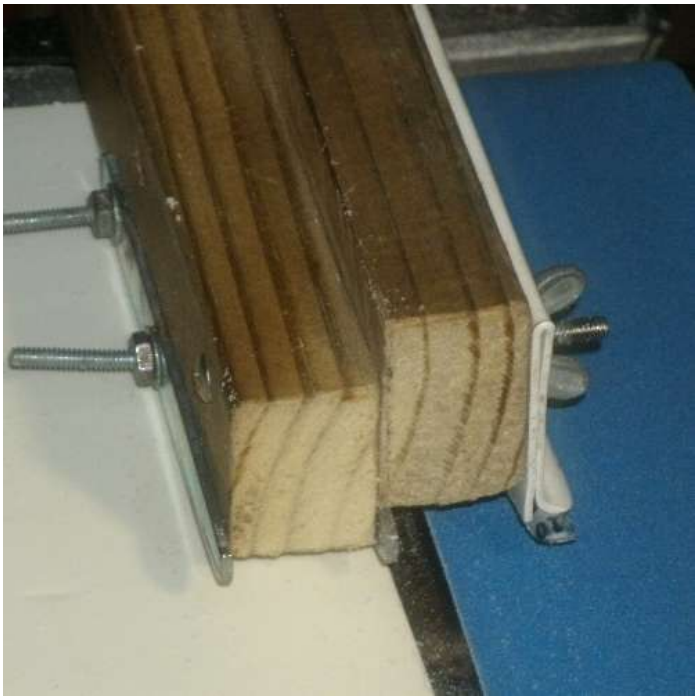
With this set-up I can sand down hundreds of mouthpieces with reasonable uniformity.

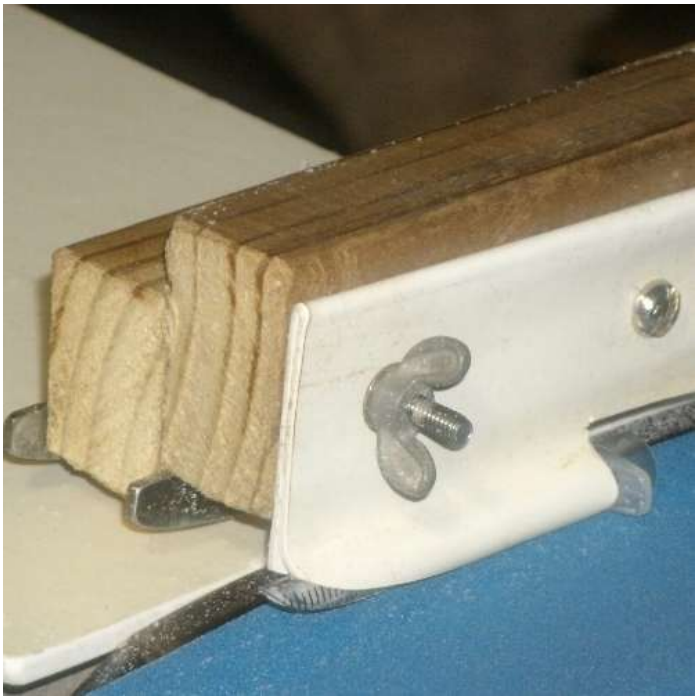
You have to finish machine sanding with a little hand sanding, using fine sand paper and then polishing with just regular paper. Dress up the edges with an X-acto knife, or similar knife and fine sandpaper.


Inverted belt sander
PVC "table"
Heat formed PVC
holds the syringe.
Two metal guides
rest on PVC "table".


The sanded curve follows the curve of the metal guides.


The sanded curve follows the curve of the metal guides.






The sanded curve follows the curve of the metal guides.

