Physics 201 Lab 7
Spinning Disks

Mar 4, 2013

Equipment

- Pasco speakers
- Smart pulleys
- Bubble levels
- Vernier calipers
- Thread
- Scissors
- 12" rulers
- Rotational apparatus
- Hanging weight sets

Initial Trial

For this exercise, we will be using a rotational apparatus. Make sure the platter is level. Using the rotating platter alone, apply a torque to it by wrapping string around one of the center spools, then running the string over the smart pulley and hanging weights (50 grams or less) from the loose end.
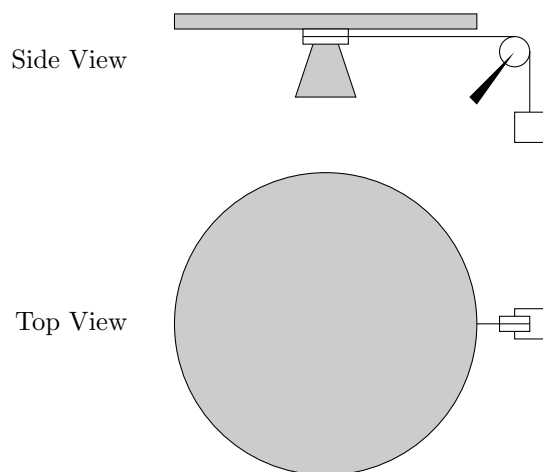

Figure 1: Rotational apparatus with initial set-up

Measure the tangential acceleration using the computer interface. Use this tangential acceleration and the radius of the spool to calculate the angular acceleration of the system.

Calculate the torque that is applied to the disk by the force of the hanging weights: $\tau = F\ell$, where the lever arm (ℓ) is the radius of the spool around which the string was wound.

Using the angular acceleration and the torque calculated above, determine the moment of inertia of the platter using Newton's second law for rotational motion.

Second Trial

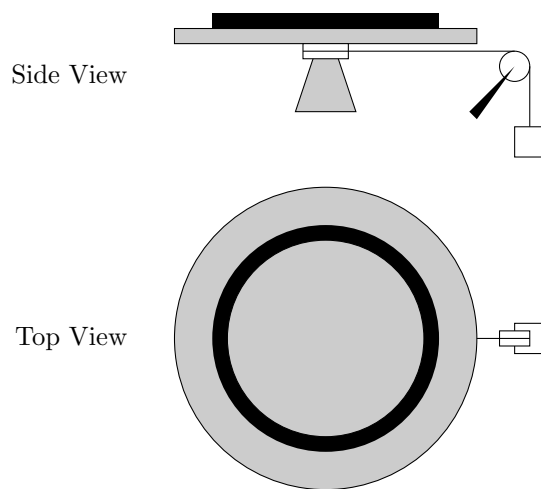Now, remove the metal ring from the box and add it to the apparatus.

Figure 2: Rotational apparatus with additional mass ring

Using the appropriate formula for an object of this shape calculate the moment of inertia of the ring. Recognizing the fact that moments of inertia are additive calculate the total moment of inertia that would result from adding the ring to your system.

Using Newton's second law for rotational motion, calculate the angular acceleration that should result from adding the ring to your system. Convert this into a tangential acceleration that can be measured with the smart pulley.

Now measure the resulting acceleration, and compare it to the value that you just calculated.