

Following on from the homopolar motor described earlier [1], and inspired by an article by Abdul-Razzaq *et al* in Physics Education magazine [2], we describe an electric motor where the moving conductor is a liquid. The study of the movement of electrically conducting fluids is known as magnetohydrodynamics. Techno-thriller fans may have come across fictional examples of marine propulsion systems using this technology in the novels of Tom Clancy [3] and Clive Cussler [4].

The main parts of the motor are shown in Figure 1. Three Magnadur pole-faced magnets were placed on a piece of board. As the magnets have to be placed side by side with like poles facing upwards, tape had to be used to secure them as the middle magnet would otherwise have flipped over. The inner wall of a polystyrene dish was then lined with foil.

The dish was then placed on top of the magnets. A screw made from a ferromagnetic material was then placed vertically in the centre of the dish, held in place by the magnets below. A saturated or near-saturated salt solution was added to the dish. Connections were then made from two 1.5 V cells in series to the foil and the central screw, as shown in Figure 2.

The solution began to rotate in the dish. Some pepper was sprinkled on the surface to make this easier to see. Reversing the current reversed the flow direction. Bubbles in the solution pointed towards electrolysis taking place. Small amounts of chlorine and hydrogen gas will be produced. Asthmatics will be particularly sensitive to the former.

In the Soup

When this experiment was set up, it prompted us to speculate whether we could stir soup using magnetohydrodynamics. A tin of French Onion soup was duly purchased and its contents emptied into the dish. Sadly, visions of swirling onions were not realised. Only with highly dilute, over-salted soup was any rotary movement seen. Ah well, back to the lang spoon that, apparently, one needs when supping with a Fifer (you'll have had your tea? Ed).

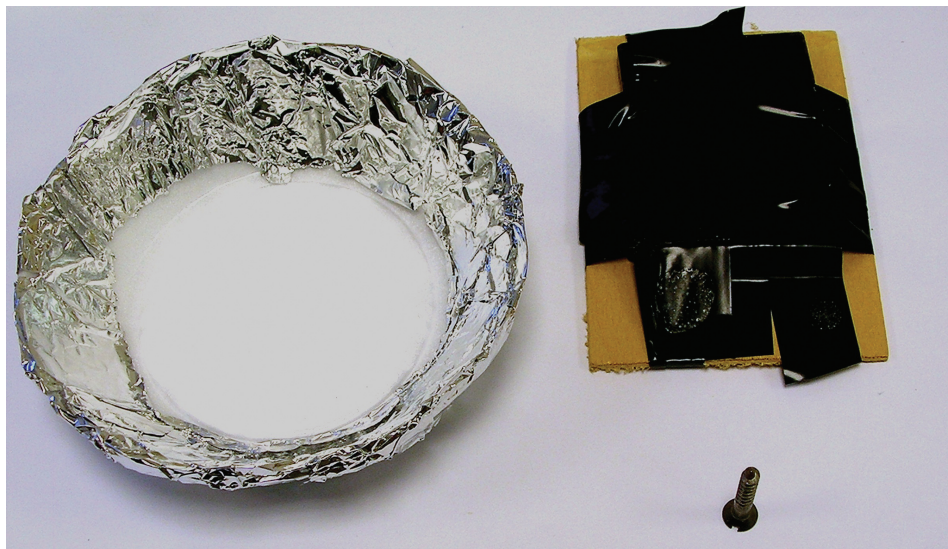


Figure 1 – Parts of a magnetohydrodynamic motor (batteries and leads not shown)

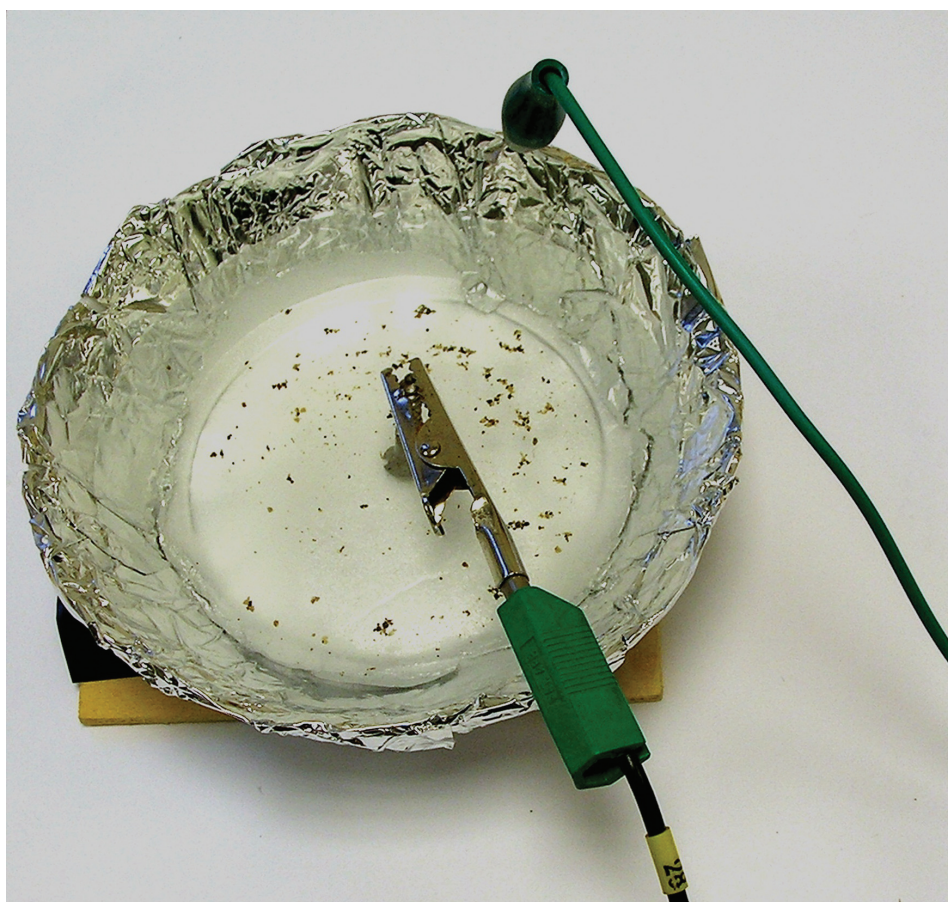


Figure 2– Assembled magnetohydrodynamic motor

References

- [1] Homopolar Motor, SSERC Bulletin 226, http://www.sserc.org.uk/members/SafetyNet/bulls/226/Homopolar_motor.htm
- [2] Physics Education, Creating a d.c. motor using the Lorenz force, Vol. 43, No. 2, p206
- [3] The Hunt for Red October, Tom Clancy (written before he completely lost the right-wing plot)
- [4] Valhalla Rising, Clive Cussler (havers, but enjoyable havers.)