Perpetual Top

P3-3503

BACKGROUND:

Spin this top once, and it will run for....

But how does it work? Interesting question since rotational energy can't just come out of nowhere. You will need to look deep inside the Perpetual Top to find the secret of its seemingly endless rotational energy.

EXAMINING THE INNER WORKINGS

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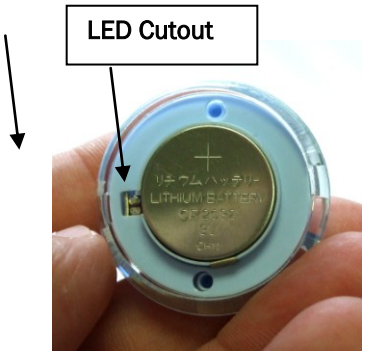
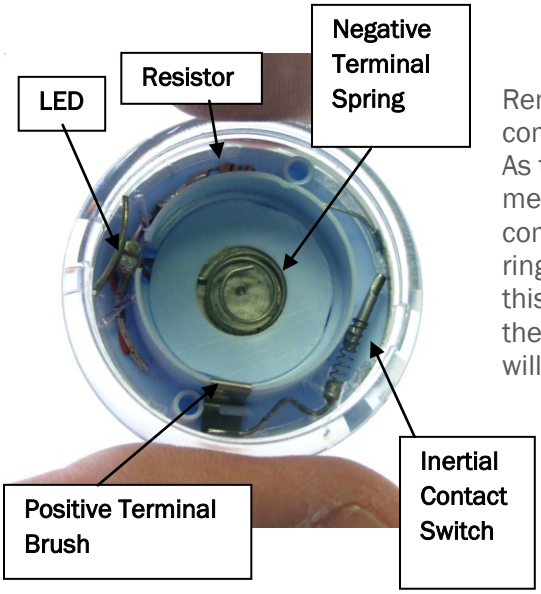


When you first open the package, you'll find the batteries that are included. By removing the top cover of the Perpetual Top to install the batteries you'll start to reveal its secret.

Inside the battery compartment you'll see a cutout in the plastic ring around batteries. This allows light from the alternating Red-Green-Blue LED to be reflected through the clear plastic rim of the Top's casing.

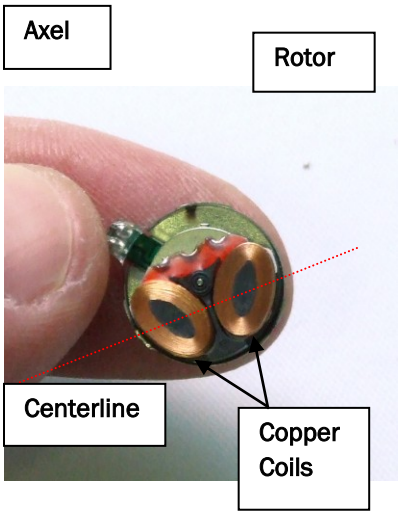
This is interesting in itself when you realize the micro technology used in the very tiny circuit within the LED that produces the light pattern seen as the Top spins. You can see variations of the 3 primary and secondary color combinations. Due to the effects of persistence of vision, you can see the colors blend and patterns change from a single tiny LED.



Remove the plastic ring surrounding the battery compartment, and the basic electrical circuit can be seen. As the Top is given its initial spin by the user, the small metal bar at the end of the spring moves outward and comes in contact with the metal plate located on the outer ring of the Top, completing the electrical circuit. You can see this action simply by tapping the Top with your finger (once the batteries are installed). When the circuit is complete you will see the LED flash.

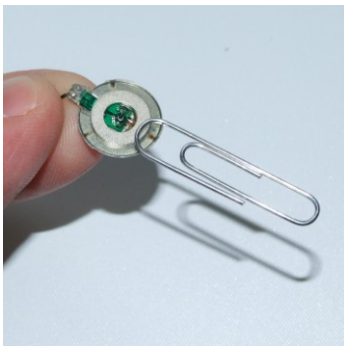
NOTE: Do not proceed with the next steps if you intend to use your Perpetual Top. It will permanently damage your top. The following steps are for exploring how the rotational energy is generated and perpetuated.

By removing the bottom of the top casing and the casings plastic plate, the secret to the Top's energy is exposed. Attached to the bottom of the casing is a small flat disk about the size of a dime. The disk has two connections: one positive and the other negative.



Removing the top of the disk casing reveals the components of a very small motor. Looking closely through a magnifying glass, you'll see that placed on a tiny axel is a rotor that has two copper coils. The coils are located to weight one side of the rotor.

Lifting off the rotor assembly reveals the small contact brushes, axel and ring magnet of the motor.



HOW IT WORKS:

The initial spin forces the inertial spring switch to close, completing the circuit from the battery to the motor and the LED. Because the rotor is weighted on one side, it creates a rotational wobble as it spins. In addition, the motor is providing torque to the Top in the opposite direction of its rotation (Newton's 1st Law). This wobbling rotational impulse is much like a child swinging their legs on a swing set. This gives the Top its impetus to spin in its original direction. Because of the gyroscopic effect of the spinning, you'll see the Top's rotation smooth out while the speed of rotation increase. Because the Top does not have a bi-direction motor, you'll also notice that it only works in one direction; clockwise. The same input that allows it to perpetual spin to the right also prevents it from spinning much at all to the left or counter-clockwise.

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