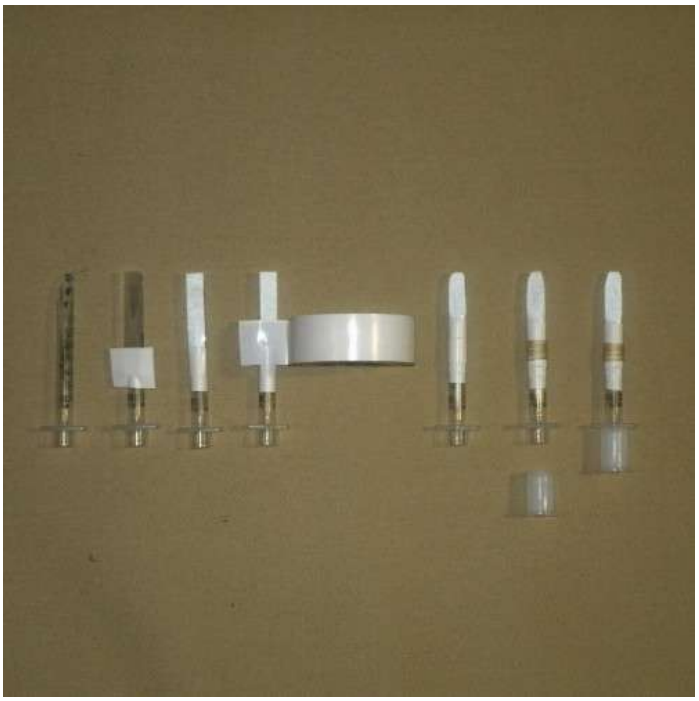
step 4: Attaching the Reed

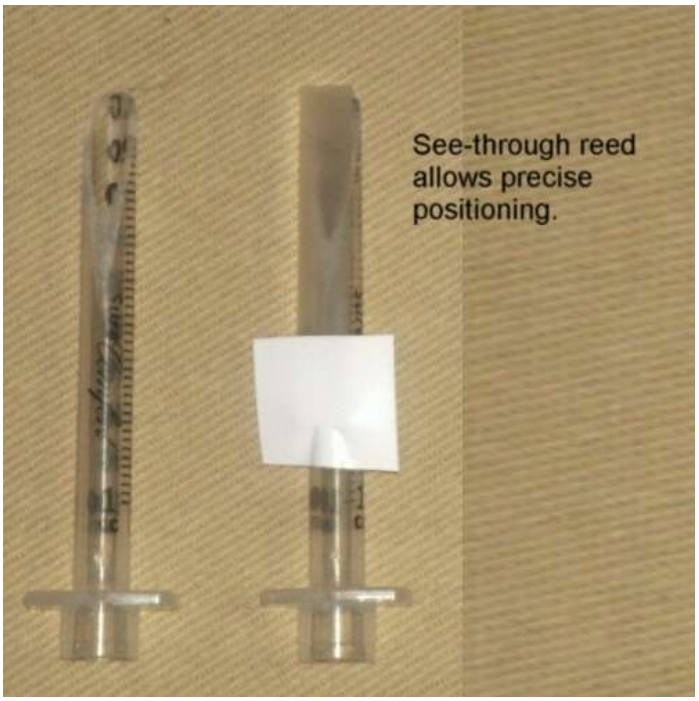
Cut rectangles of reed material a little over 1/4 inch wide (depending on the width of your syringe body), and about 1 7/8 inch long. Position it almost to the end of the mouthpiece and hold it down with a thumb. Test blow the reed. If it sounds OK, tape down the other end with a little square of electrical tape. Then press down the sides of the tape, making sure the reed doesn't shift.

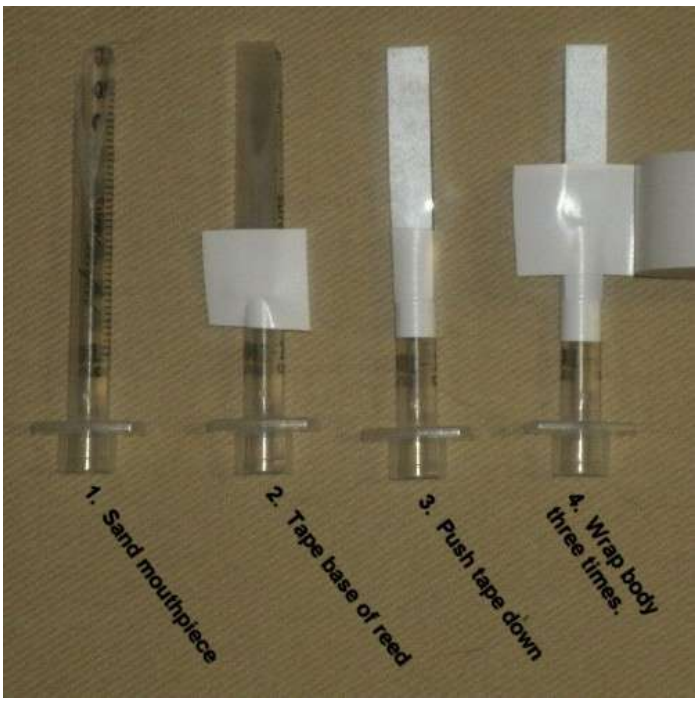
Then, starting at about where the hole begins, wrap the reed down with about three windings of tape. Cut the tape.

