LEE WILKINS

MAGNETIC FIELDS

School of Machines, Making & Make Believe

HELLO!

HOW ARE YOU?

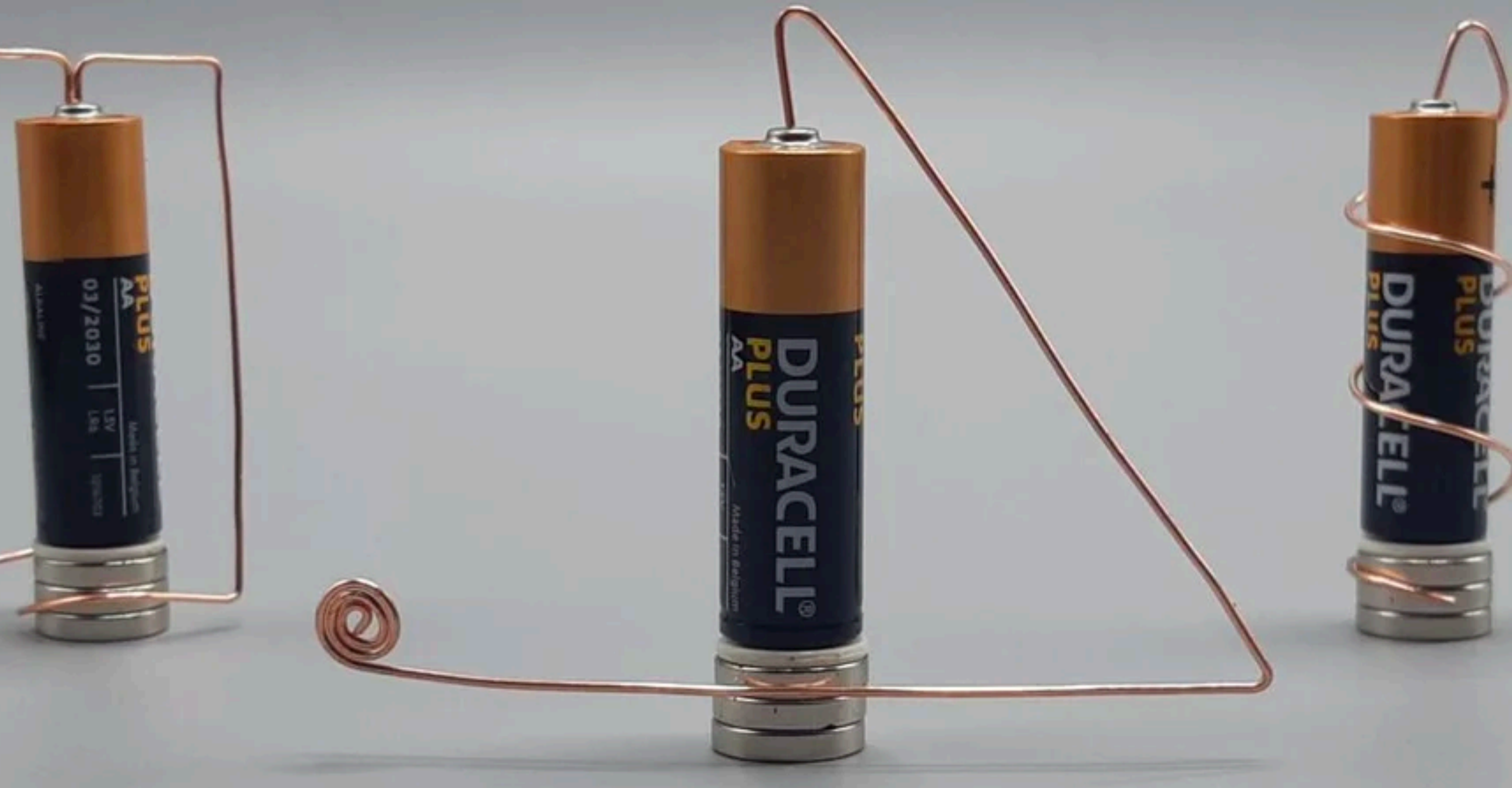
A SNACK YOU ENJOYED RECENTLY?

SHARE YOUR BEAUTIFUL SOUND?

CONTINUE FROM LAST WEEK

2- SPIN

By New Pew on Instructables




Panasonic
Carbon Zinc
Carbone-Zinc
AA

ANATOMY OF A HOMOPOLAR MOTOR

Example

Wire is balanced at the top, able to freely move

Coating is removed To make contact with Battery +

Copper Wire

AA battery

Power flows from the battery +, through the copper wire, and through the magnet to the battery -, making a circuit!

Rare Earth Magnet

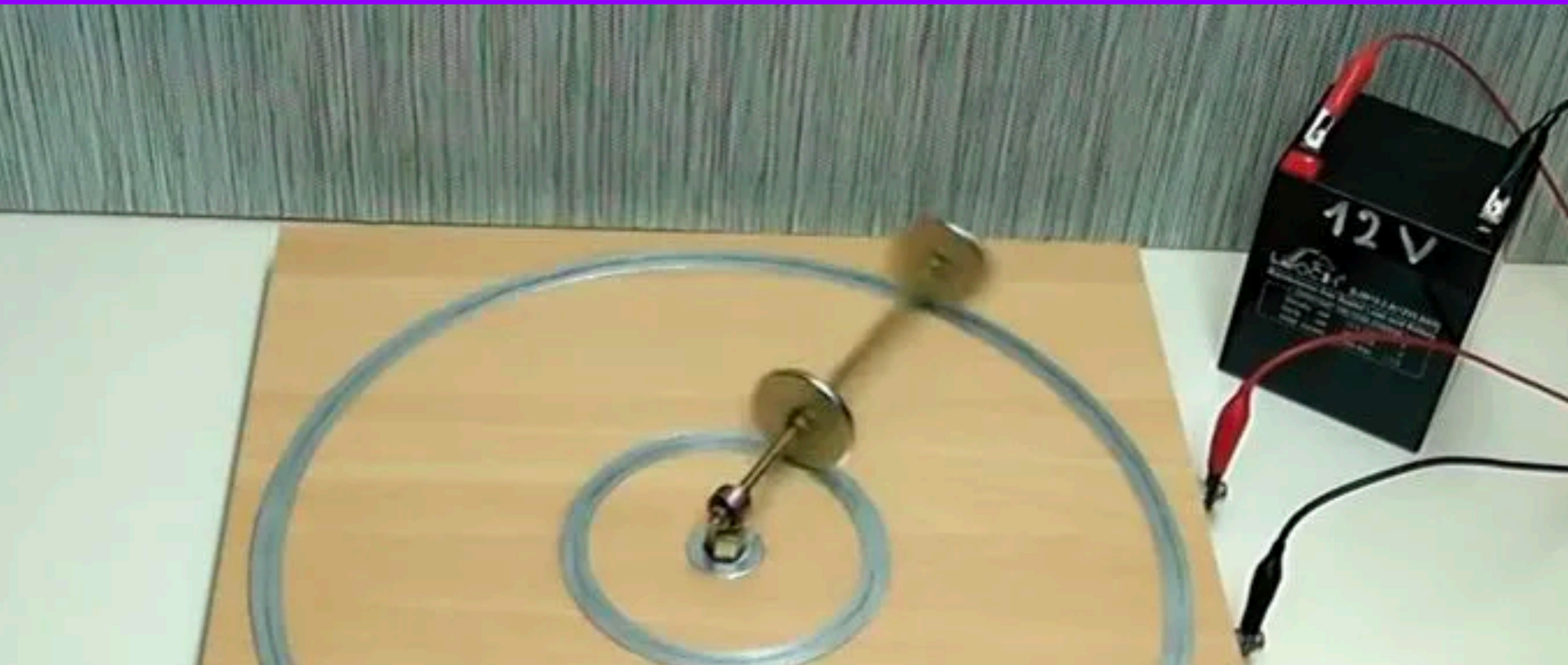
Coating is removed to make contact magnet

