

Now Hear This!

Home-brew yourself a magnetic headphone.

In the past few years, there has been an increased interest in the early days of radio. Periodically you will see articles published on the construction of crystal or regenerative radios. There was even a crystal radio building contest in 2001. I entered the contest, learned a lot and had a blast even though my project did not win. I attempted to make all of the parts for that radio. This is part of that project.

With readily available items from your junk box or hardware store, it is possible to fabricate a functional magnetic headphone that is sensitive enough for crystal (diode) radio operation. This headphone has been used with my crystal radio and performs well; the best part is that it is homemade. If you don't have the exact parts, experiment with what you have, and most of all, have fun; in the process you will learn something that will be useful. The materials and tools used in this project

can be dangerous, so be safe in your work environment and use eye and ear protection.

The nail

The nail is 4" long and 1/8" in diameter; the box was labeled "16d" ("sixteen penny"). The head of the nail is about 1/4" in diameter. Prepare two pieces of wood, one 2" square and one 1.5" square (I used 1/4" oak for sturdiness) and drill holes in the center just slightly smaller than the diameter of

the nail. Hammer the nail completely through the 2" piece until the nail head is flush with the wood surface. Hammer the nail into the 1.5" piece until you have about 2" of spacing between the two pieces of wood. File the nail head until it is smooth and it is about 1.0 mm above the wood surface. You may want to remove the pointed end of the nail; however, this is not necessary.

The wire

The wire used for this project is a



Photo A. Components for headphone.

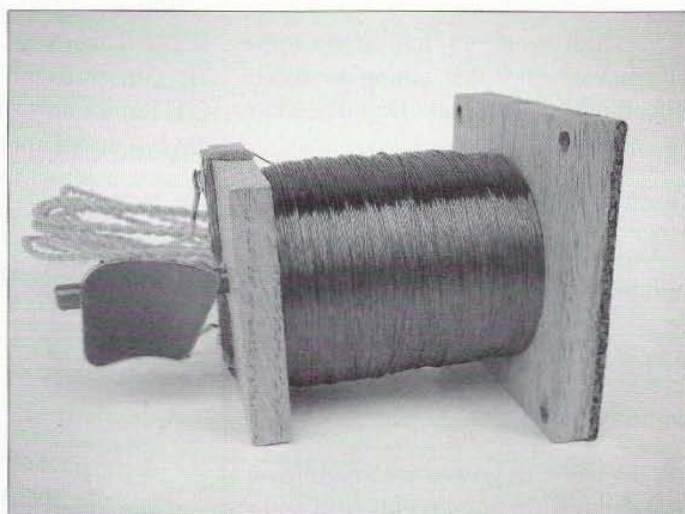


Photo B. Headphone (side view).

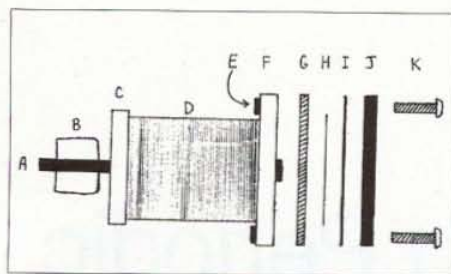


Fig. 1. Magnetic headphone assembly (see Parts list for key).

1/2 pound spool of #32 enameled magnet wire available from Hosfelt Electronics. This is about 2,600 feet and about 430 ohms resistance as described in the wire table from the *ARRL Handbook*. Different diameter wire would probably work, although much smaller than #32 becomes hard to see and to work with. It will take many, many turns to get it all wrapped on the nail. I used my variable speed electric drill with the nail secured in the chuck like it was a drill bit, and the spool of wire on a piece of dowel mounted in a vise. The wire was guided with my fingers as it wrapped on the nail. The process took about 15 minutes. A possible source of wire may be an old transformer.

The magnet

The magnet was salvaged from a junked computer hard drive. There are generally two odd-shaped powerful magnets in hard drives. If you cannot locate any magnets, All Electronics

