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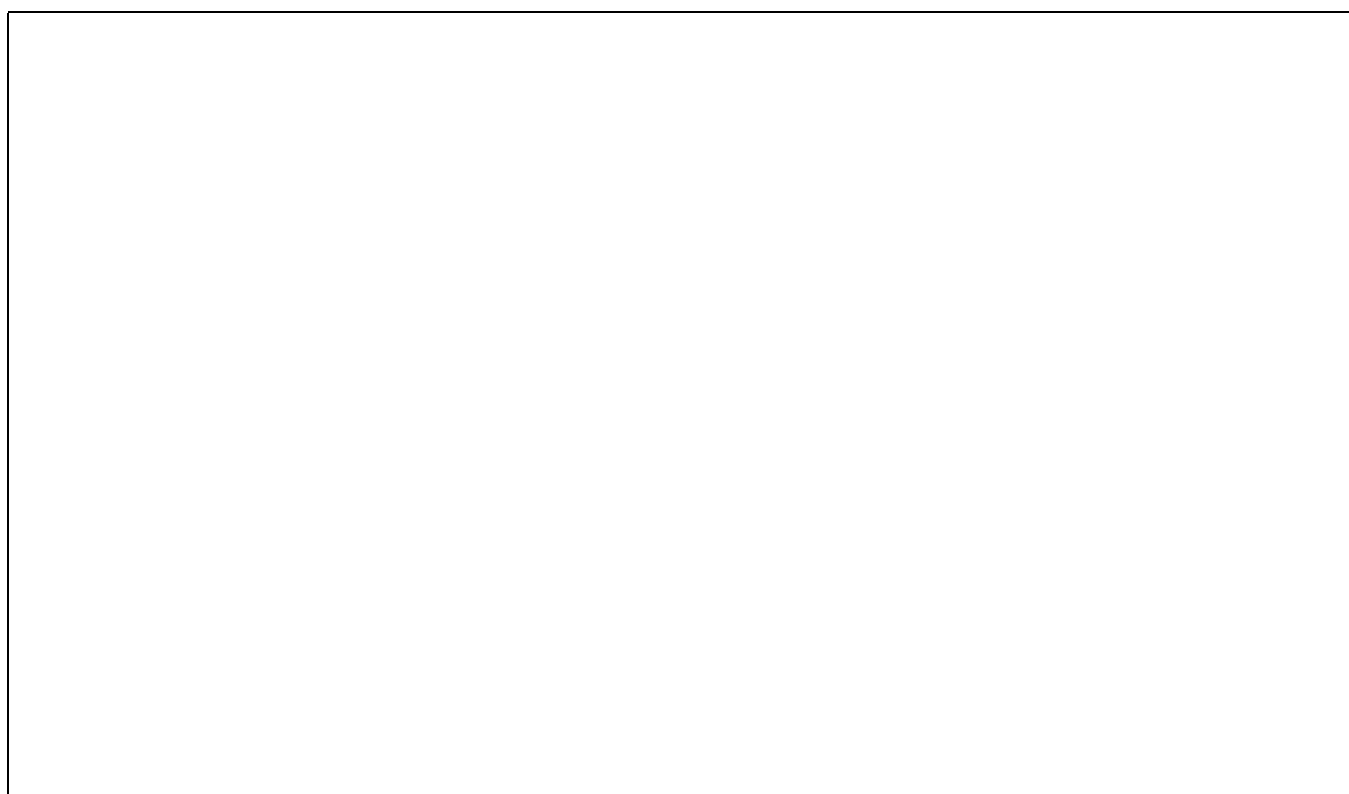
STEAM Project: Tiny Dancers (A Homopolar Motor)

March 10, 2015 by [Ana Dziengel](#) — [21 Comments](#)

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Today we are getting a bit artsy with our science! Does the idea of making a wire sculpture that “dances” entice you.....? **Tiny Dancers** is the third [project](#) in our collaborative series *STEAM POWER: Empowering kids to explore the world through creative projects*. Today's topic is **HARNESS!**





Because harnessing refers to making use of resources to produce energy we decided to try making a homopolar motor. A homopolar motor is probably the simplest DIY motor you can make. You need just a few easy to obtain items and it's FAIRLY simple to construct. Homopolar motors are not useful motors in anything but science experiments but they do demonstrate

some interesting concepts and are fun to watch! They are also a great introduction to electricity and electromagnetism.

This post contains affiliate links to products I love and recommend to my readers, plus it keeps this little blog o'mine afloat! Thank you!