HOW DOES IT WORK?

Flow of Current

Flow of magnetic field

UNCONVENTIONAL HOMOPOLAR MOTOR



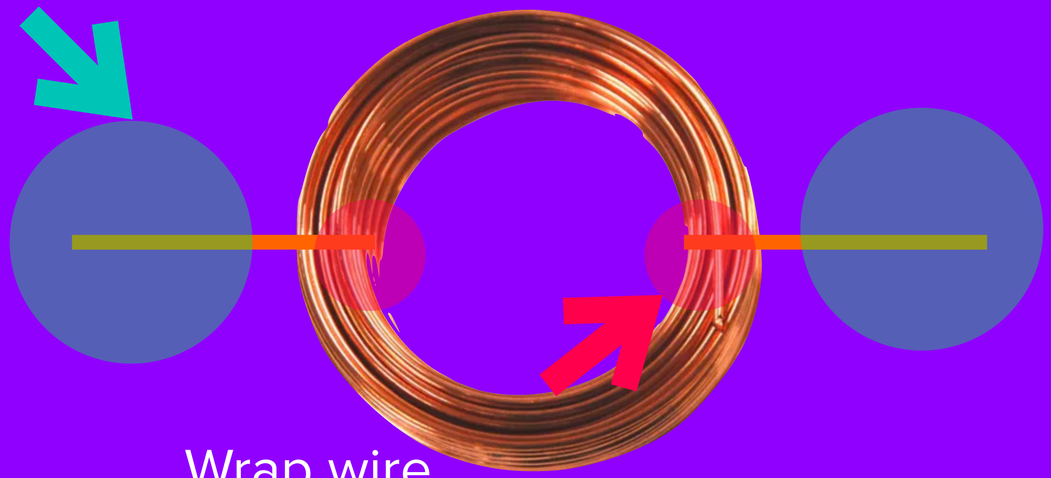
3- FLIP

CONSTRUCT A NEW COIL & SOME LOOPS

The coil for this example should have the leads coming out of the sides. Wrap the wire around the edge so that it holds its shape and remove the coating off the ends of the wire

1

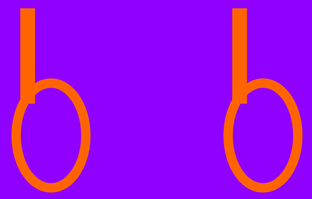
Remove coating here



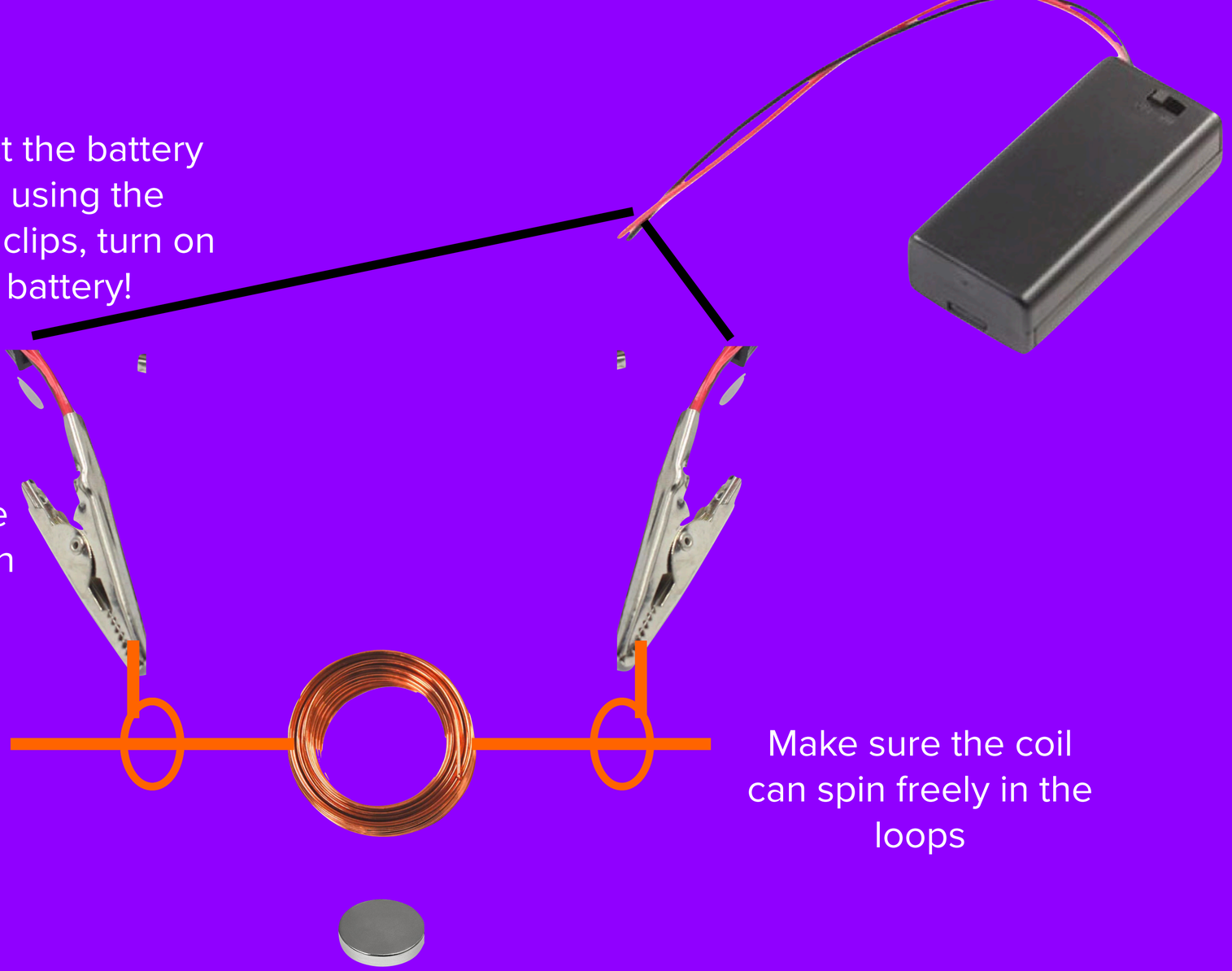
Wrap wire around here to help hold the coil shape

2

Take 2 pieces of magnet wire, remove the coating and twist them into loops.



