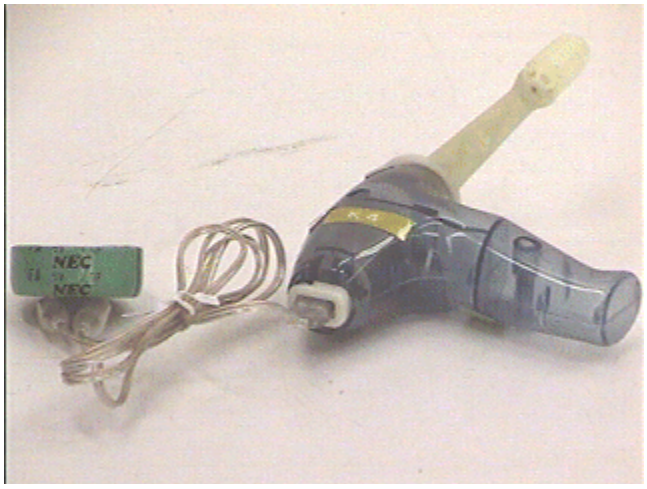
Answer #36

The answer is (a): the Genecon* will move in the same direction as it was cranked to charge the capacitor, as seen in an mpeg video by clicking on the photograph below.



Consider a wire aligned perpendicular to a constant magnetic field moving along a path perpendicular to the magnetic field lines: a current will be generated in the wire flowing in the direction determined by the **v x B** force on the free electrons in the wire. A current in the opposite direction through the wire would experience a force in the direction the original wire was moving.

The capacitor is charged as the Genecon generates current due to a coil moving in a magnetic field. When the cranking stops, the capacitor discharges by a current in the opposite direction to the current that charged it. This current interacts with the magnetic field of the genecon to create a force on the coils in the same direction as the original cranking motion.

A participator in the Question of the Week has made the following excellent comments on this demonstration:

When you first start charging the capacitor, you have to push to crank the Genecon, but it gets easier as the capacitor charges up if you maintain constant speed. The voltage of the capacitor opposes the voltage of the generator, so when the capacitor is fully charged, if you assume that the system is frictionless, no current is flowing and it requires no force to turn the crank. It would simply coast. Generalizing Lenz's law to explain this result, we can view this system as a mechanical system that opposes change. In the absence of friction and assuming small currents to limit heating effects, this is a conservative system. All of the energy from cranking the generator goes into the capacitor. After the capacitor is charged it will continue with the same motion when the handle is released.

*"Genecon" is a trademarked product distributed by Nakamura Scientific Company, Limited.

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For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.