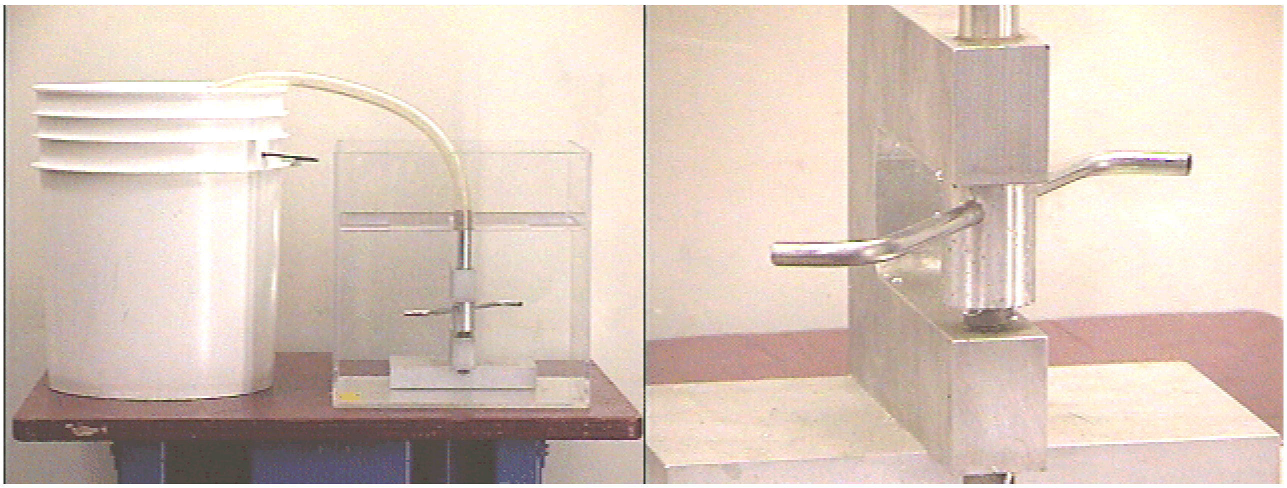
Question #61

This week we shall pose one of the most discussed and perhaps most controversial questions in recent physics: the Feynman inverse sprinkler problem. A seminal, but not original, statement of the problem for the physics community was given by Richard Feynman in his book "Surely You're Joking, Mr. Feynman."

A type of "sprinkler" is shown in the pictures below.



This device has very low friction, so that [if it is started in motion in air]() it will continue to rotate for a relatively long time without slowing down.

In the pictures above the sprinkler head is placed into a tank of water and connected by a plastic hose to a water reservoir. When the water reservoir is raised or lowered, the system functions as a siphon, and water flows through the sprinkler nozzles either into or out of the tank in which the sprinkler is resting.

If the water reservoir is raised, water flows out of the nozzles, producing a "rocket" type effect on the sprinkler head, so the head rotates in the "normal" direction. This can be seen in an mpeg video by clicking on the photograph at the right above. Note that the sprinkler head rotates counterclockwise as viewed from above after starting relatively quickly and rapidly building up to its maximum rotational speed. When the water flow is stopped (you hear a slight click) motion of the sprinkler head slowly ceases, due to the viscosity of the water bath.

The question this week involves what will happen when the water flow is reversed by holding the water reservoir *below* the sprinkler tank, so the sprinkler is "pulling" the water into its nozzles. This is called the "inverse sprinkler." The rotational direction opposite to that of the "normal" sprinkler (clockwise) will be called the inverse direction.

When water is sucked into the sprinkler nozzles, creating water flow opposite to that of the normal sprinkler, the sprinkler will:

- (a) rotate in the normal direction (counterclockwise).
- (b) rotate in the inverse direction (clockwise).
- (c) remain still, and not rotate at all.

Click here for Answer #61 after April 23, 2001.

Question of the Week

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For questions and comments regarding the *Question of the Week* contact
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given on the Lecture-Demonstration Home Page.