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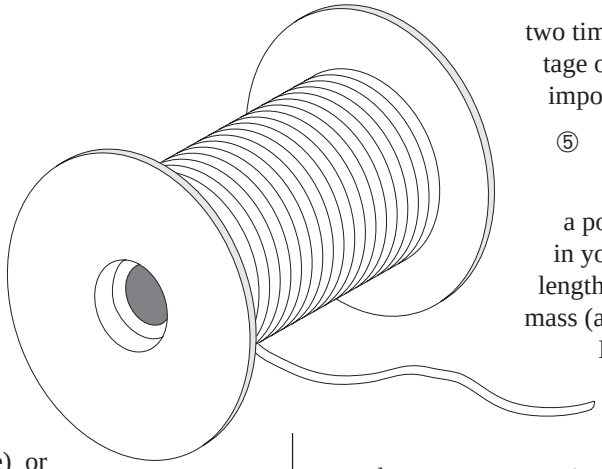
Instruction Sheet for the PASCO Model SE-9409

ELASTIC CORD

Introduction

Elastic or "Bungie" cord is a most useful item in the physics class. Just a few of the experiments and demonstrations for which you can use it are described below.



Additional Equipment Recommended:

- Wave Driver, WA-9753 or SF-9324
- Sonic Ranger, ME-9346 (Apple) or ME-9381A (IBM)
- Mass and Hangers, ME-9348

Setup Procedure

① **Horizontal waves, mechanically driven**.

Secure both ends of a length of cord and use a mechanical driver, (PASCO Model WA-9753 for example) to drive the cord. As one varies the frequency, the cord will produce excellent wave patterns at the various multiples of wavelengths. Change the tension and examine its effects on the frequencies.

② **Horizontal waves, driven by hand**.

Secure one end of the cord and set up standing waves. You will want low frequency waves for this, so use a long length of cord and relatively low tension. You can produce standing waves, or just give the cord a sharp pulse and watch the pulse travel down the cord and reflect back.

③ **Vertical waves** may be performed in the same way as horizontal waves.

√ **A very long spring**.

Use the cord instead of a spring for large demonstrations. Hang a mass, let it drop, and observe the period of oscillation. Use a sonic ranging system (the PASCO Sonic Ranger for example) to measure displacement as a function of time. The Bungie cord will stretch about two times its length and has the advantage over springs that it is almost impossible to over stretch.

⑤ **A safe Bungie cord jumper**.

Bungie cord jumping has become a popular sport. You can simulate it in your class room by attaching a length of the cord to the ceiling and a mass (about 250 g is good) to the end. Keep the length of the Bungie cord to about 1/3 of the height of the room. If the motion can be kept primarily in the vertical plane, one can monitor the results with a Sonic Ranger.

≈ **Energy conversion**.

Hang a mass from the cord, then pull the mass down and release. The amplitude of each oscillation will be less than the previous. By monitoring the decreases in amplitude, the amount of energy lost per oscillation can be calculated. The total energy of a particle in simple harmonic motion is proportional to the square of the amplitude of motion.

Δ **Spring constant**.

One can confirm Hooke's law, the description of the relationship between the force applied to a spring and its stretched length ($F_{net} = -kx$). Measure the unstretched length of a piece of Bungie cord. Hang a known mass from the end of the cord and measure the cord's stretched length. Determine the spring constant: "k" = F/x (F = mg = force applied by the known mass; x = the difference between the stretched and unstretched length). Vary the amount of applied mass and measure the corresponding amount of stretch. Plot applied force versus amount of stretch.

➤ **NOTE**: To make the Bungie cord even more visible, dye it with RIT fluorescent dye or use a fluorescent "High Lite" type pen.

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