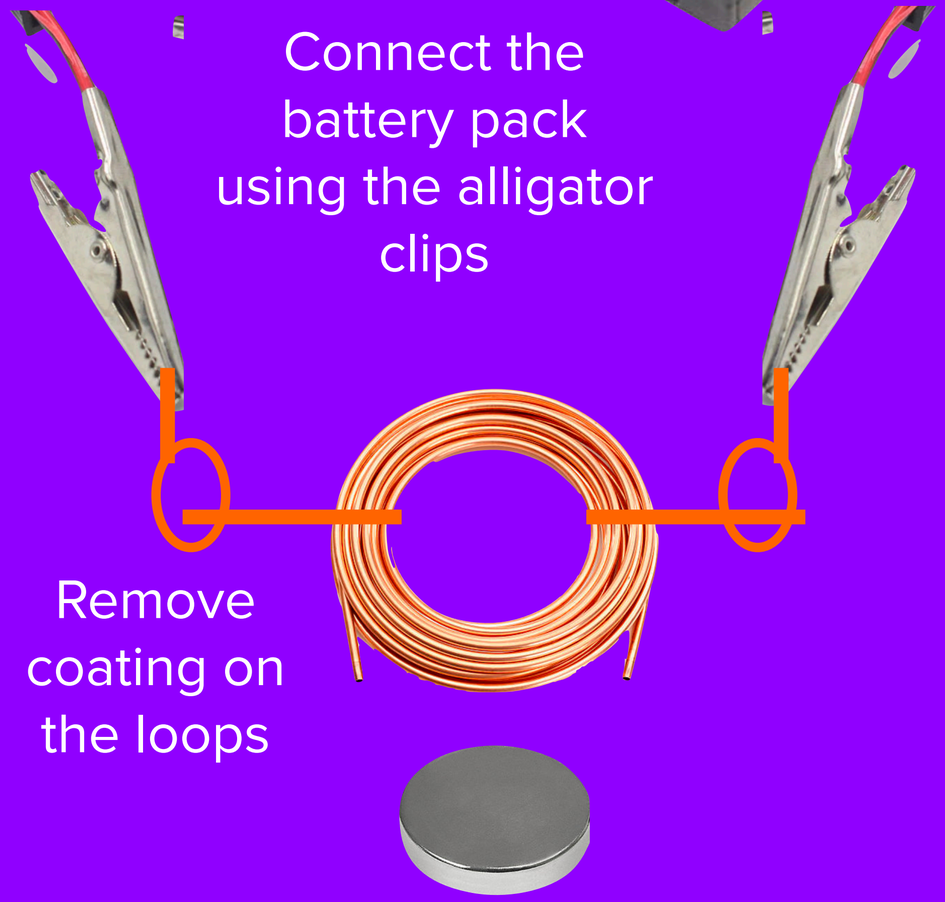
Connect the battery pack using the alligator clips, turn on the battery!



Hold the loops above the magnet and watch it flip!

Make sure the coil can spin freely in the loops

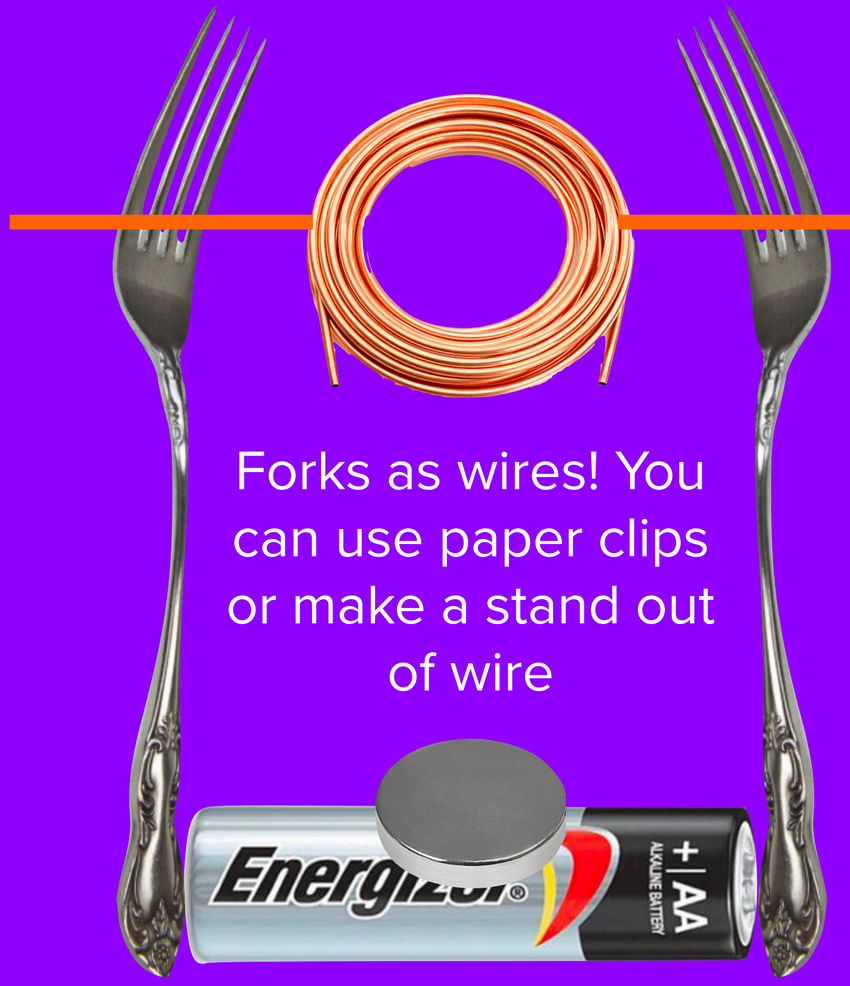
Connect the battery pack using the alligator clips



