

Application No. 337: Build a three-phase current generator

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An ineffective but instructional experiment

My project is a very simple three-phase current generator.

(A three-phase current generator is basically a "normal" alternating current generator, in which the coils are arranged in 120° angles.

Materials used:

- 4 disc magnets S-20-10-N (www.supermagnete.de/eng/S-20-10-N)
- 3 relays (and their coils)
- Building material (wood, cable, axes, ...)

The basic idea is to arrange the three coils of the relay staggered at an angle of 120° on a wooden board and mount a pivoted axis in the middle where the magnets can be attached with a connection piece.

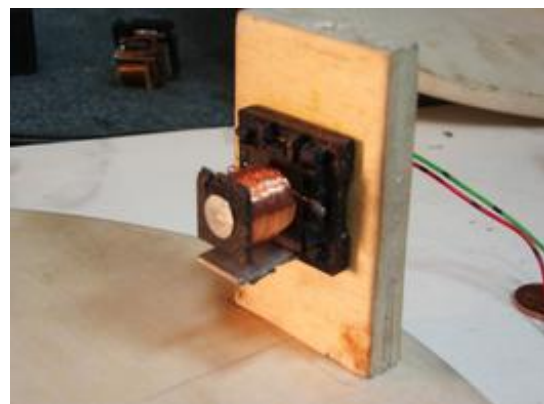
Through a quick circular motion the magnets move past the coils and induce voltage.

Assembly:

To accomplish this, you need to take apart the three relays (picture below), so that in the end you only have 2 contacts and one coil on every relay.

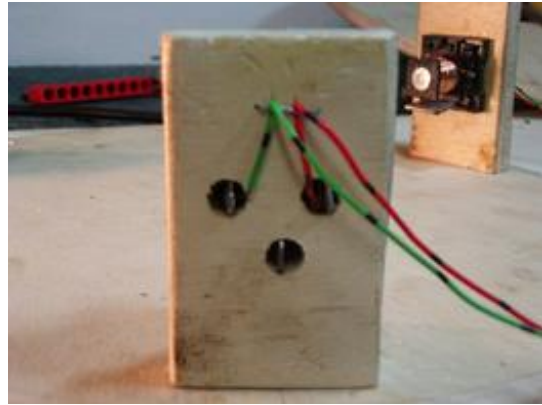


Attach this relay to one of 3 pre-drilled wood pieces, which are equally far away from the centre and positioned at an 120° angle from each other.



