Turntable Display

Category: Physics: Force & Motion, Electricity

Type: Make & Take

Rough Parts List:

1	Baseboard
2	Small craft sticks
2	Wood sticks
2	Small wood blocks
1	Binder clip
1	Paperclip
1	Battery
2	Electrical wires
1	Motor
1	CD
1	Dowel
1	Brass fastener
1	Wood piece, round
	Foil
	Decorations for display
	Electrical Tape

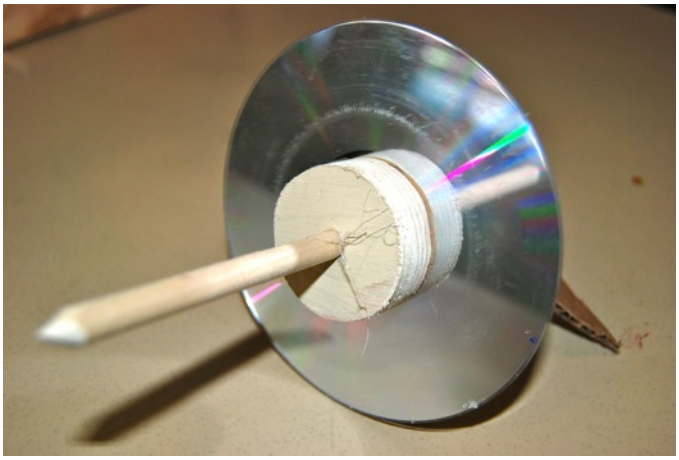
Tools:

Pencil sharpener
Drill
Hot glue gun

Video: http://youtu.be/aTJBXjqdI9c

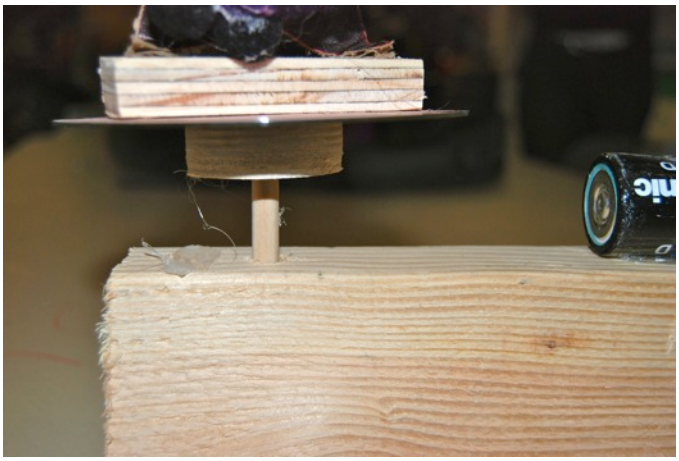
How To:

Glue a small craft stick onto the bottom of the baseboard so it can stand without falling. Glue a battery onto the top edge.

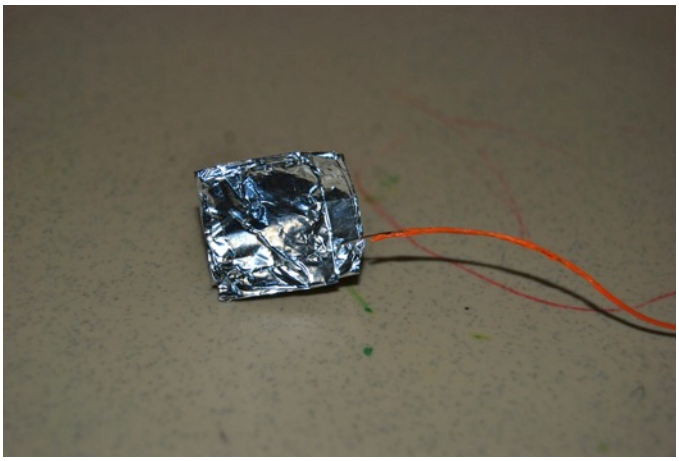


Drill a hole through the center of the round wood piece. Push the piece through the dowel and glue a CD on top. Use a pencil sharpener to sharpen one end of the dowel.