Remove coating on the loops

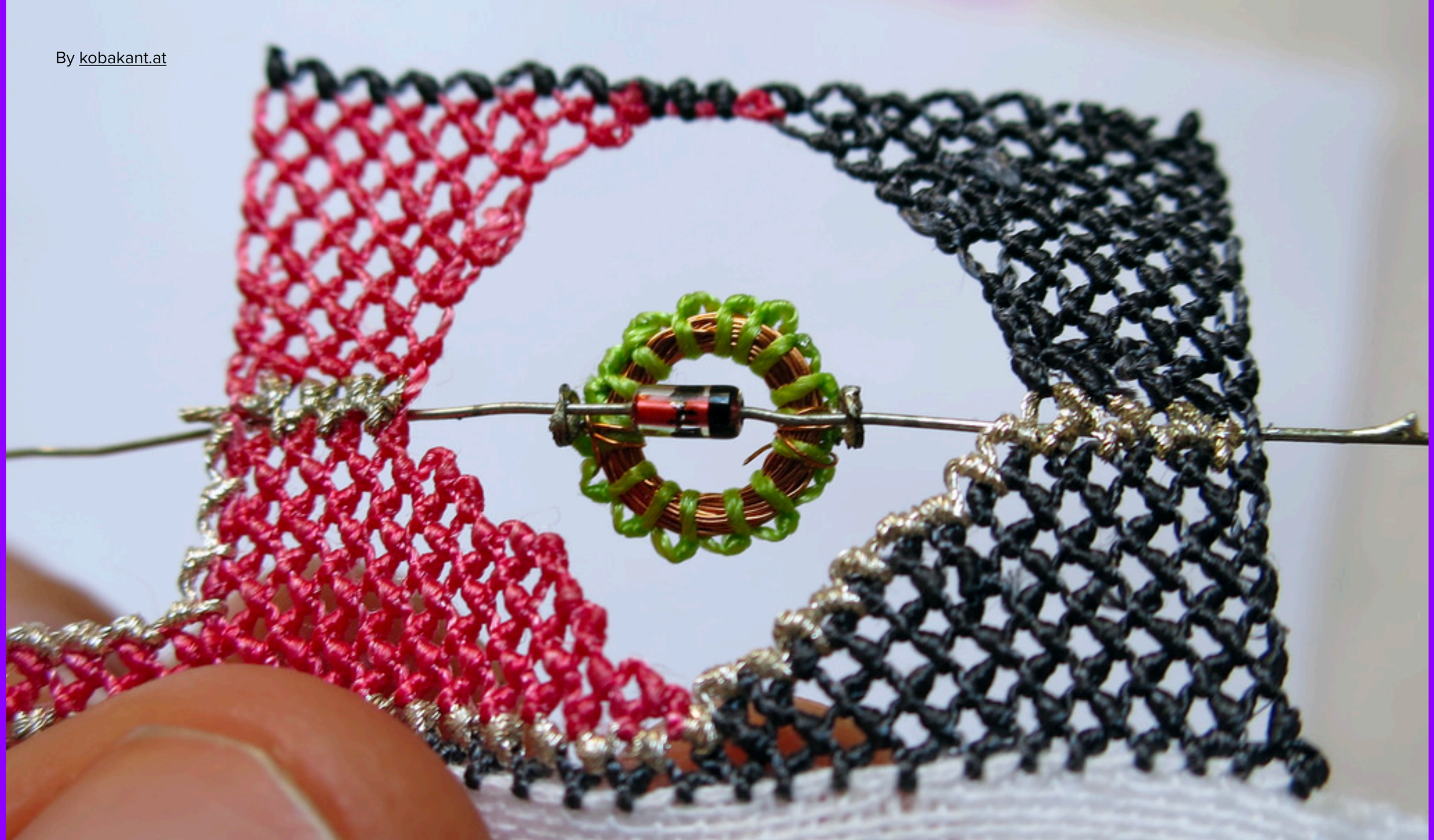
SIMPLE DC MOTOR

Example Video



Forks as wires! You can use paper clips or make a stand out of wire

By kobakant.at



4- RUN?

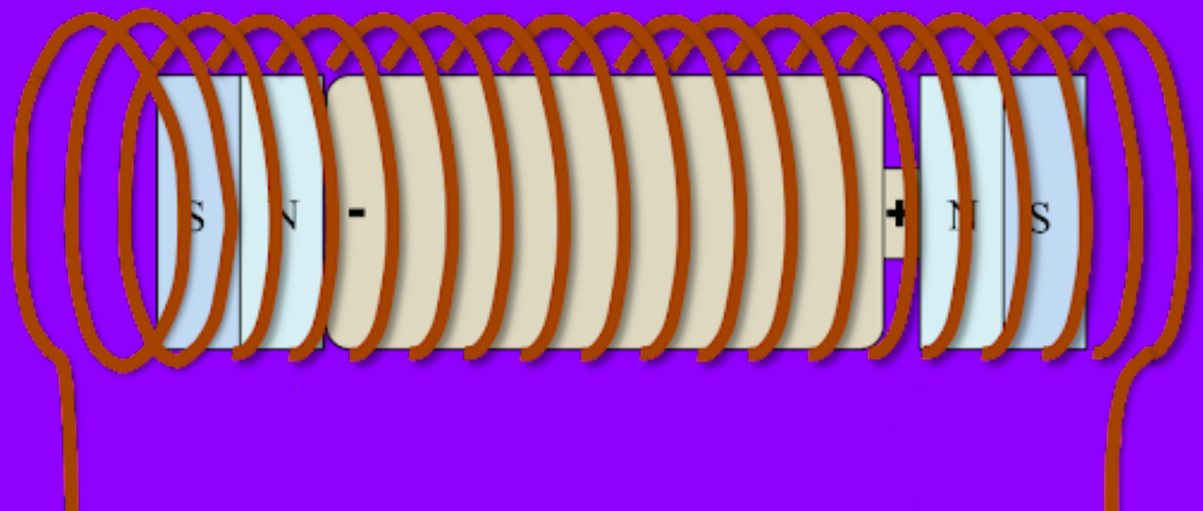
TRAIN

Link

1 Create a long coil with no enamel coating

2 Put a AA battery with a magnet on each end inside

3 See it run!



FURTHER READING

Kobakant Examples

Soft Robotics

507 Movements

Carl Bugeja

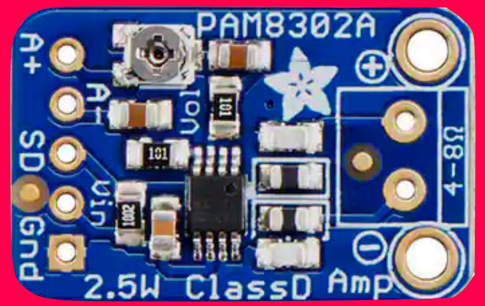
BREAK

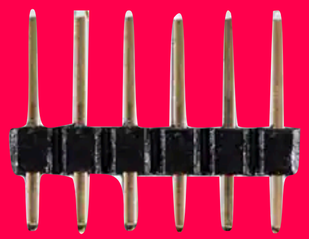
PROJECT BREAKOUTS

HOW DO SPEAKERS WORK?

