Steps for Making Motor

Norbert Doerry
January 2014

1. Draw two lines on the axle (1/4 inch diameter wood dowel 4 inches long) 1 inch and 2 inches from one end of the axle.

2. Use epoxy to attach the commutators to the axle. The side with the ridge (if it has one) should be at the2 inch mark and the side without the ridge should be away from the 1 inch mark. Make sure the two gaps between the commutators are about the same and not touching.

3. Use epoxy to attach the rotor to the axle. It should be mounted at the 1 inch mark and should be aligned with the gaps between the commutators. (If the two gaps are horizontal, the rotor should be horizontal too) Set the axle aside to let the epoxy cure.

4. Draw a line on the base board parallel to the long edge and in the middle.

5. Mount one of the angle brackets:

    a. Make sure the hole marked in black (it's been drilled out with a 17/64 bit for the shaft to go through) is on the vertical part

    b. The two holes in the horizontal part of the angle bracket should be on the line you drew; the back edge of the angle bracket should be flush against the edge.

    c. Mark the position of the holes

    d. Drill pilot holes for the screws (1/16 bit)

    e. Attach the angle bracket with the flat head screws. (Make sure the hole marked in black is on the vertical part)

6. Glue the brush base on to the board so it is flush with the angle bracket. Use hot melt glue

7. Put a 90 degree bend in the two brushes about 3/8" from the end with the mounting hole.

8. Solder a wire to each brush near the mounting hole (but make sure there is enough room for the head of the mounting screw).

9. Attach the two brushes to the brush base so that the two brushes are a little less than 1/4" apart and aligned with the hole in the mounted angle bracket. Position the brush, and mark the screw location on the brush base. Using a 1/16" drill bit, drill a starter hole about 3/8" deep. Use the small pan-head screws to attach the brushes to the brush base. Use hot melt glue to attach the wire to the brush base.

10. Once the Epoxy on the rotor has cured, wrap each end with electrical tape.

11. Wind about 100 turns of magnet wire (22 AWG) around the rotor (50 turns on each end). Make sure you always wind in the same direction. Leave about 3 or 4 inches extra length at both ends. You can use a little bit of hot melt glue to hold the wires in place. It will probably take about 21 feet of wire.

12. Cut the magnet wire so that it will easily reach the two commutators. With a knife, scrape off the insulation at the end of the magnet wire for about 3/8 of an inch. Solder one wire to one coummutator, then the other wire to the other commutator. Solder the wire as close to the edge of the commutator towards the field winding as you can; the solder joint should not interfere with commutator contact with the brushes.

13. Put the axle into the mounted angle bracket, (be careful with the brushes and the commutator). Support the free end with the other angle bracket and make sure the back edge of the bracket is flush with the end of the board and the two mounting holes are aligned with the line you drew in step 4. Make sure the rotor can turn; then mark where the holes should go for mounting the angle bracket. Drill the pilot holes. and mount the bracket with the rotor in place. The rotor and commutator should now be complete.

Ideally you should be able to remove the rotor with both angle brackets in place by sliding the rotor towards the angle bracket with the brush base, and slipping the rotor out of the other angle bracket. If you can't, the motor should still work, but repairs and adjustments may be more difficult.

14. Put the field bracket in place. Adjust the axle position so that the brushes are on the commutator. Position the field bracket so it is centered on the rotor and the axle is midway between the two upright arms. Ideally the center of the field bracket should be about 3/4" from the angle bracket without the brush base. Use hot melt glue to glue the field bracket into position.

15. Place a magnet at the end of each upright arm of the field bracket. Make sure the "north" side of each magnet is pointing in the same direction. (one end of the rotor should be near a south pole and the other end of the rotor should be near a north pole)

16. Make sure the rotor can turn freely without binding anywhere (the magnets will tend to keep the rotor horizontal). Make sure the brushes are making good contact with the commutator. Make adjustments as needed.

17. Apply DC power to the two wires and give the rotor a quick spin, the motor should start turning on its own.

Build-your-own-motor
Norbert Doerry
January 2014

Base is 3/4” by 3.5” by 6.5” wood
Base for brush is 3/4” by 1” by 3.5” wood
Magnets are ~3/8” round rare-earth magets
The upper hole in each angle bracket was drilled out using a 17/64” bit