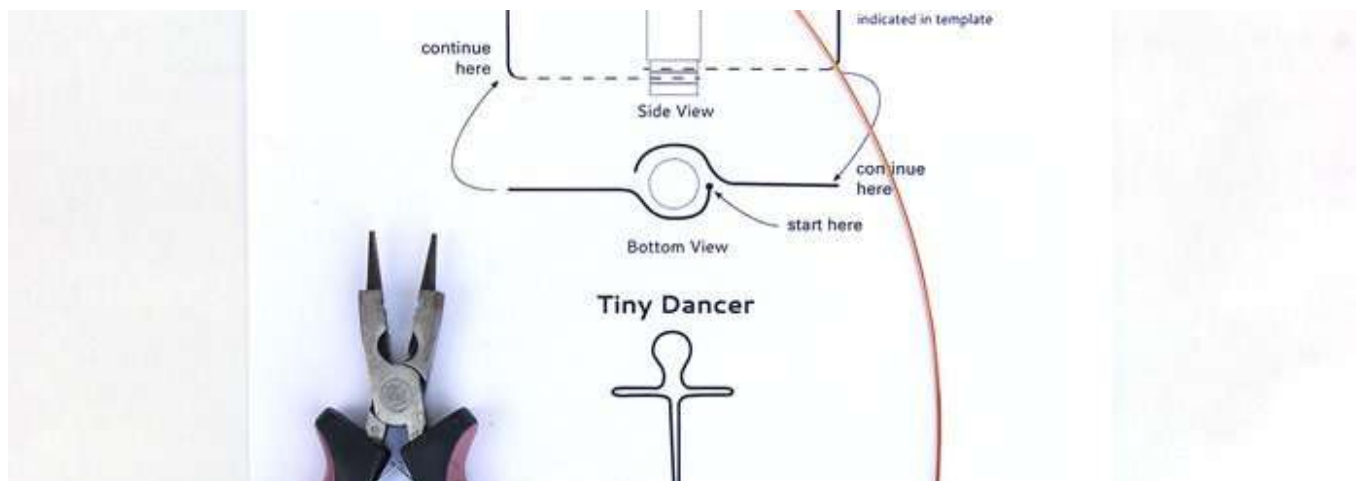
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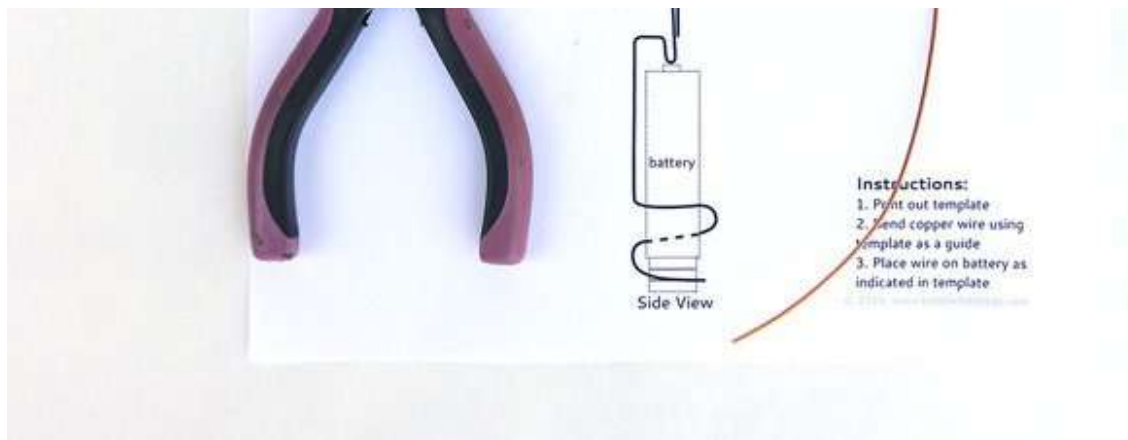
Neodymium magnets are extremely strong and MUST BE KEPT OUT OF REACH OF SMALL CHILDREN! Do not give them to any child who might put them in their mouth, they are dangerous if swallowed and must be surgically removed! This is a project for older children who can understand the precautions and I recommend ADULT SUPERVISION! For more about neodymium magnets safety and precautions go [here](#) Additionally neodymium magnets can interfere with electronic devices so please keep them away from phones!

Tiny Dancers (A Homopolar Motor)

Note: Before we get started I want you to know that despite this looking very easy there is a fair amount of TWEAK TIME you will need to invest to make this project work! I recommend starting with a BASIC HOMOPOLAR MOTOR to get the hang of how the motor actually works, then trying your hand at making a tiny dancer. Each dancer will need to be tweaked to get them to dance properly on a battery. Don't be discouraged if at first it doesn't work, keep tweaking and see our tips sections for some troubleshooting solutions.

