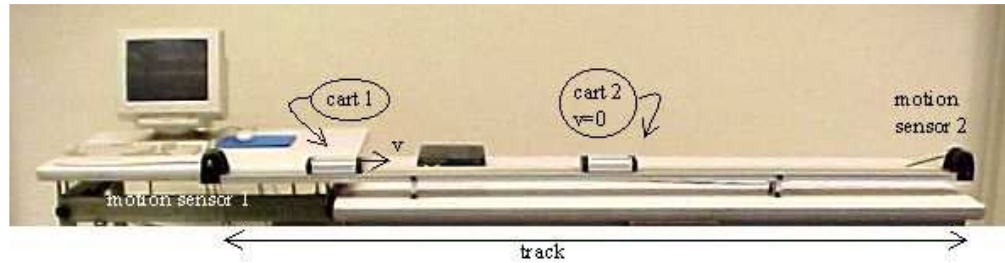# Kinetic energy in an elastic collision

Aim: To show conservation of mechanical energy in an elastic collision.

Subjects: 1M40 (Conservation of Energy)

Diagram:

Equipment:
- Track (2.2m, PASCO ME-9452), levelled.
- Two carts (PASCO ME-9454) with magnetic repelling bumpers.
- Two motion sensors (PASCO CI-6742).
- Data-acquisition system and computer with software (we use 'Scientific Workshop').
- Beamer to project the monitorscreen.

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Presentation: Set up the equipment as shown in Diagram. Set up Scientific Workshop so that it shows four graphs: velocity of cart 1, kinetic energy of cart 1, kinetic energy of cart 2, sum of both kinetic energies (see Figure1).
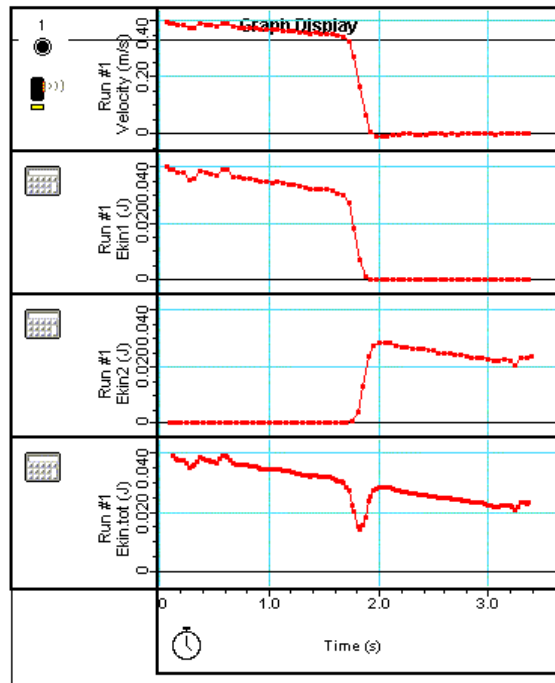

Figure 1

First show the elastic collision without using the data-acquisition system. Let the students observe that the velocities of cart 1 before the collision and of cart two after the collision are the same: conservation of kinetic energy. Do the demonstration again, but now collect data. On the screen the mentioned graphs appear. The results can be discussed.
Observing the graph of Ekin1 and Ekin2 shows at first sight conservation of kinetic energy in this demonstration. But the graph of Ekin1+Ekin2 shows a remarkable dip: observe that kinetic energy disappears and comes back again. Ask the students if there is a temporarily violation of the law of conservation of mechanical energy.

Explanation: During the collision potential energy is stored in the magnetic field of the bumpers.

Remarks:
- The magnetic bumpers can be replaced by mounting a spring on one of the carts, but this makes the demonstration easier to understand by the students. Not seeing the elastic bumper, they have to reason that there must be somewhere a potential storage.
- The downward slope of the Ekin-graphs shows that some energy is dissipated (friction).

Sources:
- Mansfield, M and O'Sullivan, C., Understanding physics, pag. 91
- PASCO scientific, Instruction Manual and Experiment Guide, pag. CI-6569

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