

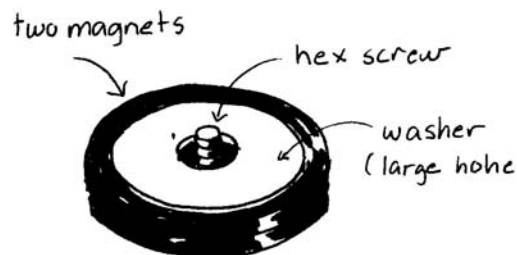
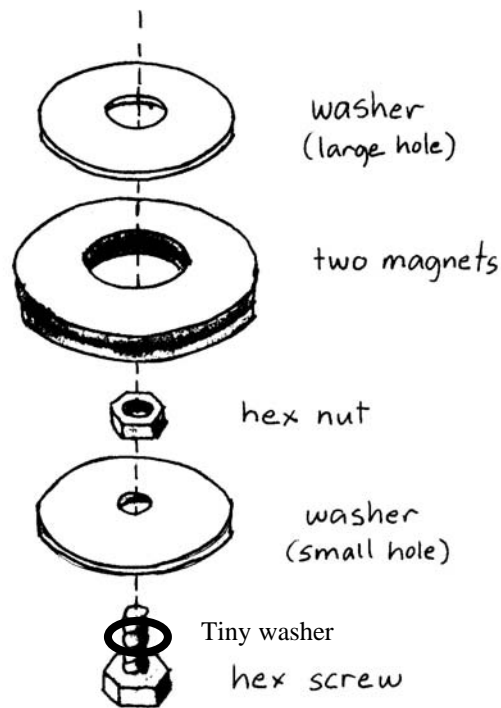
Science and Technology of Everyday Life
Hope College, GEMS 151

Electrodynamic Speaker

In this lab we will make a simple speaker that reproduces sound.

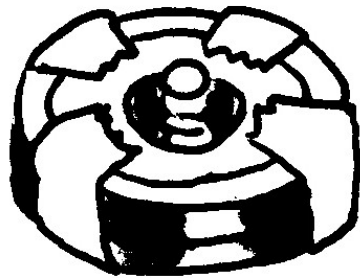
Part 1: Magnet Assembly

1. **Assemble the magnet pieces.** Assemble the components of the speaker magnet as shown below. Be sure to tighten the hex nut on the hex screw (hand-tight is sufficient).



2. **Adjust the magnet assembly.** Washers should be evenly centered on the magnets. The hex screw should stick out through the center of the hole. It is very important that that all of the components are lined up properly.

3. **Secure the magnet assembly.** Once the washers are evenly centered on the magnets, secure the assembly using tape. Black electrical tape is recommended. Keep the tape away from the center hole.