Speakers work by creating movement through the air by using a tiny coil and magnet, similar to the ones we used last week!

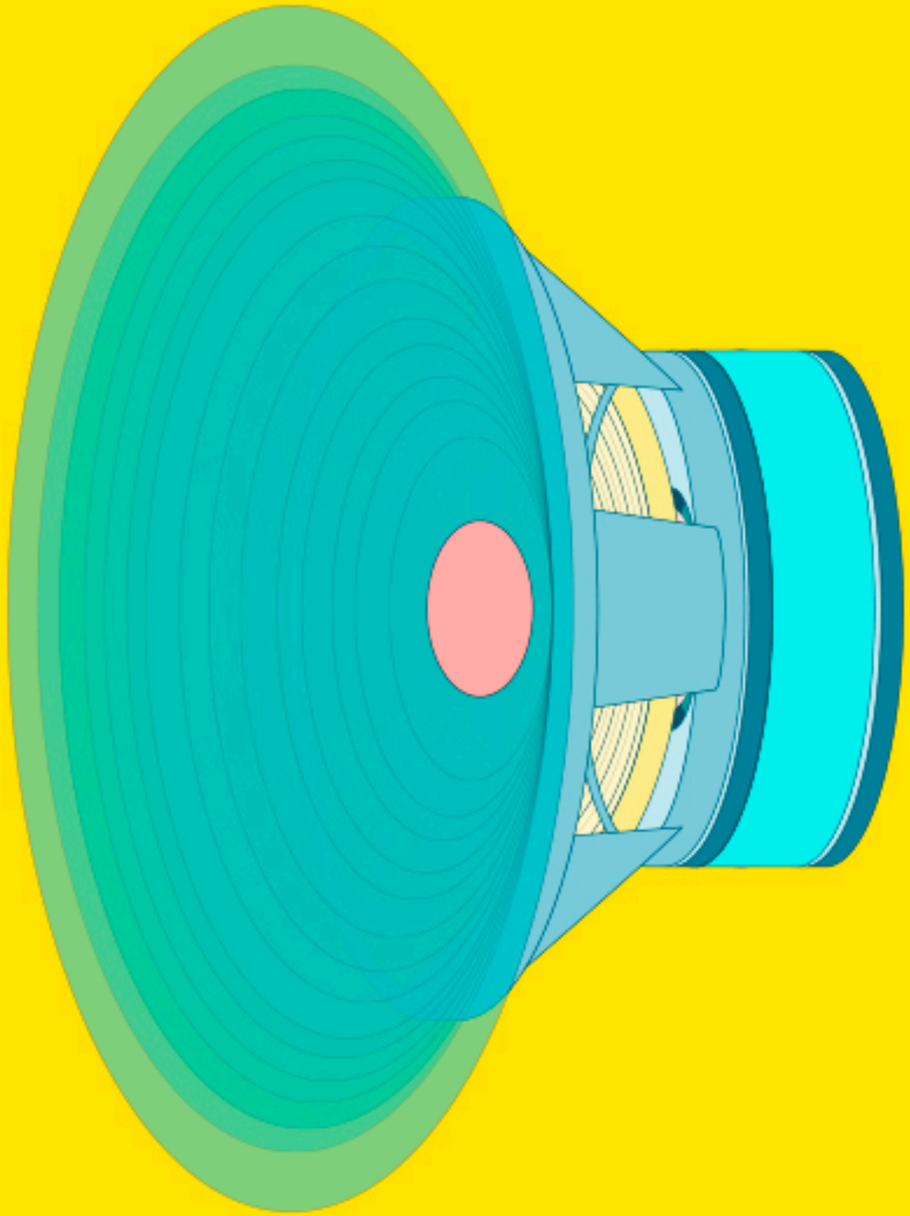
HOW DO AMPLIFIERS WORK?





Amplifiers make a small electrical signal bigger. Because the signal leaving our devices is weak, and our speaker will also be weak, we'll need to make the electrical signal bigger using an amplifier circuit.

Image adapted from Landr



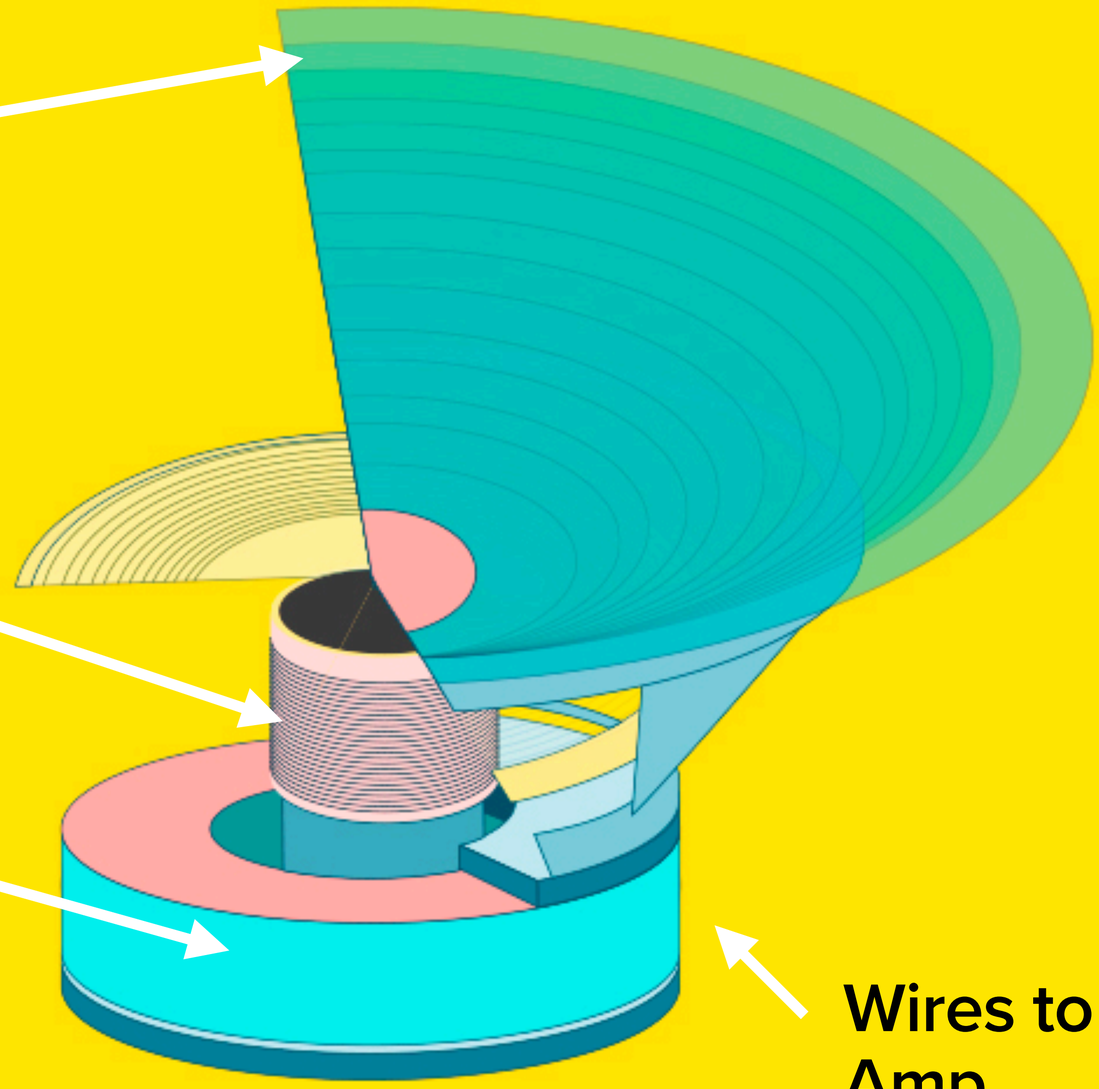
An electrical signal leaves the audio device and goes into the coil, the coil creates a magnetic field based on the sound input, which interacts with the permanent magnet, moves the cone, and creates sound!

