
the Pulsar

computer controlled massage

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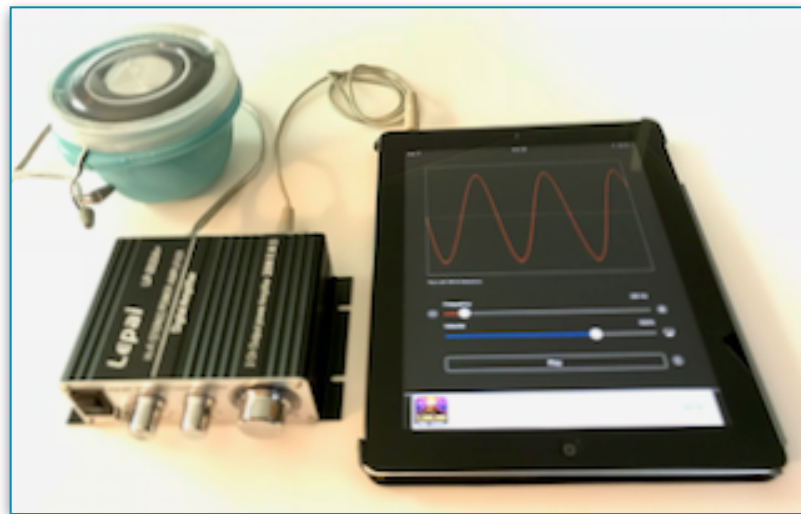
Introduction

The Pulsar is an acoustic wave vibrator useful for gentle massage to targeted areas of the body. It was designed to be a “do it yourself” project using readily available parts. The project is basically the same as putting together a home sound system and building the speaker enclosure.

This project description is offered with the sincere hope that someone might find it useful. The device is not being marketed in any way and there is no guarantee of its effectiveness or safety, so build and use it at your own risk.

The three main parts of the Pulsar are (1) a computer tablet running a sound generator app, (2) a small audio amplifier, and (3) a sound exciter transducer. The project construction mainly involves building the enclosure for the transducer.

To start off, let’s first describe each of the three main parts of the Pulsar, after which I’ll present two different enclosures for the transducer.



the tablet

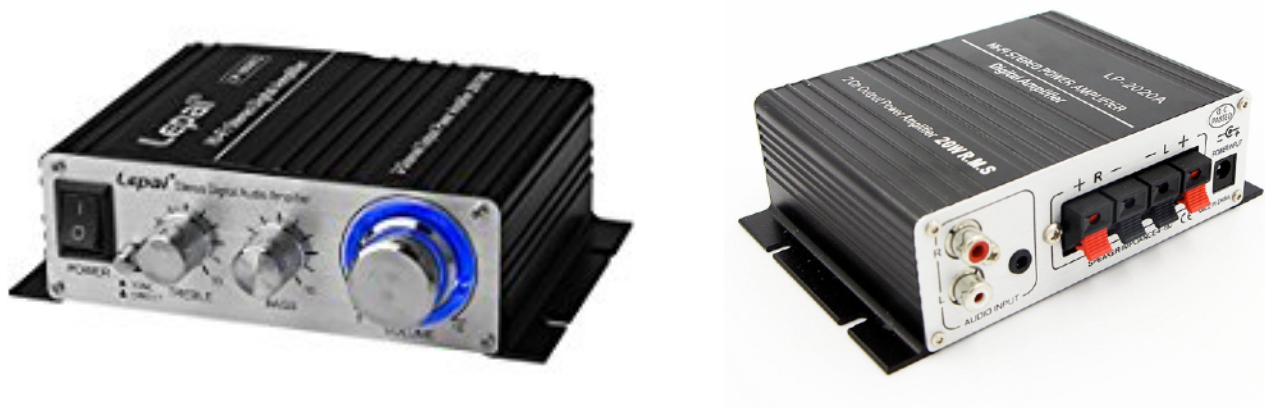
Most homes have some type of computer tablet these days. Any kind will work for this project, even a smart phone. The type of tablet shown in the photos is an Apple iPad. Android tablets would also work and can be bought for as little as \$12 (ASUS ZenPad from Walmart).