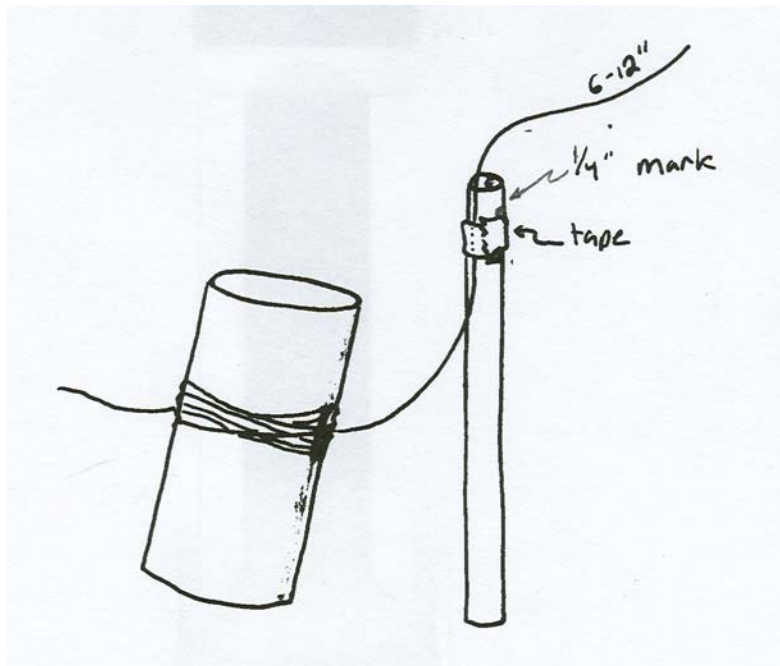


Black Electrical Tape

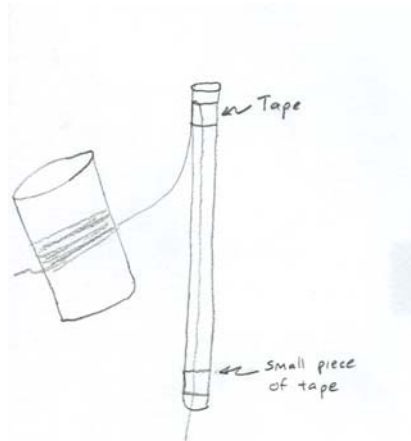
4. **Magnet finished.** Set the magnet assembly aside.

Part 2: Coil.

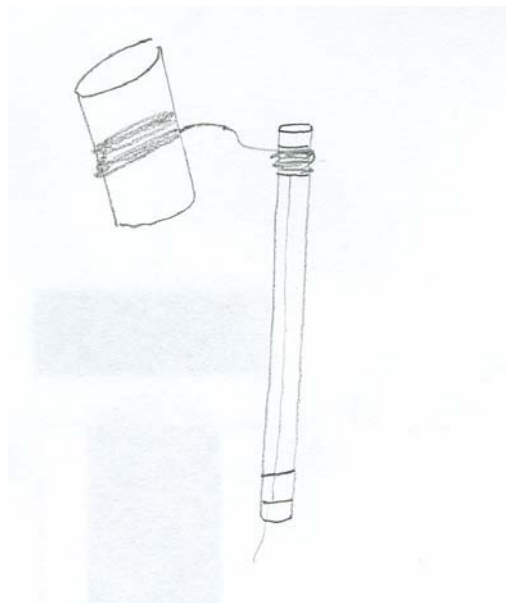
1. **Start the Coil.** Locate the straw and coil of fine wire. Make a mark 1/4 inch from the end of the straw. Tape the wire to the straw as shown. Leave an extra 6-12" extending past the taped point. The top of the tape should be 1/4 inch from the end of the straw. Use clear cellophane (Scotch) tape.



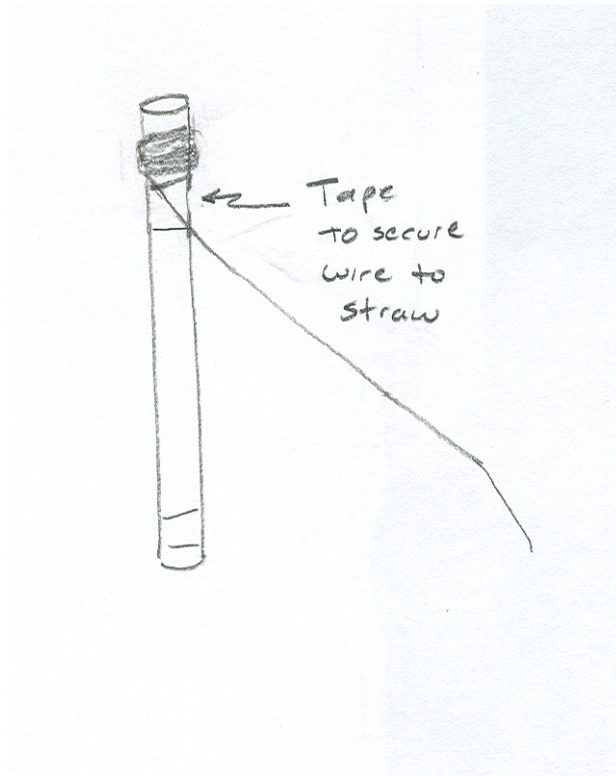
2. **Secure the free end of the wire.** Tape the 6-12 inch section of the wire to the other end of the straw. This is only a temporary connection so only a small amount of tape is needed. The purpose of taping this wire down is to keep it out of the way during the next two steps.