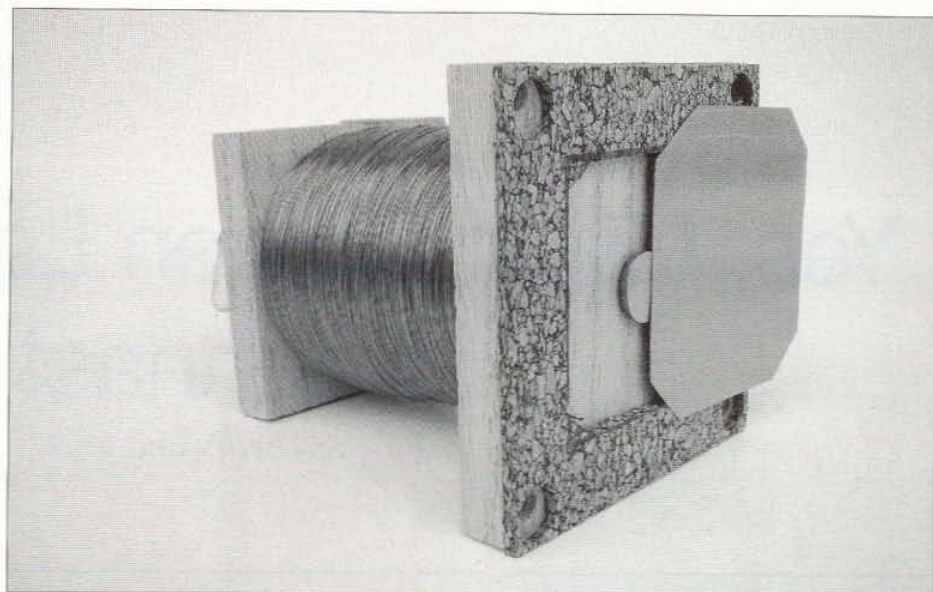


Photo C. Headphone (front view).

sells them. The magnet simply attaches to the part of the nail that extends from the wood. Other types of magnets work, too — it is just nice to find a use for these powerful ones.

The steel diaphragm

Most tin can lids and bottoms have ruffles and ridges. A search in the store found a potato chip canister that has a very nice flat bottom piece roughly .08" thick. Also, frozen juice canisters have flat tops and bottoms. A sturdy pair of utility shears is used to cut the piece to the size you need for the diaphragm. If you want to experiment a little, try using different thickness steel

shim stock. I have tried 0.01" through 0.05" and the best results were with 0.03" and higher. Steel shim stock is inexpensive and can be obtained from an industrial supply company. If the diaphragm is too flexible, it gets pulled into the magnetized nail and you lose the gap between the head of the nail and the diaphragm that is necessary for good performance.

Final assembly

The key to success is the positioning of the diaphragm above the nail head as close as possible without the

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Fig. 1 Key Letter	Part
A	Nail (16d)
B	Magnet
C	1.5 in. x 1.5 in. wood retainer
D	Wire wrapped around nail
E	4-40 machine nut
F	2 in. x 2 in. wood retainer
G	Cork gasket material
H	Steel diaphragm
I	Cardboard spacer (index card)
J	Cover (aluminum, plastic, or wood)
K	4-40 x 3/4 in. machine screw

Table 1. Parts list.

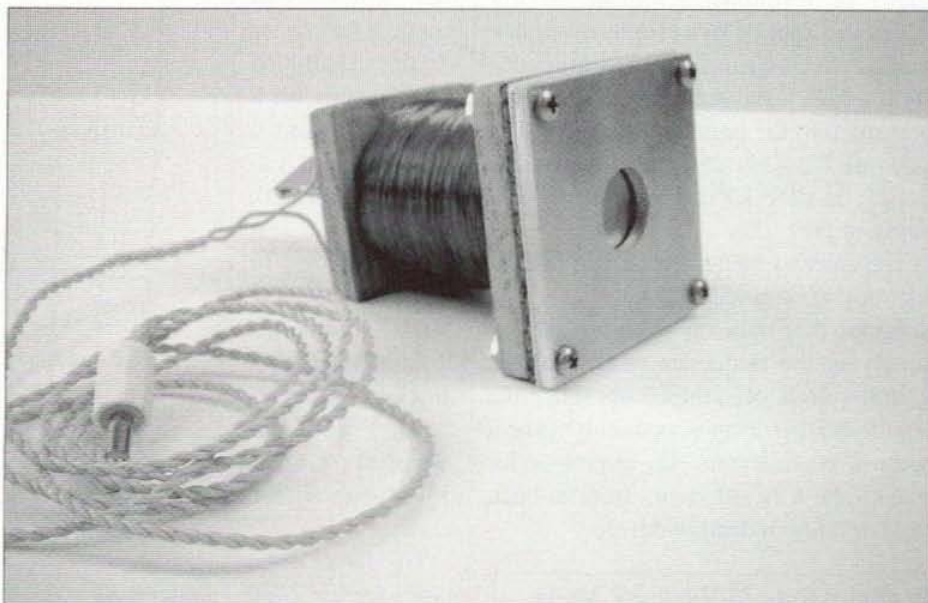


Photo D. Completed headphone.

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diaphragm touching the nail head. This is easier than you may think. A piece of cork gasket material was cut to fit on the piece of wood with the protruding nail head. Before gluing in place check the clearance with the magnet attached. It may be necessary to file down the nail head a little more to gain clearance. A few finishing touches: (1) Glue a piece of circuit board to the back and solder the #32 wire leads. (2) Fabricate a covering for the diaphragm from wood or aluminum with a 1/2" hole in the middle; make a spacer of thin cardboard (approximate thickness of two index cards) to go between the covering and the diaphragm edges: secure with screws in the four corners. Congratulations! Your home-brew magnetic headphone is complete. Have fun!

Performance

Although it cannot compete with the best magnetic headphones that exist, it performs well. The strongest local AM stations can easily be heard, and sometimes on a good night more distant ones can be heard, too.

Parts sources

Hosfelt Electronics, Inc.
2700 Sunset Blvd.
Steubenville, OH 43952
1-800-524-6464

All Electronics Corporation
905 S. Vermont Avenue
Los Angeles, CA 90006
1-800-826-5432