Simple Friction Experiments

ANNA HAJDUSIANEK
Institute of Physics, Wrocław University of Technology

Abstract

In this article several experiments with friction are presented. They are easy to carry out and can be done with commonly available materials. Most of the described experiments kids can do it themselves under adult supervision.

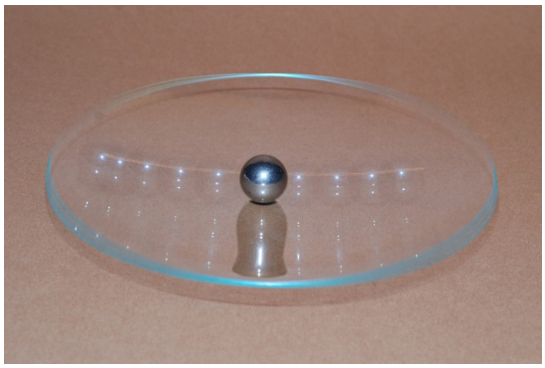
Introduction

The first scholar who has studied the phenomenon of friction was Leonardo da Vinci. He observed that the friction depends on the type of contacting bodies and that the friction increases proportionally to the body weight. Another scholar who has studied the friction was Guillaume Amontos. He noted that the friction is caused by rough surfaces.

Friction occurs widely in nature. With no friction people would have a problem with walking, driving a car and etc.

Experiments

The simplest experiment showing the existence of friction and its properties was first described by Galileo. He put the small ball inside a spherical surface and watched its move. The ball once set in one place does not already returned to this same height.

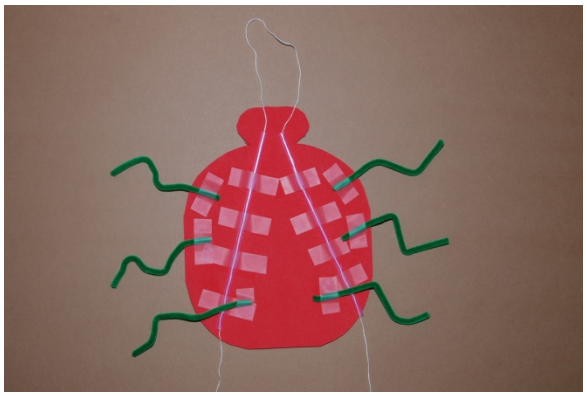


Similar phenomena can be made by observing the oscillating mathematical pendulum. The pendulum is swung from the position of equilibrium and it does not return to the same position. Galileo also observed the movement of hanging candle holder in the Cathedral of Pisa and noted that the amplitude of the oscillations decreases with time [2,3].

Another simple experiment that shows the effect of the friction is rubbing the hands. By rubbing our hands we are doing work against friction and warm up our hands.

Next simple experiment is a connection of two notebooks (see Fig.). Papers are connected only by the arrangement of alternating sheets. Separation of notebooks is not that easy, it requires using of excessive force.


Young children also like playing with a carton ladybug. They cut out the shape of ladybugs or other animal. They stick straws diagonally on the reverse of the cardboard. Then they put the thread through the straws (as shown in the Fig.) and fasten it high. They lead the other end of the thread, respectively. Ladybug will be moved up.

Another simple experiment illustrating the friction is inserting a pencil into a bottle. Bottle should be light and filled with rice. Put a pencil into a bottle and try to pull out the pencil. The bottle will pick up also.

An important toy for future engineers is ball bearing construction. Experiment shows that the presence of large friction, particularly in mechanics, is not always desirable. Put ping-pongs or metal balls between two plates or lids (see fig), we can see how the ball bearing works. Children can try to move lids without the balls and with balls can see when it is easier one. Pouring balls with the oil can show how important is the role of the grease in the bearings.

Ball bearings were already known in ancient times. However, in the Middle Ages it was almost forgotten. Leonardo da Vinci used them as a part of the machinery constructed by him. Ball bearings were widely used after the construction of the P.M. Fisher automatic grinding the balls. Philip Vaughan was a Welsh inventor and ironmaster who patented the first design of a ball bearing in 1794 [1]. To the present day ball bearings are widely used in engineering.

Very spectacular experiment is cutting a bottle (or a pencil) by paper. Children think that this is not possible and after this experience they are very surprised. This experiment must be done by an adult or under his care. It can be dangerous to a small child. To complete the experience you need a drill and a paper disc. Rotating discs can cut a plastic bottle or some type of soft wood.

The experiments described in this article have been presented to children attending the Academy for Young Explorers and aroused their interest [4].

Photo was made by Ireneusz Hajdusianek.

Literatura

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