Image adapted from Landr

CONE There is a cone that moves up and down with the electromagnet to create the sound waves

COIL Much like the coil we've been using, the coil inside a speaker is made of many winds of copper wire that create a magnetic field when current is passed through them

MAGNET There is a permanent magnet at the base of the spear, around the coil.



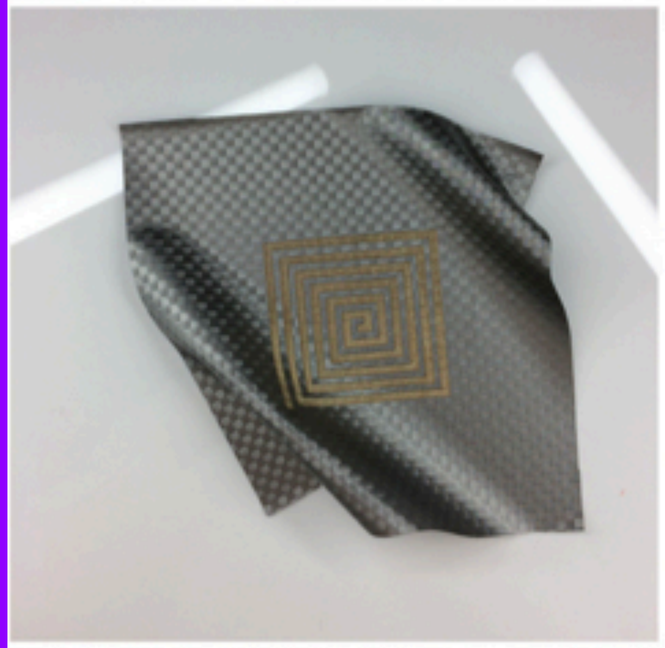
BEAUTIFUL COILS

By Kobakant

https://www.kobakant.at/DIY/?p=5935

BEAUTIFUL COILS

Eszter Kárpáti of EJtech



BEAUTIFUL COILS

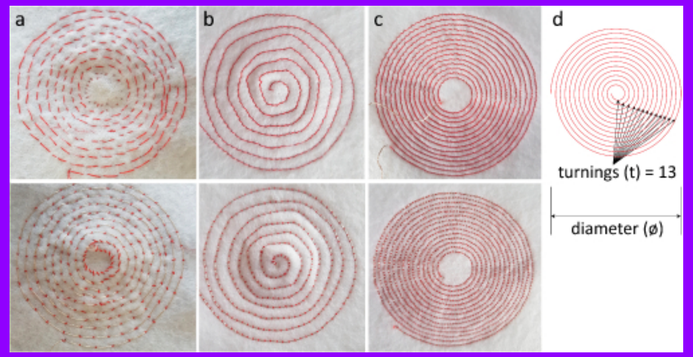
Eszter Kárpáti of EJtech
Draping Sound
http://ejtech.cc/?page_id=1379