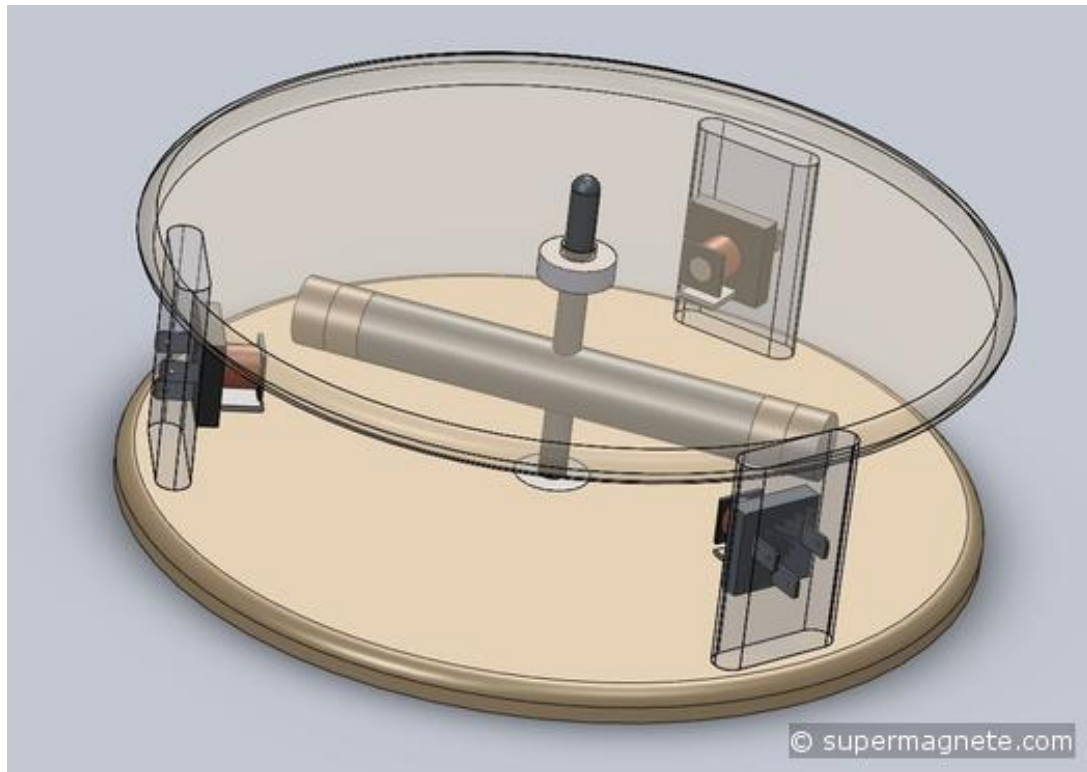
Front view

The wiring is relatively simple, because you only need to separate the contacts correctly and weld them together with 2 different cables or connect them otherwise, and then you bring the red and the green cables together separately.

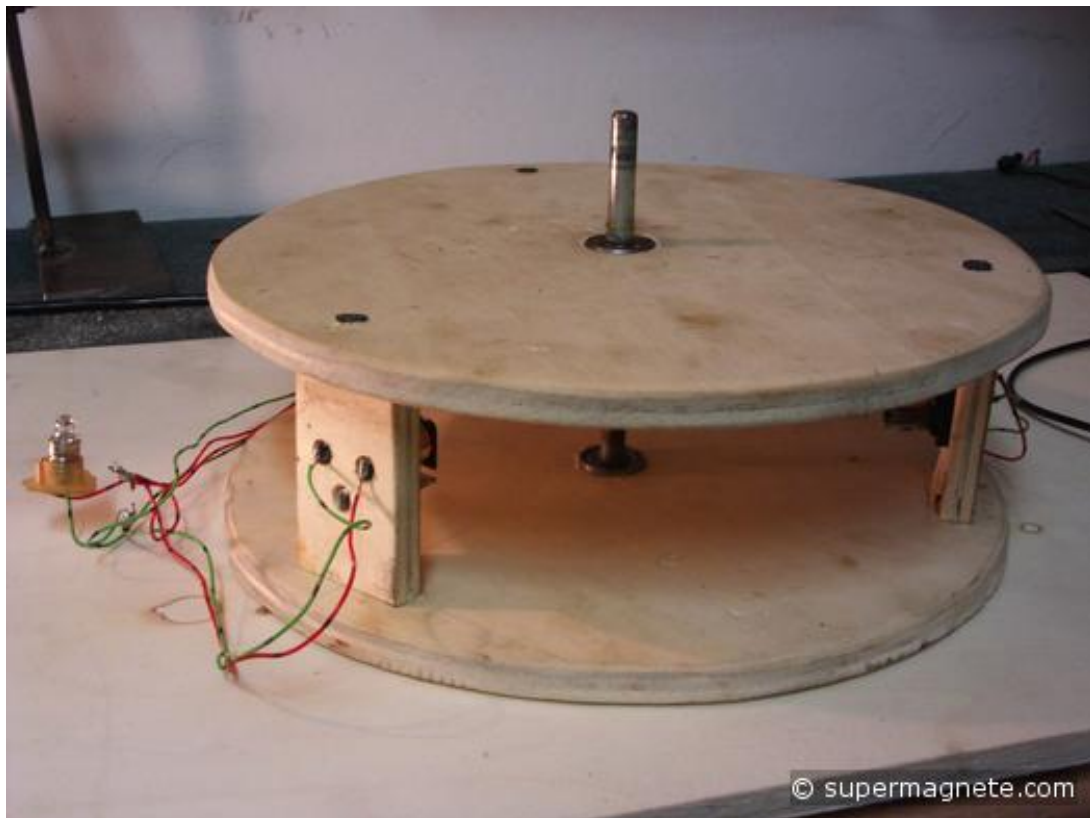
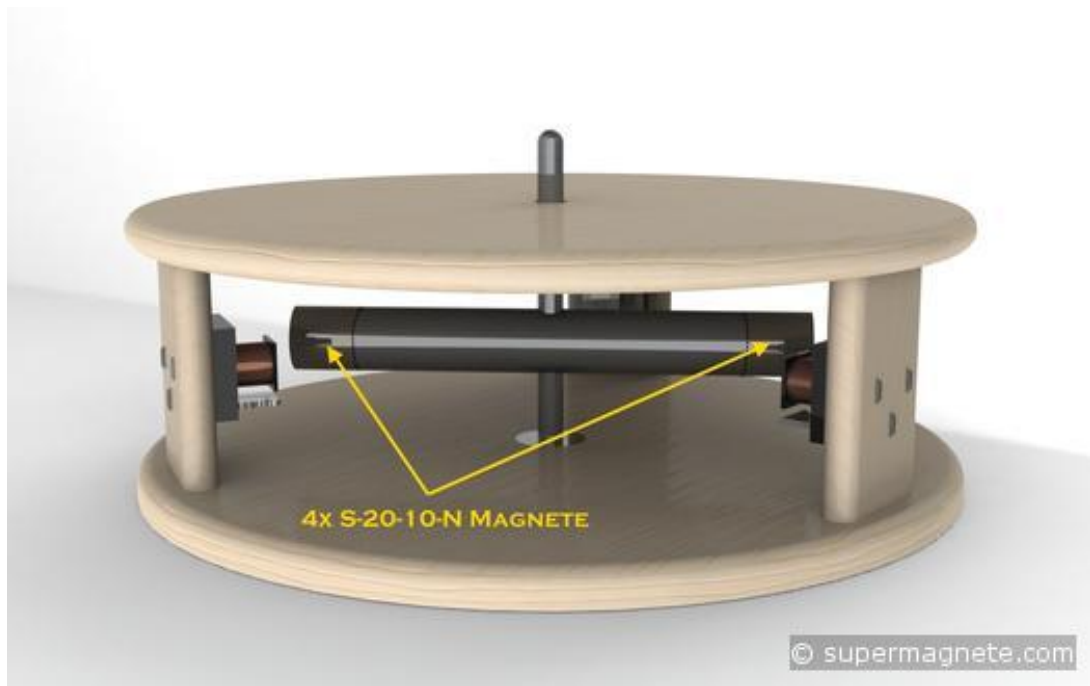