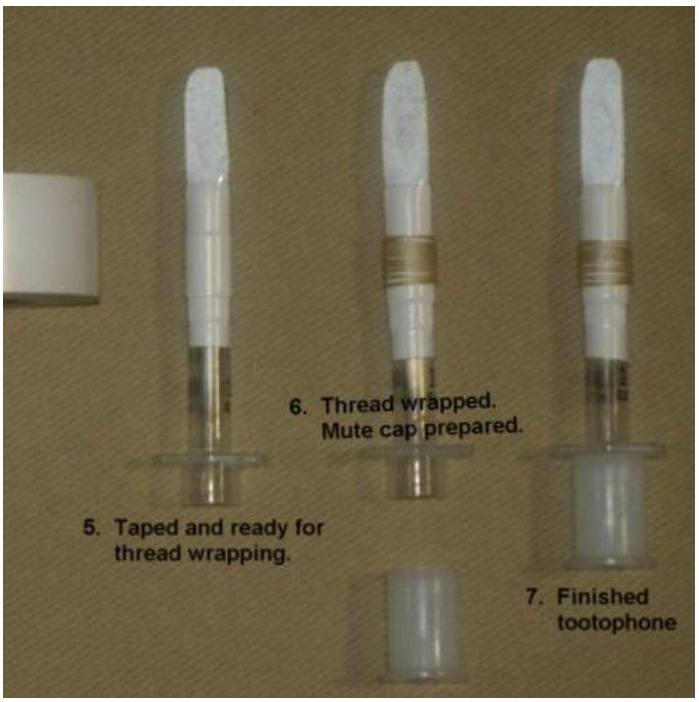
Once the reed is taped down, trim the two exposed corners of the reed with scissors to more closely conform to the shape of the mouthpiece.

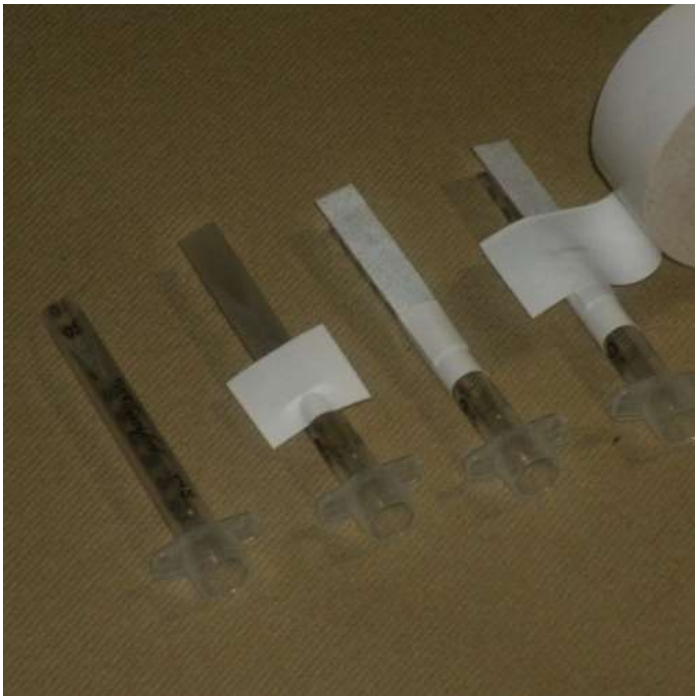
Electrical tape can sometimes come unstuck, especially if people wash the instrument. To prevent the tape from unwinding, I hold it down by wrapping it with nylon thread. See the picture for a description of how to do this. Pulling one end of the thread pulls the other under the windings. Trim the exposed thread ends and it's going nowhere.