BEAUTIFUL COILS

Liza Stark

BEAUTIFUL COILS

Lee Jones https://www.youtube.com/watch?v=9s87b2cXY_k Paper on fabric speakers

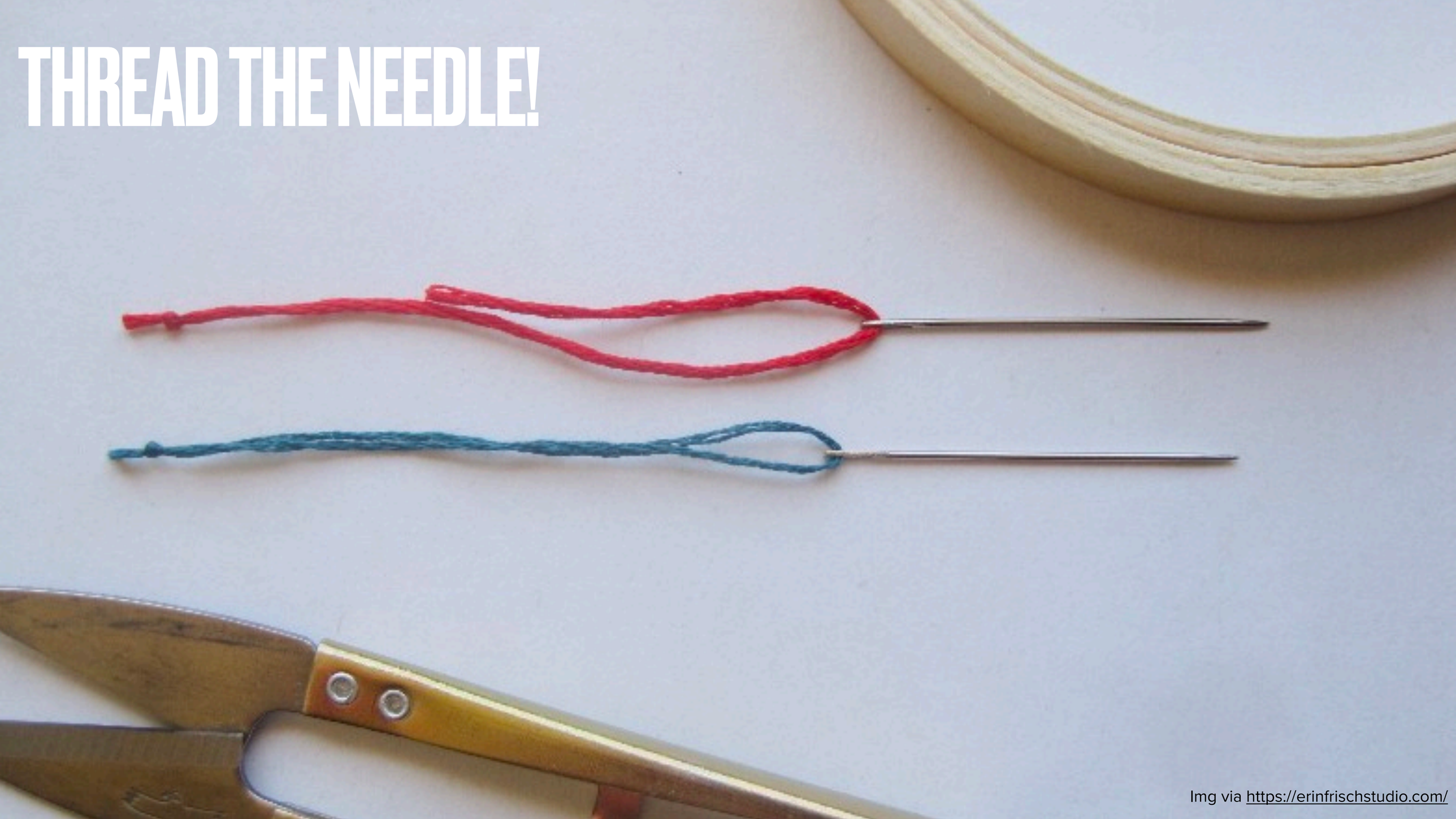


LETS MAKE A SPEAKER!

First we will place our fabric in the embroidery hoop. Then begin sewing a spiral as big as you'd like your speaker to be. Remember that the beginning and end of the spiral will need to have an alligator clip attached to them, so leave space.

If you are using magnet wire, your coils can overlap. But you can use materials like conductive fabric, wire, conductive paint, etc.

THREAD THE NEEDLE!



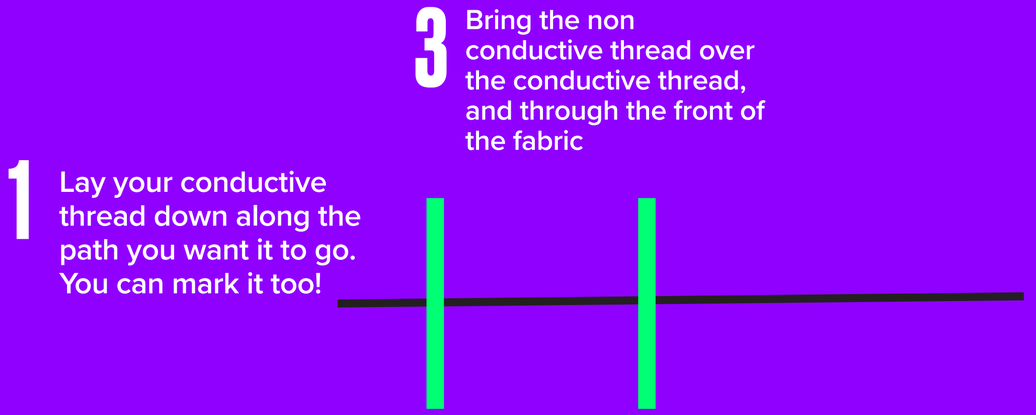
Img via https://erinfrischstudio.com/

1. RUNNING STITCH

Running stitch looks like this, it is a single, conductive thread. Bring the needle up through the back of the fabric, and pass it though the front. Repeat this pattern. Don’t make your stitches too wide, and take your time!

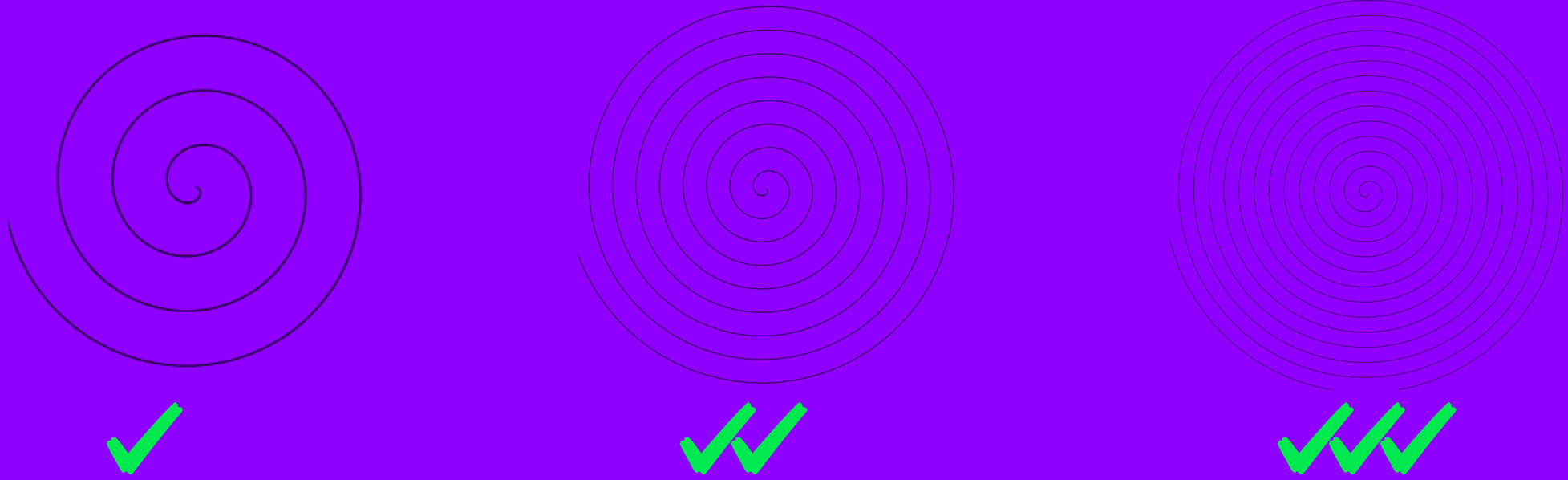
2. COUCH STITCH

Couch stitch looks like this, it uses 2 threads. In our case, the black thread is conductive, and the green one represents a non conductive thread that is holding it down.