Back view

Now you need to center an axis and a rotor, to which you later attach the magnets. Pretty much anything is suitable for a rotor: wood, plastic, etc. But a metal piece works best, because then the magnets arrange themselves automatically correctly on the opposite side and amplify their magnetic force.

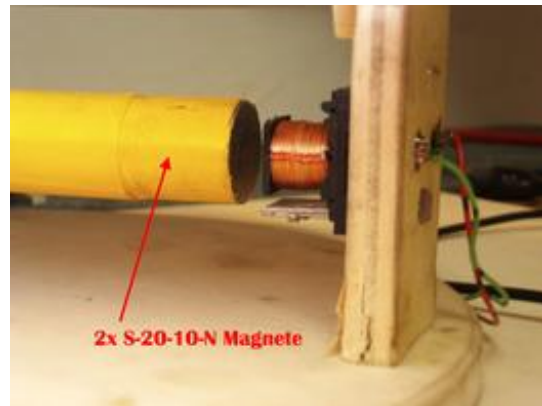


Schematic drawing of the generator



That's what my shell looked like

Finally, attach the disc magnets. Two magnets need to be attached to each side of the rotor. You could also build an axis with 4 strands and attach a magnet to every side. This way the motor would need to rotate only half as fast. At the time I was missing the appropriate parts for that though :-).