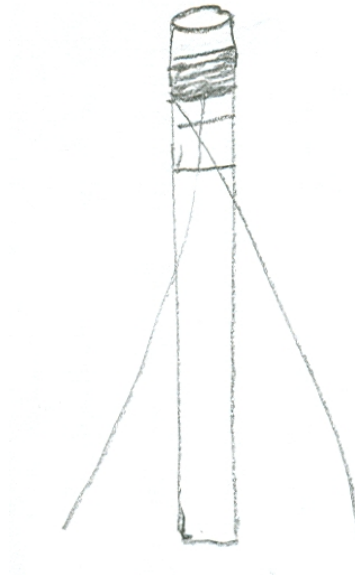
3. **Wrap the coil.** Wrap all but 6 inches of the wire around the straw. Wrap securely but do not wrap too tightly so as to crush or compress the straw. Wind the wire on top of the tape that was attached during the last step. See the figure below.



4. **Secure the coil.** This second end must be secured to the straw. Wrap one layer of cellophane (Scotch) tape around the straw and wire, securing the wire in place. This should be on the longer end of the straw. Avoid putting any tape on the coiled wire.



5. **Free other end of wire.** Remove the tape that was temporarily holding down the other end of the wire. There should now be two ends of the coiled wire available to be used in the next step.

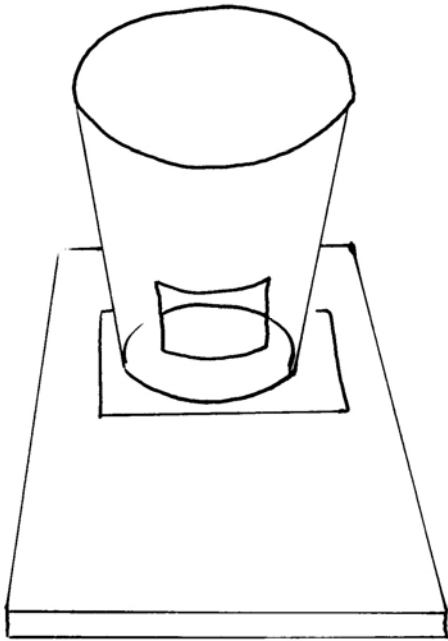


6. **Sand ends of wire.** Locate the sandpaper and remove the insulation from last 1 inch on the ends of each wire. Careful! The wire is very fragile.

7. **Coil completed.** Set aside the straw with the coil of wire.

Part 3: Cup and Base.

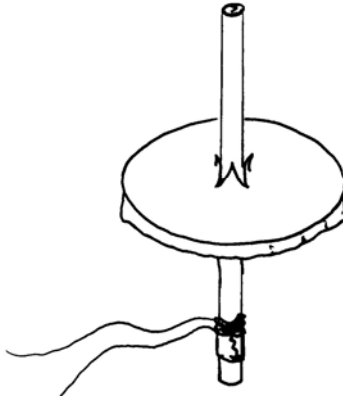
1. **Hole in cup.** Locate the cup. If it does not already have one, cut a hole in the side of the cup about 1 inch x 1 inch as shown. This hole is to allow the wires to pass from the inside to the outside of the cup. Make the first cut with a knife. Make the remainder of the cuts with the scissors.



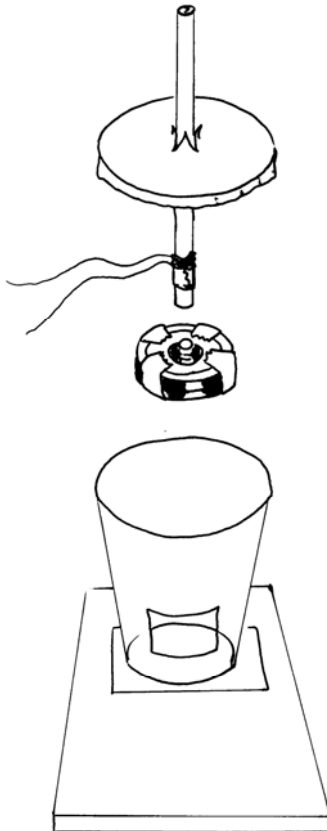
2. **Attach cup to base.** Locate the base. Use hot glue to attach the cup to the base. The cup should be near one side of the base as shown above. The hole should point toward the other end of the base. Follow the above picture.

Part 4 Final Assembly

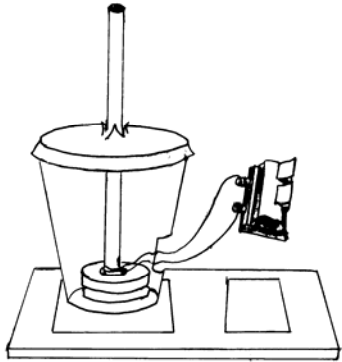
1. **Put the straw through lid.** Insert straw in lid as shown.