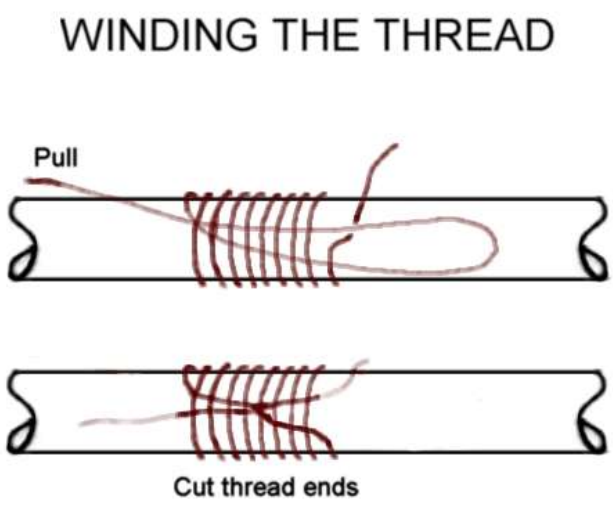



See-through reed
allows precise
positioning.


1. Sand mouthpiece
2. Tape base of reed
3. Push tape down
4. Wrap body
three times.


6. Thread wrapped.
Mute cap prepared.
5. Taped and ready for
thread wrapping.
7. Finished
tootophone





step 5: Mouth Control

Reed instruments are basically mouthpieces with tubular extensions on them.

Tootophones are single reed instruments. The mouthpiece is shaped with a curve, and the player's lips press the reed against the rigid part of the mouthpiece at some point along the curve, creating a tangent line to the curve.

Bend your lower lip in a little over your teeth and rest the reed at about the midpoint on the dry side of your lower lip. You don't want a lot of saliva gumming up the reed, preventing it from vibrating.

Air blown through the space between the reed and the mouthpiece creates an area of low pressure, which pulls the reed upward until it closes off the air flow and the reed springs back. The repeated opening and closing causes pulsing pressure waves in the air and the frequency of those waves determines the tone.

Placing the lips closer to the end of the reed shortens the length of the reed and it vibrates faster, creating a higher tone. Allowing the entire length of the reed to vibrate creates the lowest tones.

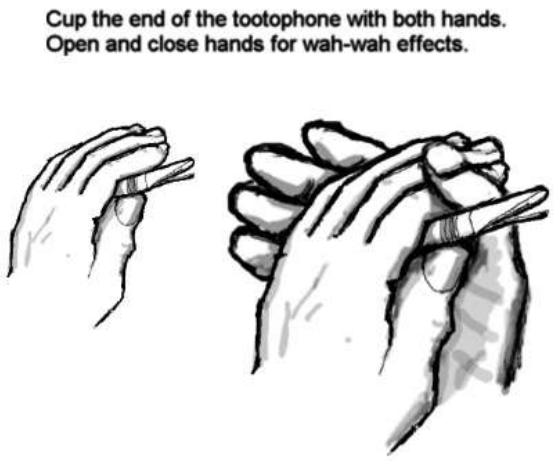
I usually place my lips at about the midpoint of the reed, allowing me to vary the notes by varying the upward pressure of my jaw, and the strength of blowing. The higher notes usually need more air pressure.

Once you can get a sliding scale from low notes to high notes using mouth control, you can pick the notes you need for any melody out of the sliding scale. This tiny tootophone covers about two octaves. Fine tune and enhance the basic notes using your hands.

step 6: Hand Technique

With stiff reeds, like cane, the traditional technique of opening and closing fingering holes works best. With softer reeds, the holes don't behave the same and tonal changes are more easily achieved by not using fingering holes at all.

Instead, cup the end of the mouthpiece, or instrument with your two hands, enclosing a ball of air. Open and close your hands to create a wah-wah effect and to fine tune the basic note created by mouth and breath control. Closing the hands creates more resistance to air flow and a lower tone, the same as having a longer column of air in a longer body does. Opening the hands raises the tone.



step 7: Listen to the Tiny Tootophone

To hear the Tiny Tootophone, click on the icon below that looks like a piece of paper with the corner bent over. That should open up an mp3 audio file.

This tiny tooter uses a fiberglass and silicone rubber reed.

File Downloads

TINY TOOTER - RUBBER REED.mp3 (1 MB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'TINY TOOTER - RUBBER REED.mp3']

step 8: Other Tootophone Variations

Any modification of the body will modify the sound. Bigger and longer bodies give deeper voices.

Click on the icons that look like paper with the corner bent over to listen to the sample audio files.

File Downloads

HYPO TOOT.mp3 (1 MB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'HYPO TOOT.mp3']

SUGRU TOOT (26).mp3 (918 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'SUGRU TOOT (26).mp3']

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Basic Alto Saxophone (could be applied to tenner, barritone, ect.) Guide by waverider894