The Pulsar requires some type of sound generation app installed on your tablet; something that creates a Sinewave audio signal with frequency and volume controls. Some of the many available for the Apple iPad are Oscillator by Masayuki Akamatsu, Tone Generator by TMSOFT, Tone Generator Pro by Performance Audio, Signal Generator by Media Punk Studios, Generator by Andrew Smith. Sound generators apps for tablets with Android operating systems are also readily available: Simple Tone Generator by Dmitsoft, Audio Test Tone Generator by Media & Video, Pro Audio Tone Generator by Tools, Signal Generator by Adonsoft. Many of these apps are free, and the others are no more than \$5.

The tablet, with its Signal Generator app is the audio source for your new sound system, with volume and frequency controls. The audio signal is accessible from the tablet's headphone jack. The preferred waveform is a sinewave. Other waveforms, such as the square wave or sawtooth, will sound too buzzy. The frequencies that most easily resonate inside the human body range between 35 and 40Hz, though you can easily experiment with others. A few of the apps may even offer a frequency sweep feature that continuously sweeps the frequency between two set points at a specified rate.

the audio amp

The headphones output of your tablet is not quite powerful enough to drive the speaker used in this project. You will need an audio amplifier. Any will do, but it needn't be very large. At 20 watts, the Lepy LP-2020A is a good choice that can be purchased from Amazon for \$27. It has a stereo mini phone input jack for connecting to the tablet's audio headphone jack using a simple stereo mini phone cable. Connections to the speaker use a simple clamp type connector — press the black or red tab to open the clamp, insert the stripped speaker wire end, release the tab to let the clamp bite down on the wire.



The cable used for the speaker (called speaker cable, zip cord, or lamp cord) has two conductors held together by an insulating jacket that can be easily separated simply by pulling apart. Separate the end of the speaker cable and strip off about 1/4 inch of the insulation from each of the ends. Twist the wire on ends and, if possible, coat them with solder to keep them from fraying. One of the conductors goes to the plus clamp (red) and the other goes to the negative clamp (black). The amp is stereo with two inputs and two outputs. This project uses only one side of the amp, left or right, leaving the other side unused.

Be careful to turn off the amp before making these speaker connections. The amp can be blown very easily by accidentally touching the plus output to the minus.

the sound exciter

A sound exciter is a loudspeaker without the frame and cone. In this project it is attached to a small cup or tin container that can then be pressed against parts of the body to provide a targeted gentle massage when driven with low audio and sub audio frequencies.

The idea for the Pulsar originated in part from the notorious “Bass Shaker”. This is a tactile transducer that can be embedded in a chair to deliver another dimension to the listening experience in home theater and gaming. Low frequency shaking frequencies are delivered to the chair for that “feeling” part of the experience.

We will be trying out two different sound exciters, the Dayton Audio TT25-8 PUCK Tactile Transducer Mini Bass Shaker (\$18 from Amazon) and the smaller Dayton Audio DAEX25 Sound Exciters (\$22 for a pair from Amazon).



Dayton Audio is a good source for these types of audio transducers. For more information check out their website article, “Exciters & Tactile Transducers 101, An Introduction” at

<http://www.daytonaudio.com/index.php/exciters-buyers-guide>

enclosure 1

As luck would have it, I found the perfect enclosure for the Dayton Mini Bass Shaker. It's the Rubbermaid TakeAlong On-the-Go 2 Cup Twist & Seal Food Storage Container, 3 Pack (Amazon for \$6). This little food storage container has a tray insert that is almost the perfect size to hold the Dayton transducer.



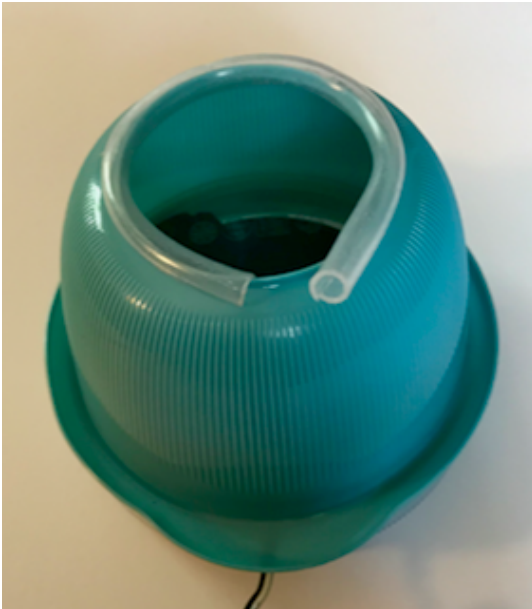
The three tabs on the transducer were filed down a bit to allow it to fit in the Rubbermaid tray insert. The transducer wire connections were extended with speaker cable using two wire nuts.