Place a wood block on top of the CD.
Decorate the display.



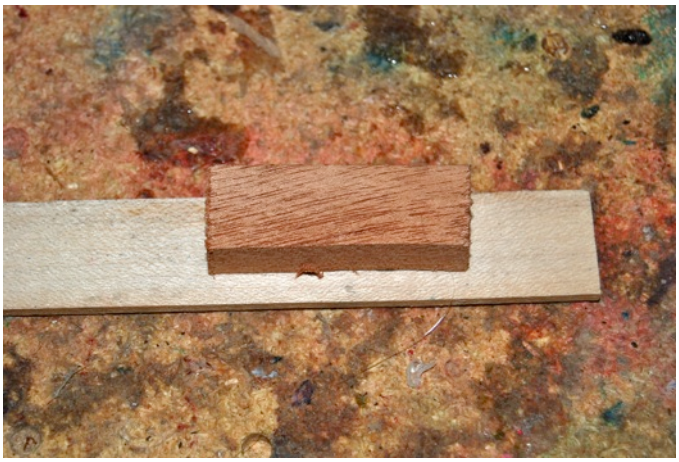
Drill a hole into the top of the baseboard. Stand the sharpened dowel end in the hole.



Strip the ends of the electrical wires. Wrap one end of one wire in foil.

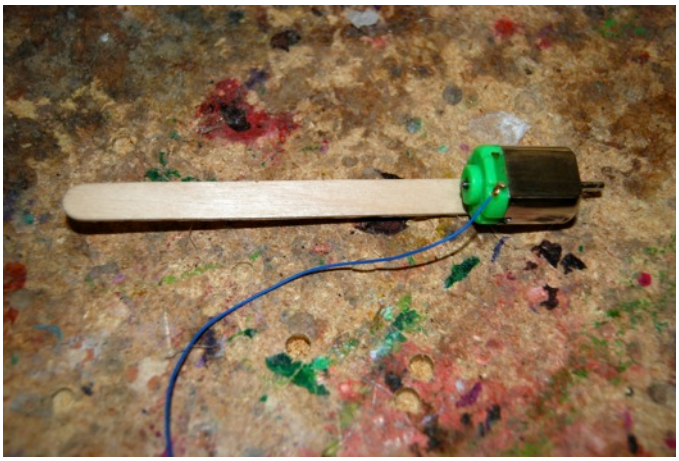
Use electrical tape to connect a brass fastener to one end of a battery and the foil-wrapped electrical wire to the other end.

Glue the end of a wood stick onto
the top edge of the baseboard below the CD.

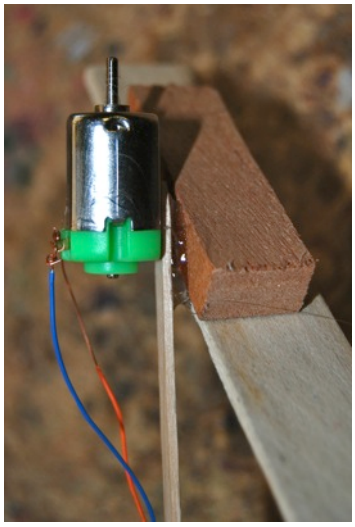


Glue a small block of wood
onto a second wood stick.

