The great motor contest

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In a separate envelope you will find: 2 magnets, 2 drawing pins, 1 block of wood, 2 papers clips and approximately 2 m of insulated (enamelled) copper wire, dry cell size D (regular 1.5 V torch battery).

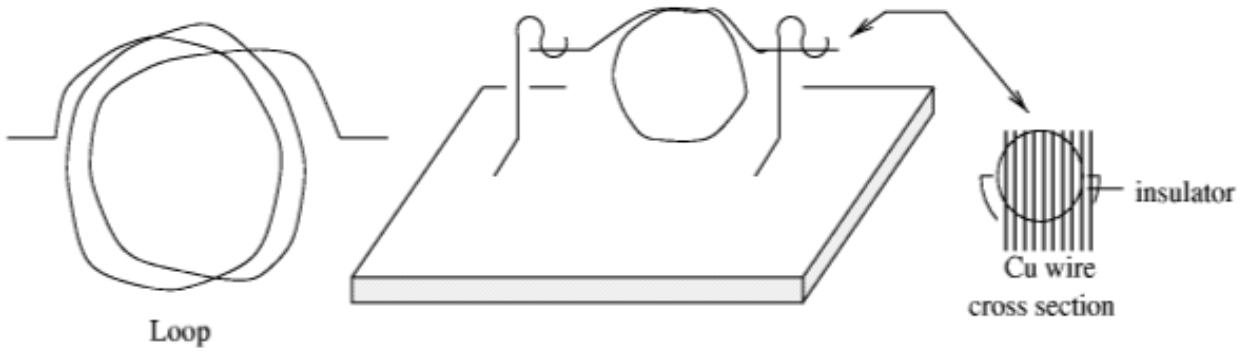
Objective

The goal is to build an electric motor using ONLY the material in the envelope.You may use any tool, you may cut the wood, drill holes, &c., but the motor must be built *only* of the material that is in the envelope (even a small piece of tape, or a drop of glue or solder, if noticed, will disqualify you).

Building a motor can be great fun, and it will also be educational. You must also produce one side of A4 about how your motor works. Feel free to include diagrams and/or photos, and include all the points about the physical theory and engineering challenges...

Contest

The builder of the fastest motor when tested in the first lesson after the Advent weekend will receive a special prize, and there will be a 'runner-up' prize for the best overall entry, including design, operation and explanatory notes. To avoid possible mix-ups, please make sure your name is written in pencil on the motor!



How to build the motor

To build one is not that difficult; to build one that runs faster than 2000 rpm is a different story. Here are some general guidelines:

1. Make a loop of the copper wire with a diameter of about 3 cm. The smaller the diameter, the more turns you can make, but that does not necessarily make the motor go faster!

2. To make the windings of the loop stay together, if necessary, you could clop off a few pieces of wire and twist them around the loop at a few places (you will not cause any short circuits, as the copper wire is insulated).

3. Make a support for the loop. Use the paper clips as brackets; they can be fastened to the wood with the drawing pins. Your battery can then be connected to the paper clips which will feed the current through the loop.

4. The ends of the loop could be freely supported by the paper clips (bend them any way you want to). Thus the loop can rest on the paper clip support brackets.

5. Now comes the hardest bit! The insulation on the two ends of the copper wite must be removed so that the current can flow. This can be done with e.g. a knife (scrape). If you remove the enamel all the way around the wire, the loop will not continue to rotate, as the couple will then reverse every half rotation. A simple solution would be to only remove the enamel on one 'half' of the wire. *You have to think about which half in relation to the plane of the loop and the magnetic field configuration that you choose.*

6. Another solution is to build a commutator which you can look up online. The advantage of a commutator is that the current will flow through the loop all the time (not half the time) which will give you on average a higher couple on the loop. However, to build a commutator in such a way that there is a net gain is not so easy: friction is the killer.

7. Place the two magnets under the loop or choose another magnetic field configuration.

8. Connect the 1.5 V battery to the paper clips, and your motor should run; it may need a small push, but that is allowed!

How to build a super fast motor? Your imagination is the limit, and you may wish to ignore all, or most, of the above advice...

Good luck and have fun!

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