Materials





[download our template here](#)

- Copper Wire- THIS is the gauge we used
- Round Neodymium Magnets
- AA Battery
- 3 in 1 Combination Tool or pliers/wire cutters
- Template
- Crepe Paper (optional for skirt)
- Hot Glue (optional)

Instructions

- **Steps One** Cut a long piece of wire off your spool, I started with about a 10" long piece. Lay it on the template of your choice and bend as shown using 3-in 1 tool or pliers. No need to be perfect HOWEVER try and keep your form as symmetrical as possible.
- **Step Two** To create the base section of wire that wraps the magnets, I recommend bending the end of the wire around the battery. Remove the battery and gently widen the circular wire form with your fingers.
- **Step Three** Place three neodymium magnets on the negative side of your battery.
- **Step Four** Place the motor on top of the battery so that it touches the positive pole. **The round section at the bottom of the motor must be low enough to encircle the magnets!**
- **Step Five** Let it go. If properly constructed it should start to spin. If it doesn't see our tip: below.
- **Step Six** (optional) to make a skirt for your dancer cut a small circle of crepe then cut a

slit in the center of the circle. Slide it up onto the dancer and secure in place with a dab of hot glue.





Tips

- Start with your basic homopolar motor. It's easy to bend and shape and you should have [success](#) ✓ with it. The dancers require more time to fine tune.
- **Keep the forms as symmetrical as possible!** Since they spin on an axis if they are not symmetrical and/or balanced they will spin off the battery! This happened to us all the time. If they do spin off try and bend the form slightly to get them balanced on the battery.
- To make the head of the dancer, bend your wire around a pencil.
- Thin wire does not work! We tried this with very thin copper wire at first and it did not work. Stick to heavier gauges. [Here is the gauge we used.](#)
- The templates are meant as GUIDES ONLY! **The motors will need to be fine tuned by hand by you!**
- Remove the magnets immediately after running your motor. They will drain your motor if kept attached.
- These puppies can heat up! Some of the motors that got going really fast heated up quite quickly. Use precautions when touching them and removing the magnets after prolonged turning.
- When the electrical circuit is completed you will hear a very low buzz.

Troubleshooting

- **If the motor does not work try turning your magnets upside down and reversing the polarity.** I found this did the trick most of the time.
- **The batteries burn out quickly!** If turning the magnets upside down doesn't work, try replacing your battery with a new one.
- Make sure that the bottom section of wire encircles the magnets. If it doesn't your motor will not work.
- Be sure your wire is free to move around the battery and magnets. If it's too close to the

battery or magnet it will get stuck and be motionless.

- I read that you can use a nail to put a small indentation in the top of your battery to help keep the motor in place. *I highly recommend AGAINST doing this.* I tried it! One small and light dent worked and the next dent smashed a hole in the battery causing battery acid to spin on my counter! Eek! I decided off balance motors were better than battery acid splashes.





What's happening?

I'm going to keep this as simple as possible because let's face it, electromagnetism is hard to explain! Basically homopolar motors demonstrate something called a **Lorentz Force**. This is a force that is generated when electricity moves through a magnetic field. Our copper wire is conducting electricity from one end of the battery to the other. As it moves through the magnets on the negative side of the battery, it creates a force which causes the wire to spin.

You can read more about the Lorentz force and homopolar motors [here](#) and [here](#).

Looks Like

Hendrik Lorentz. Hendrik Lorentz was a Nobel Prize winning Dutch physicist who inspired Albert Einstein! The Lorentz Force is named after him though he was not the first to discover its existence. In his early years Lorentz was primarily interested in [studying](#) [electromagnetism and light](#). Albert Einstein used Lorentz's paper "[On the Electrodynamics of Moving Bodies](#) " as the basis of his own work and the theory of special relativity. It's super complex stuff but suffice it to say Lorentz 's studies of electromagnetism laid the groundwork for some of the most important scientific discoveries of the last century.

More





Ready for more projects that harness energy in some way ? My fellow bloggers have done a wide variety of projects you have to check out!

Simple Circuit – What Do We Do All Day

Rubber Band Car – All for the Boys

Lego Inspired Electric Dough – Lemon Lime
Adventures

Design Thinking – Meri Cherry

Mason Jar Solar Night Lights – Tinkerlab

Electromagnetic Train – Frugal Fun For Boys

10 Ways to Play & Learn with Springs – Left Brain
Craft Brain





Spread creative ideas like wildfire: Pin this!





tiny dancers

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Filed Under: Popular Posts, Science for Kids

Comments



Dayna says

March 10, 2015 at 7:06 am

Well.... that is pure awesomeness!