2. **Assembly.** Assemble components.

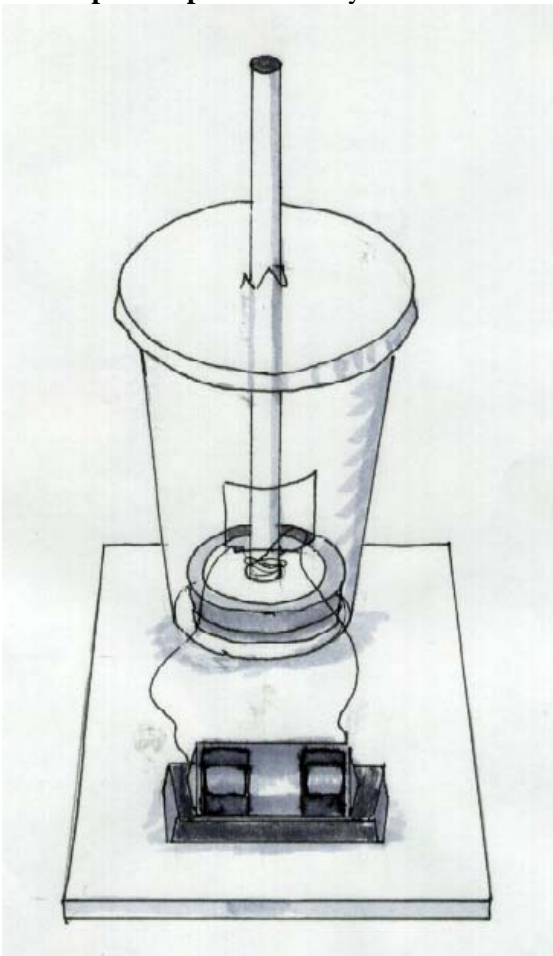


3. **Terminal block.** Locate terminal block. Wrap wires around contacts. Bend the contacts away from the base. Secure wires by soldering.



4. **Attach terminal block.** Attach terminal block to base using hot glue.

5. **Completed speaker.** Ready to test.



Testing

4. **Prepare wire.** Locate 3 feet of two-conductor speaker wire. Separate and strip the insulation off about 1 inch on both ends of the wire. (No drawing shown).

5 **Test.** Test your speaker. Connect the speaker to the system at the front of the room.

Problems:

Not working: check for a broken or disconnected wire.

check to see that fine wires are making good contact to terminal block.

Not very loud: Coil is too far from the end of the straw, carefully trim excess straw.

Straw is rubbing on hex screw. Check to see if coil compressed straw.

Buzzing noise: Excess tape or the straw is rubbing on the washer.

Note on using the speaker at home: Your speaker is completely compatible with any consumer audio equipment. You can attach it to your stereo at home. However, it is not as efficient as a commercial speaker and it will not be as loud as manufactured speakers. Avoid very high volumes with your speaker as this can generate enough heat to melt the straw.

Name: _____

Date: _____
Section: T or R

**Science and Technology of Everyday Life
Speaker Laboratory**

Questions. Due next week in lab

1.) Instructor or TA signatures:

Operation of speaker verified: _____.

Keep your speaker we will need to use it for another lab.

Answer the questions after lab. Material to answer questions will be discussed in class before the lab is due. Attach separate sheets.

2.) How is the sound produced(In general)? (See Macaulay page 219).

3.) Draw a picture or graph showing the voltage produced by a sound signal from a microphone or other source such as a stereo amplifier. Is the voltage constant?

4.) When your speaker is used to produce sound, a voltage similar to your answer from the previous question is applied to the coil of your speaker. A current flows through the coil. Is a magnetic field produced? Draw a picture of your coil showing the magnetic field lines on the coil. Is the strength of the field of the coil constant? Why or why not?

5.) Given your answers to questions 2, 3, and 4, and noting that there is another permanent magnet in your speaker, explain how the speaker is able to reproduce sound. In other words, what happens between the sound system and what you hear? **This question will require some thought and effort.** Note: Do NOT copy an answer to this question from a book. Use your own words and ideas. You may want to use drawings to aid in your explanation.