

# Saturday High School Teacher Workshop

## Make and Take Ring Flinger Apparatus

You will be building a fascinating piece of instructional apparatus today that is known by many names – *The Ring Flinger*, *Jumping Ring*, *Elihu Thompson Coil* and several others. The design of our apparatus was inspired from a design by Karl Trappe of The University of Texas at Austin. Several of the steps have been done for you already, but you have lots of work to do so don't waste time!

Materials provided:

Coil form and endcaps (white PVC tube with gray PVC discs already glued)  
~250' 14g insulated magnet wire  
~7.5 lbs. (1-1/2 box) RG-45 welding rod 3' in length  
8" square plywood base  
electrical box and switch  
wire nut  
power cord  
5 screws (3 #6 x 1" drywall, 2 # 5 x 1/2" wood)  
Al ring, Al split ring

You can start by either winding your coil or cutting your welding rods.

### **Cut Welding Rods**

Jigs are already made to help facilitate this step. Lay a rod on top of the jig so one end is at the stop and snip the rod at the free end of the board. This cuts the rod in half – you need both halves.

### **Wind Coil**

Thread end of wire through one of the mounting holes on the base (gray PVC) of the coil form. Carefully wind the wire, starting from the bottom, allowing the remainder of the wire spool to spin against your feet. This tension helps keep the coil tight. Do not allow the tension off the wire, the coil will uncoil and you'll have to start again!

If you need a break during this, use a piece of duct tape to hold the wire in place.

You will wind about 114 turns from bottom to top. When you reach the top, continue winding by turning the form in the same direction, but move the wire from top to bottom. You need 4 layers of wire! Winding should take about one hour or so. When

finished, thread the last end of the wire through another mounting hole in the bottom to keep tension on the coil.

Finish the coil by wrapping with one layer of clear packing tape to prevent the coils from unwinding.

You should now have your coil wound and your core pieces cut.

## Mounting the Coil

Small differences in core position can make large differences in jumping height. You are provided with a stop to assist you in determining the best position for optimum jumping height. Insert the stop, large diameter upwards into the bottom of the coil form. Later, you will adjust this for the best performance. You may have to raise or lower this stop. Perhaps your apparatus will perform just fine without any adjustment.

Now that the stop is inserted, place the form on the plywood square and secure with 3 large screws. You may want to predrill holes for this. You have to mount an electrical box, so make sure you leave room for that.

## Mounting the Box

It's your device, place the electrical box on the plywood where you wish and secure with 2 small screws. Punch out the 2 wire knockouts. Feed both ends of the magnet wire into one of the holes.

## Electrical Connections

Scrape the ends of the magnet wire to remove the insulation using a razor blade. Be careful, razor blades are sharp and you could severely or fatally injure yourself or others in your vicinity. That was my legal disclaimer.

Connect one end of the magnet wire to a terminal on the switch (not the green one!) by wrapping around the screw and tightening the screw, or by inserting into the round hole on the bottom of the switch. Insert the power cord into the other knockout and connect the **black** wire to the other terminal screw of the switch using the same technique (again, don't use the green screw).

Hold the end of the magnet wire next to the end of the white wire. Carefully thread the yellow wire nut onto these wires. Give a gently tug on the wire nut and wires to make sure everything is securely connected. If a wire comes free, repeat this step. When everything is secure, wrap the nut and wires with electrical tape.

Carefully pack the wires into the electrical box and secure the switch to the box with the supplied screws. Attach the cover plate.

## **Core**

Don't plug in your device yet. At best you'll blow a fuse. More likely you will damage your coil. Check the resistance with a multimeter. The resistance should be about 0.7  $\Omega$ . What would happen if you plugged this into the 110 VAC outlet?

Start stuffing your rods into the PVC form. Try to keep the rods aligned so the crisscross is minimal. The final 10 or 20 rods must be inserted individually; pack them tightly.

## **Congrats!**

You're now finished! Place a ring on, plug it in and turn it on. Make sure you're not under a light, and don't leave the coil energized. Turn off the switch when the ring jumps.

Plugged into a variac, you can levitate the ring by reducing the line voltage to something much smaller. Make rings out of other metals and observe the repulsion characteristics which are indicative of the metal resistance. Make a ring out of plastic. Will your students understand why this does not work? How about wrapping a few turns of wire around the core and connect the ends to a small light bulb?