EXPERIMENT 6: Simple DC motor

Materials and tools: Approximately 0.5mm diameter enamel insulated copper wire, two paper clips, an AA 1.5V dry cell, a ferrite magnet, sand paper and a pair of scissors

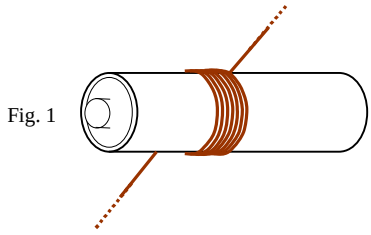

Fig. 1

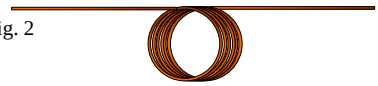

Fig. 2

Fig. 3

Fig. 4a

Method

1. Wind the copper wire around the AA cell 6 to 8 times. Turns depends on the diameter of the wire. The thicker the diameter the fewer the turn.
2. Remove the copper wire from the cell. (Fig.2)
3. Tie the both ends of the wire firmly up around the solenoid part of the wire. (Fig 3, 4a and 4b) It becomes the rotor of a simple DC motor. Make the rotor as symmetrically as possible.
4. Remove the upper insulation from the both ends of the wire with sandpaper or blades of scissors. Do not remove lower insulation. (Fig. 5)
5. Unwind and twist two paper clips like figure 6a and connect them to a cell.

Fig. 4b

6. Hang the rotor on the clips and place them above a ferric magnet.
7. Spin the rotor gently with your finger until the rotor starts rotating.

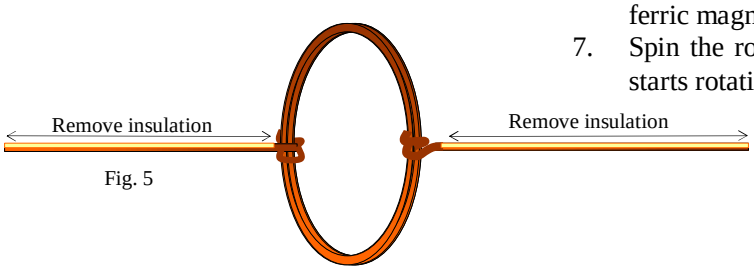

Fig. 5

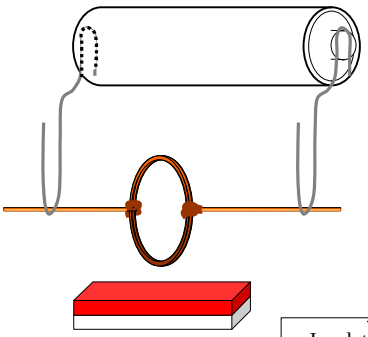

Fig. 6a

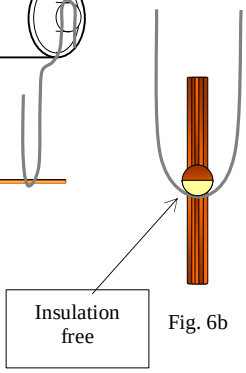

Fig. 6b

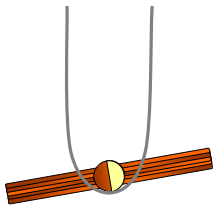

Fig. 6c

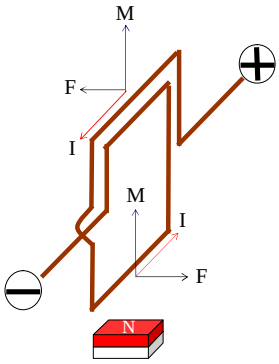

Fig. 7

Note:

While insulation free parts of rotor's axis touch the clips connected to the cell (Fig.6b), direct current comes from the cell to the rotor solenoid. Schematic drawing figure 7 shows the principle of this simple DC motor. The force which is generated between a magnetic field and an electric current is described by the left-hand rule of Fleming. M, I and F represent direction and strength of the magnetic field, the electric current and the force respectively. While direct current flows like figure 7, the upper copper wire receives force which pushes the wire left and the lower wire receives force which pushes the wire right. This is the reason why this motors starts spinning.

After the rotor spins more than 90degrees the insulated parts of the axis touch the clips. (Fig. 6c) Then the force generated by the magnetic field and the electric current disappears. The rotor continues spinning under its own inertia until insulation free parts touch the clips again.