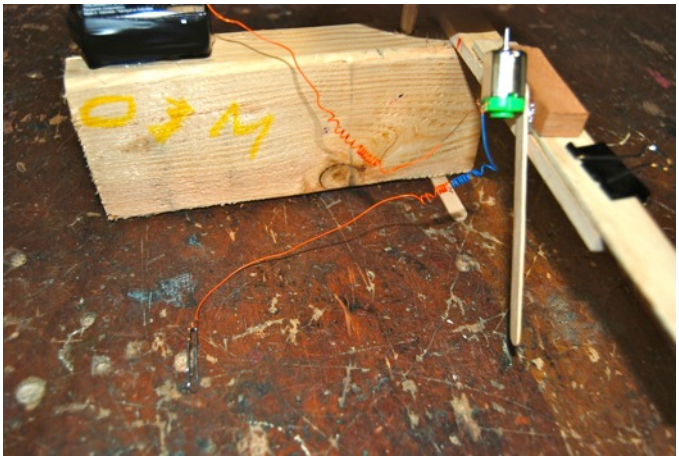
Use a binder clip to attach the second wood stick onto the stick that is glued to the baseboard.



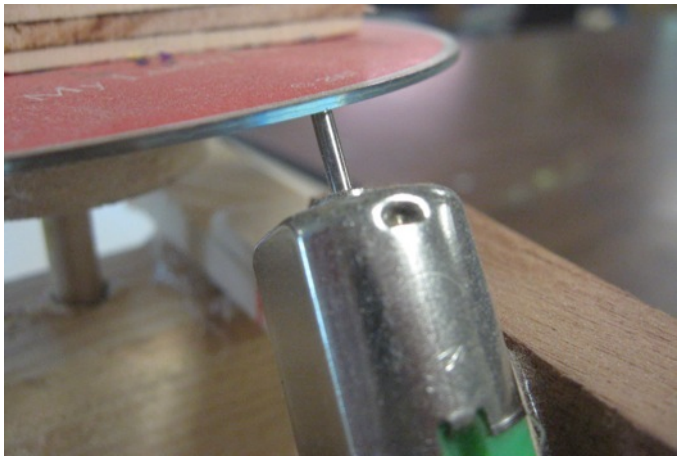
Glue a motor onto the edge of a small craft or popsicle stick.



Glue the craft stick onto the side of the small wood block on the second wood stick.



Complete the circuit by connecting electrical wires between the motor and battery.



Slide the second wood stick back and forth until the tip of the motor meets the bottom of the CD. When the motor spins, it should also spin the CD.

Fine Points:

→ The 'display' should be centered on the CD.
→ Too much weight on the display will make it difficult to turn.

Concepts Involved:

- The wheel & axle can be used as a tool to multiply the force you apply, or to multiply the distance travelled. In this project, the motor acts as an axle and the CD as a wheel.
- Angular motion
- Center of gravity
- Energy
- Newton's Laws of Motion:
  - *An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force.*
  - *Acceleration is produced when a force acts on a mass. The greater the mass of the object being accelerated the greater the amount of force needed to accelerate the object.*

Focus Questions:

1. How can you make the display spin faster? Slower?
2. Can you reverse the spinning direction of the display?

Elaboration:

The closer to the center the motor is placed, the faster the display will spin; the further from the center the motor is placed, the slower the display will spin.

Once the CD display is spinning rapidly in one direction, you may turn off the motor and watch it spin. Isaac Newton said things in motion tend to stay in motion, until acted on by an outside force. This is true for things traveling in a straight line and also spinning things. The outside forces on this turntable display are the same as those affecting a top: air friction and friction with the tip on the wood block. Both of these are pretty small, so it may be able to go a long time if it is well balanced.

Links to k-12 CA Content Standards:

Grades k-8 Standard Set Investigation and Experimentation
Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other strands, students should develop their own questions and perform investigations.

Grade 2 Standard Set 1. Physical Sciences:
The motion of objects can be observed and measured.
1.c Students know the way to change how something is moving is by giving it a push or a pull. The size of the change is related to the strength, or the amount of force, of the push or pull.

Grade 3 Standard Set 1. Physical Sciences (Energy & Matter)
1.c Students know machines and living things convert stored energy to motion and heat.

Grade 8 Standard Set 2. Forces:

Unbalanced forces cause changes in velocity.
2.a Students know a force has both direction and magnitude.
2.c Students know when the forces on an object are balanced, the motion of the object does not change.
2.e Students know that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).