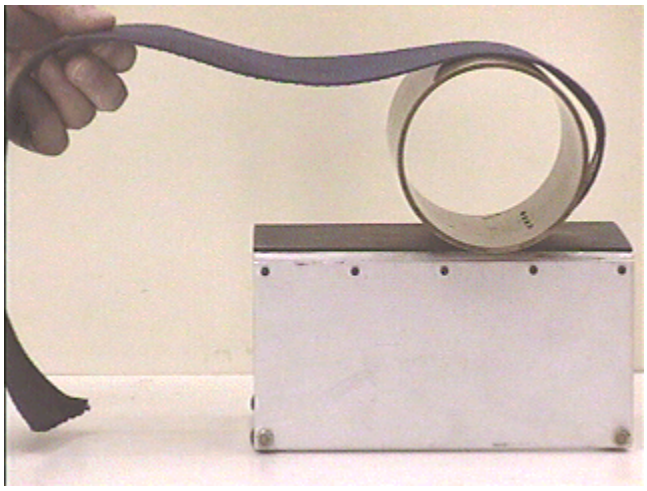
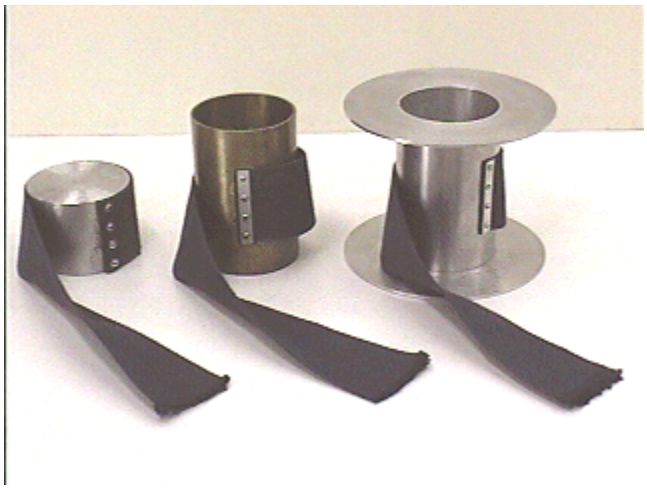
Answer #52

The answer is (c): the base remains at rest. For a thin cylindrical shell (zero thickness) there is NO reaction force on the base when the cylindrical shell is yanked off the base, as seen in an mpeg video by clicking your mouse on the photograph below.



Well, almost no reaction force: the base moves very slightly to the right because the cylindrical shell is not quite really "thin." Other possible choices to be accelerated in the same way are shown in the photograph below.



For example, a section of a cylinder has a very clear reaction force to the right. On the other hand, a spool rolling on its small radius has a very clear reaction force to the left. The moment of inertia of the cylinder is less than mr**2 and it produces a reaction force to the right. The moment of inertia of the spool is greater than mr**2 and it produces a reaction force to the left. For a geometry where the moment of inertia is exactly mr**2 the reaction force is exactly zero, and the base remains at rest. The cylindrical shell shown in the photograph approximates this case.

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For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.