

Detecting the Hard Drive in an iPod

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My wonderful wife presented me with an iPod as a holiday gift. While I was initially excited about the ability to have 10,000 musical selections at my fingertips, it wasn't long before my physics-warped mind began to wonder about how it works. A quick search of the manufacturer's website¹ answered my question: "iPod plays music out of a solid-state memory cache to provide skip-free playback and maximize battery life. iPod spins its hard drive to fill this cache." It is hard to believe that a 20-G hard drive can be placed in a package that is 4.1 x 2.4 x 0.57 in and still have room for a display and batteries. The simple experiment below detects angular momentum inside the iPod presumably created by the spin of the hard drive.



The cradle is made from two long strings that cross underneath the iPod and hang from a ring stand. The iPod is then set to play and you wait. Every 10 to 25 minutes, the iPod refills its solid-state memory by firing up the hard drive. The resulting change in angular momentum causes the cradle to rotate in the opposite direction by the law of conservation of angular momentum.

Many of us learned about angular momentum from an ancient music player called a phonograph. It is delightful that students today can still discover angular momentum in their modern music machines.

Reference

1. <http://www.apple.com/batteries/ipods.html>.