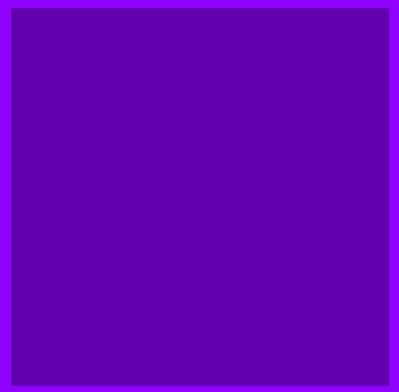
FACTOR 1: NUMBER OF TURNS

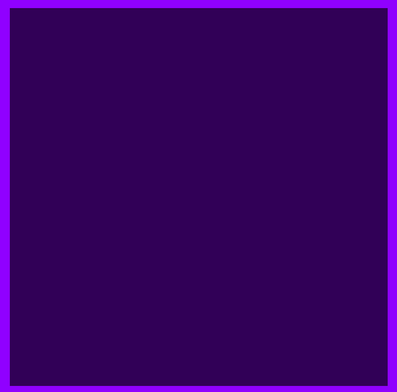
The number of turns will effect the quality of the sound because you're making a stronger magnetic field. The thickness of the trace doesn't matter, but try and get as many turns into the smallest space possible!

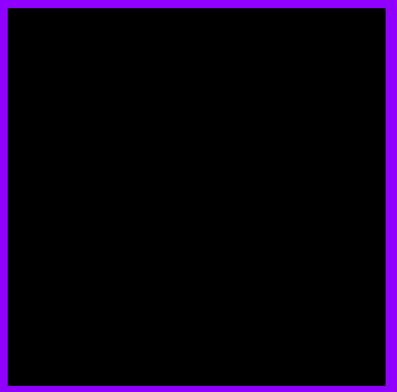


FACTOR 2: BASE MATERIAL

Basically any material will work, but if the fabric is too heavy to vibrate with the coil, the sound will be weaker.

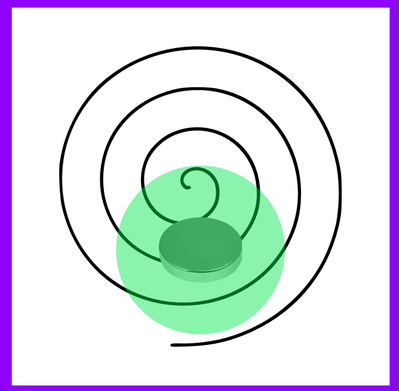


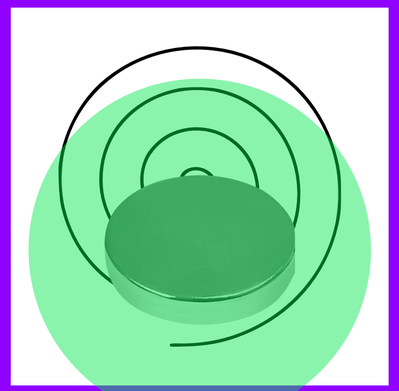




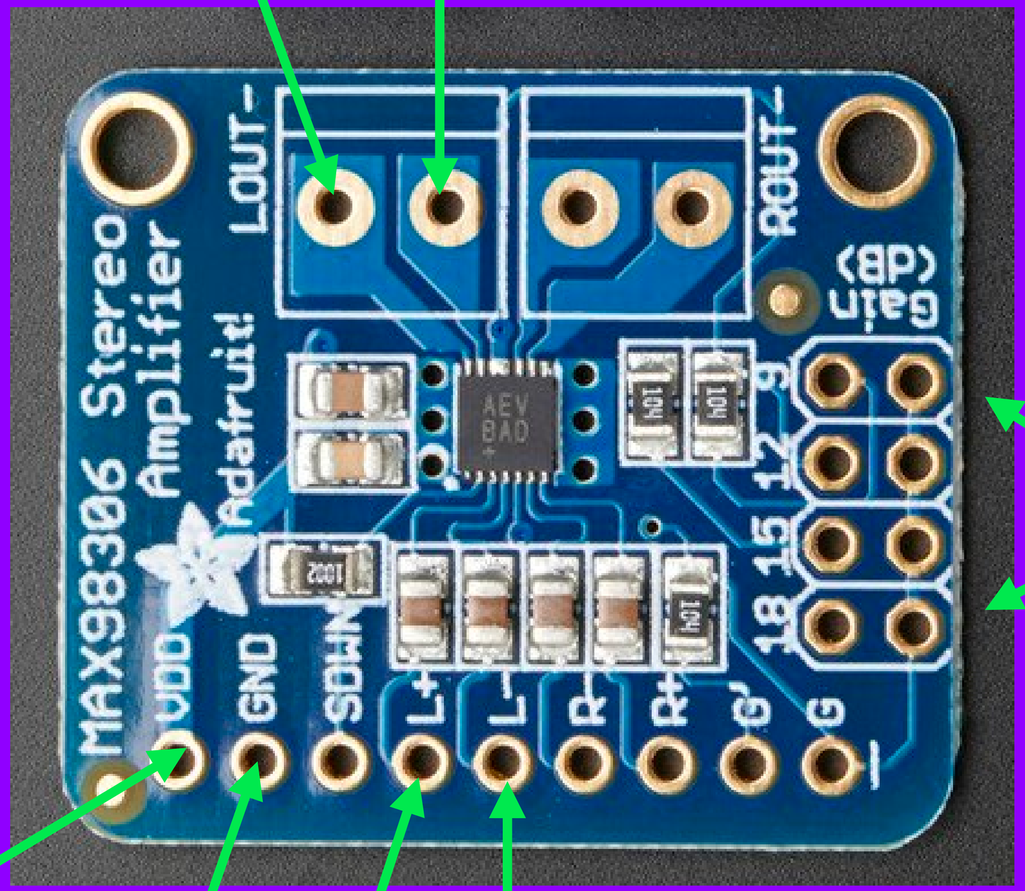
FACTOR 3: MAGNETIC STRENGTH

Make sure the magnetic field of the magnet encompasses as much of the coil as possible to get the best sound. You can stack multiple magnets too!





AMP PINOUT



You can also use the right channel, just make sure you are using the same one, or both.

Solder jumpers here if you want to play with the gain

Red battery cable

Black battery cable

Audio cable +

Audio cable -

CIRCUIT

Always read the board!