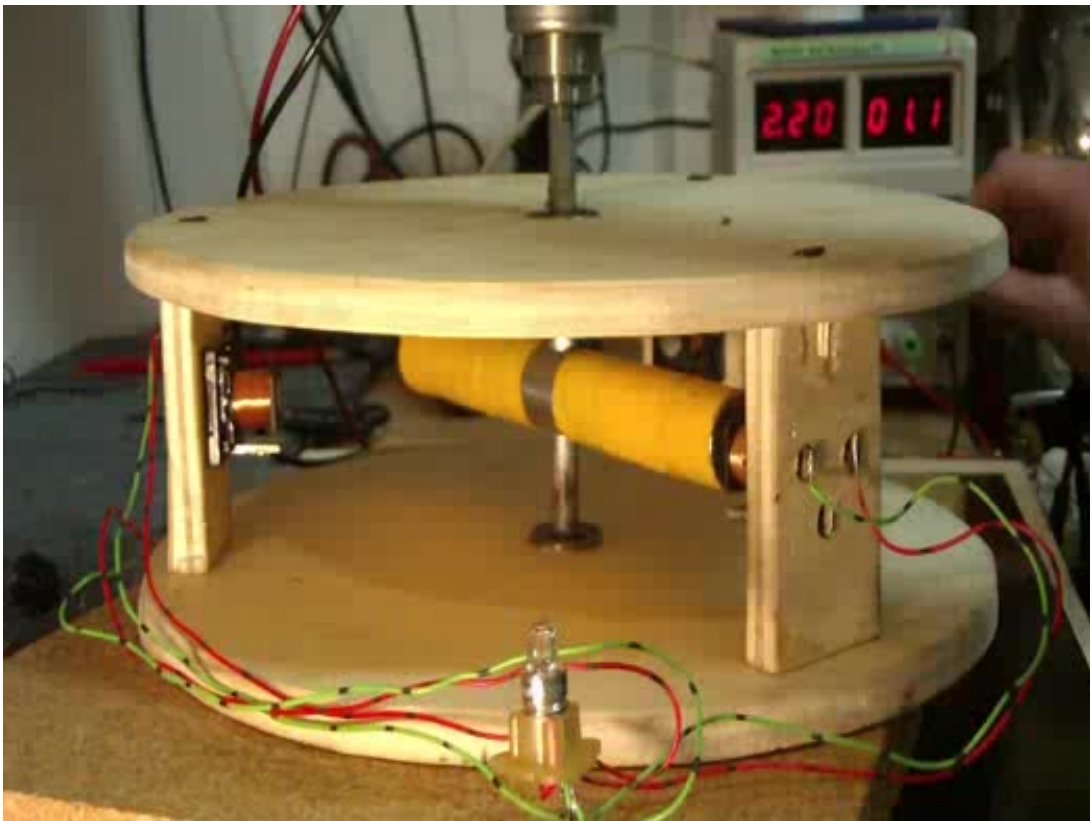
You always have to check the distances, because if the spacing between the magnets and coils is not right, it can lead to an irregular output current (output voltage) and you won't accomplish a single rotation.

Also, you should keep the distance between the coils and the magnets as small as possible to induce a high voltage.

Each coil delivers its own voltage (one phase). Since there are 3 coils that receive a voltage induction at different times, these voltages or phases overlap, so in the end you'll get a more or less constant voltage.

The faster you drive the generator, the less the voltage will pulsate (meaning the frequency, with which the phases of the coils alternate increases so much that it is no longer visible to the naked eye). The user (here the light bulb) doesn't have enough time to glow out before the voltage starts anew.

At a certain speed the naked eye only detects a pulsation or nothing at all.



Video, 9.3 MB

The video shows a simple trial run where I used a gear motor as an engine.

In the background is the power supply unit that delivers the necessary electricity and in front is the user (light bulb). After a few seconds the light bulb starts glowing.

Maybe a few viewers will notice that at 10-11 volt the whole table starts shaking. The reason: At this voltage the generator rotates exactly at the natural frequency of the table.

Of course, the generator is not particularly effective ;-). That should become clear after the video, since the applied energy is about 23 volt and 3 ampere and the electricity that is "generated" doesn't even suffice for a small light bulb (I believe it works already at about 1,5 volt :D)

My three-phase current generator should simply demonstrate the principle.

You can improve the three-phase current generator by using more and stronger magnets and coils, meaning you run it on a grand scale.

Note from the supermagnete team:

- To improve the generator you should reduce its diameter: The rotor should be a little shorter than displayed. Also, the rotor magnets should be even closer to the coils. Then, instead of pulsating, the resulting voltage would show the shape of a regular sinus curve.
- A similar application is the project "Generator repair" (www.supermagnete.de/eng/project245).



Articles used

4 x S-20-10-N (www.supermagnete.de/eng/S-20-10-N)

Online since: 30/03/2010

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