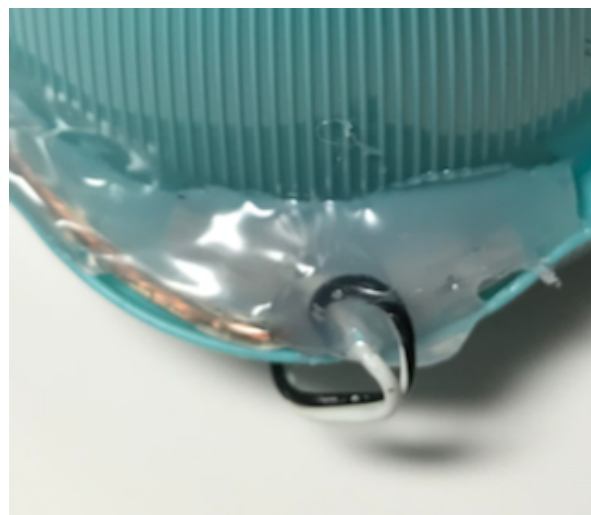
Use a file to cut a slot through both the tray insert and the lid edge of the cup. Position the slot over the cup handle. Feed the transducer wires through the slot before screwing on the lid. The transducer is now completely enclosed in the top of the cup.



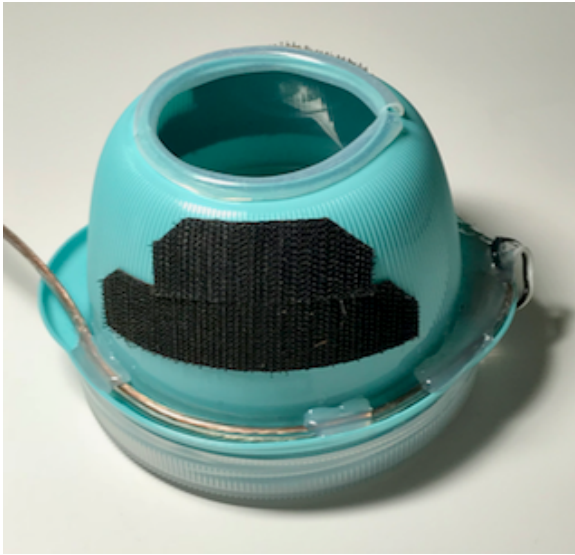
Using a hobby knife blade, cut out the bottom of the Rubbermaid cup up to but not including the bottom ridge. Cut a length of 1/4" tubing and, using the hobby knife blade, cut a slit along its entire length. Install the tubing over the cup's bottom ridge and edge.



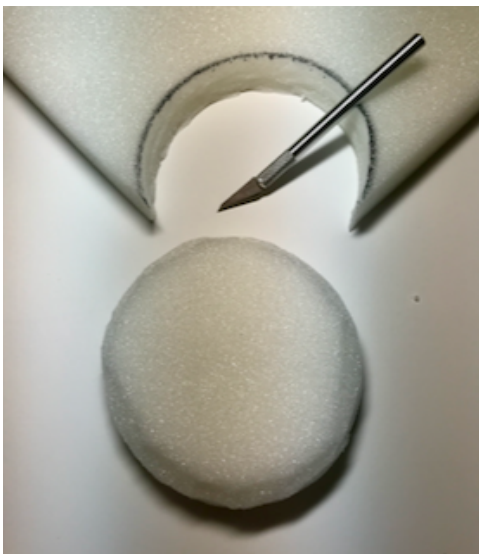
Tuck the two wire nuts into the bottom of the cup handle and secure them with a hot glue gun. You can also secure part of the speaker wire under the cup lip using the hot glue.



Apply velcro strips with the sticky backing to two sides of the cup. Use the non-fuzzy type of velcro for the cup sides. Cut two lengths of hook loop strap type of velcro and attach them to either side of the cup to form an adjustable hand strap with the fuzzy side against the top of the hand used to hold the Pulsar.