Dayna recently posted...[Lego Inspired Electric Play Dough](#) 🍷

[Reply](#)



Ana Dziengel says

March 10, 2015 at 9:32 am

Thanks Mama!

[Reply](#)



Anne says

March 10, 2015 at 8:51 am

Love the combo of adorable dancers and battery power! My daughter just gave the highest compliment: "I want to do that! Now!"

Anne recently posted...[10 Ways to Play and Learn with Springs](#) 🍷

[Reply](#)



Meri cherry says

March 10, 2015 at 10:02 am

You just blew me away.

Meri cherry recently posted...[Design Thinking and Building Empathy for Kids](#) ❤️

[Reply](#)



gina says

March 11, 2015 at 7:01 am

These are adorable, Ana. Just adorable!

gina recently posted...[The Artful Year Book Give Away and Granola Bar Recipe](#) ❤️

[Reply](#)



Rachelle | TinkerLab says

March 11, 2015 at 6:07 pm

I love the simplicity of this (and yet, it seems quite complicated). Brilliant, Ana.

Rachelle | TinkerLab recently posted...[Pi Day 2015 | Pi Day Art Project](#) ❤️

[Reply](#)

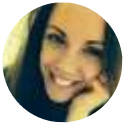


Ana Dziengel says

March 25, 2015 at 6:02 am

Thank you so much Rachelle!

[Reply](#)



Cait Fitz @ My Little Poppies says

March 19, 2015 at 12:25 pm

This is AMAZING. I cannot wait to try this with my STEM-obsessed little dancers. Thank you so much for sharing. The video was incredible, too, by the way! Nicely done!!

Cait Fitz @ My Little Poppies recently posted...[I won't miss the whining](#) 🍷

Reply



Ana Dziengel says

March 25, 2015 at 5:58 am

Thank you so much Cait!

Reply



Mariana says

March 20, 2015 at 5:22 pm

What a great idea!

Reply



Ana Dziengel says

March 25, 2015 at 5:57 am

Thanks Mariana!

[Reply](#)



Leslie says

March 23, 2015 at 11:39 am

These are so cool! 😊 Love how they look like they're dancing!

Leslie recently posted...[Origami Artwork With Kids](#) 💖

[Reply](#)



Ana Dziengel says

March 25, 2015 at 5:55 am

Thanks Leslie!

[Reply](#)



April says

March 25, 2015 at 6:04 am

I see you have a link for the magnets, but do you have any ideas of where I might be

able to find them locally? (Or type of store that might carry them?)

Thanks for the great idea! My kids can't wait to do this activity!

Reply



Ana Dziengel says

March 25, 2015 at 6:13 am

Possibly Radio Shack or an electronics store but they usually stock only ceramic magnets which are not strong enough. Call ahead and see!

Reply



Meghan @ PlaygroundParkbench says
May 31, 2015 at 7:45 am

Planning a ballerina-themed birthday for my oldest this summer... these will make the cutest centerpieces. Do you think they would work with a bigger battery too?

Meghan @ PlaygroundParkbench recently posted...[Invitation to Paint: Cardboard Box Castles](#) ❤️

Reply



Ana Dziengel says
June 5, 2015 at 6:00 am

They are pretty finicky so I'd stick with the small battery. Plus these babies get hot after spinning awhile so take precautions if experimenting with a larger battery 😊

Reply



Jennifer says
June 6, 2015 at 8:37 pm

What guage wire did you use?

Reply



Ana Dziengel says
June 23, 2015 at 4:45 am

16 Gauge. Here's the product we used: <http://amzn.to/1BJcthJ>

Reply



Tracy Hart says

June 10, 2015 at 9:18 pm

The link to buy the magnets is broken. Could you tell me which size I should order off Amazon.

Reply



Ana Dziengel says

June 23, 2015 at 4:40 am

Thanks for letting me know! Here is the link : <http://amzn.to/1CqrBeF>

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MEET ANA

Ana Dziengel is an architect, award winning furniture designer, and the creator of Babble DabbleDo.

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A graphic on a light brown, textured background. The words 'ROCKIN' ART MOMS' are written in a bold, hand-drawn, blocky font. 'ROCKIN'' has radiating lines to its left, and 'MOMS' has radiating lines to its right. Below this, the word 'on' is in a small, italicized script, followed by 'PINTEREST' in a bold, red, blocky font.



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