To cut down on handling vibrations cut out a pad of foam and attach it with glue or tape to the top of the cup.



The Pulsar is now ready to set up. Connect the headphone output of your computer tablet to the audio input of the amp with a stereo mini plug cable. Strip the two ends of the transducer speaker wire and connect them to a plus and minus speaker output on the back of the audio amp. Make sure the amp is turned off while making these connections.



This enclosure is designed to transmit less of the mechanical vibration of the transducer and more of the acoustic air waves. It is thought that mechanical waves stay at the surface of the body while the acoustic waves are better able to penetrate into the body.

All objects have resonant frequencies, or natural frequencies of vibration. The body and its organs are no different. They will tend to vibrate more at their resonant frequencies and much less at other frequencies so it is important to be able to tune the frequency of the Pulsar. The best frequency range to explore is 20Hz to 65Hz. It is also important to be gentle with the volume levels.

enclosure 2

This enclosure uses a smaller type of sound exciter, the DaytonAudio DAEX25Q. It may not be as strong as the Bass Shaker transducer used in the previous enclosure, so, to compensate, this one is attached directly to the base of the enclosure. This design uses mechanical vibration, direct vibration from the bottom of the tin, which will result in more of a body surface massage with less penetration into the body.



A tin for mint candy is used to house the transducer. Drill a hole in the side of the tin for the wire. Try to smooth the edges of the hole with a file. A rubber grommet is needed for the hole so that the speaker wire is not cut by the sharp hole edges.

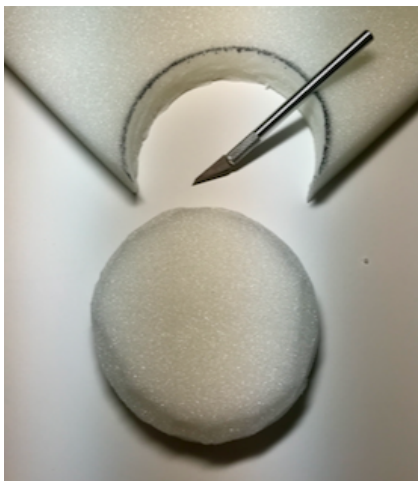


Cut an extra long length of speaker wire. Pull the conductors apart at one end, strip off 1/4 inch of insulation on both ends, and attach them to the transducer. The transducer uses the same type of clamp connectors as the audio amp. Thread the cable through the grommet in the tin.

This sound exciter doesn't quite fit in the tin. Snap off one or two of the spider legs to get it to fit. Peel off the paper covering the adhesive pads on the bottom of the transducer and stick it on the bottom of the tin. Tighten a nylon zip tie to the speaker cable on either side of the rubber grommet to prevent pulling or pushing at the transducer cable connections.



To cut down on handling vibrations cut out a pad of foam and attach it with glue or tape to the top of the tin.



A large silicone kitchen ladle spoon makes for a great enclosure handle. Place it over the top of the foam, the handle in line with the cable hole, and wrap it with your choice of colored duck tape. Do not wrap too tightly and overly compress the foam. Tape the speaker wire to the end of the handle, allowing for some slack in the cable.



With this Pulsar design you have direct mechanical contact with the vibrating transducer. The handle makes it more convenient to reach areas like your back.



music

Yes, you can play music through the Pulsar ! Simply direct your tablet to your favorite tunes and play away. Don't expect the greatest fidelity from the Pulsar by itself, remember that it is actually a speaker without a cone. Here are a couple options:

Choose a tune with lots of bass guitar and bass drums. Attach a headphone splitter to the tablet's headphone output, or your audio amp may have an extra headphone output. Use one connection for the Pulsar and the other for your higher fidelity headphones and then enjoy vibrating with the music. The Pulsar is similar to a bass woofer except that it is lower powered and more directed.

Attaching a sound exciter to any surface will turn that surface into a speaker. For best results use a flexible surface like a foam board or a large cardboard box. Hollow doors, glass coffee table tops, drum heads, etc. will also work with various results. The second Pulsar enclosure may work better for turning surfaces into speakers since the exciter is in direct contact with the bottom of the tin. Use some type of elastic to keep the Pulsar tightly pressed against whatever surface you are using. When not using the Pulsar for massage, it can then serve double duty as a rogue speaker.