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| Research Article

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Naimenshee znachenie sily, necessary for movement of the object horizontally or inclined plane

Garzhovov Adkham Nortojievich

Student 1 course of the department of physical education of Termez State University

Chorshanbieva Nigina Abdullaevna

Prepodavatel kafedry obshchey physics Termezskogo gosudarstvennogo universiteta

Abstract: Today, one of the main goals is to educate the younger generation to be more educated and intelligent. In order to increase the interest of schoolchildren in physics and their activity in solving problems, more convenient and new methods of solving problems are being developed. This article explains that in order to move a body along a horizontal line on an inclined plane, the direction of the resultant force must be horizontal, and the body always moves in the direction of the resultant. The projections of the forces acting on the body onto the x and y axes are considered.

Key words: Inclined plane, horizontal line, resultant force, plane motion, friction force.

The Introduction

Frictional force is a resistance force that occurs when two surfaces interact with each other and when they move or try to move relative to each other, this force is caused by molecular interactions between the surfaces. Friction is divided into the following types: Friction at rest, sliding friction, rolling friction.

Friction at rest is the force that prevents surfaces from starting to move relative to each other. This force increases until the object starts to move and reaches its maximum value.

$$F_{ish}=\mu \cdot N$$

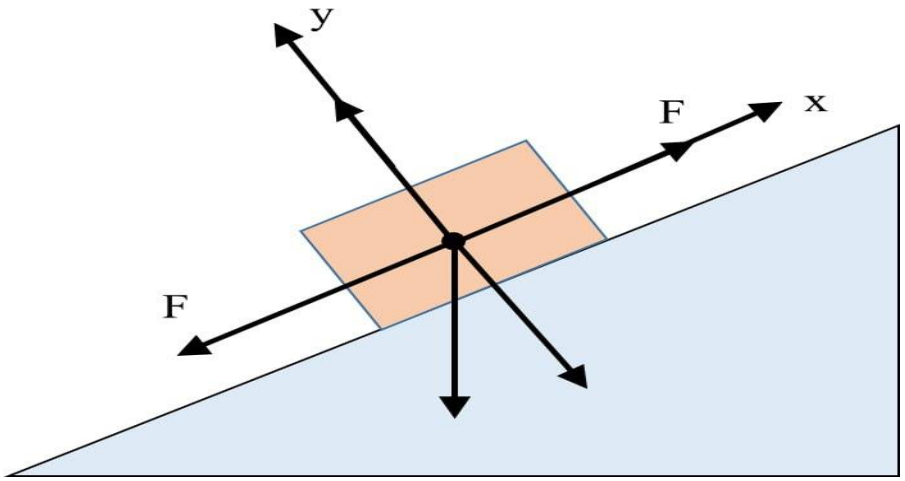
Here: μ is the coefficient of friction at rest.

N is the reaction force (usually a projection of gravity).

Sliding friction force is the resistance acting on surfaces as they move. This force is constant and smaller than the frictional force at rest.

Rolling friction is a force of resistance between a rolling object and a surface, which slows down the movement of the rolling object. Rolling friction is much smaller than sliding friction, so rolling mechanisms (wheels, bearings) are widely used in engineering.

Example: Find the smallest value of force required to move an object along a horizontal line on an inclined plane forming an angle α with the horizon? **(μ>tgα)**



$\frac{F_x}{F} = \cos\alpha$ $\qquad F_x = F * \cos\alpha$ **(1)**

$\frac{F_y}{F} = \sin\alpha$ $\qquad F_y = F * \sin\alpha$ **(2)**

Now we record the projections of the forces acting on the body on the x and y axes. to find the minimum value of the force, we assume that the acceleration of the body is zero.

x: $F*\cos\beta - F_i = 0$ $\qquad F_i = \mu mg\cos\alpha$ **(3)**

y: $F*\sin\beta - P_x = 0$ $\qquad P_x = mg\sin\alpha$ **(4)**

$$F_n = \sqrt{{F_x}^2 + {F_y}^2} = F$$

$$\begin{cases} F * \cos\beta = F_i \\ F * \sin\beta = P_x \end{cases} + \begin{cases} F^2 * \cos^2\beta = F_i^2 \\ F^2 * \sin^2\beta = P_x^2 \end{cases}$$

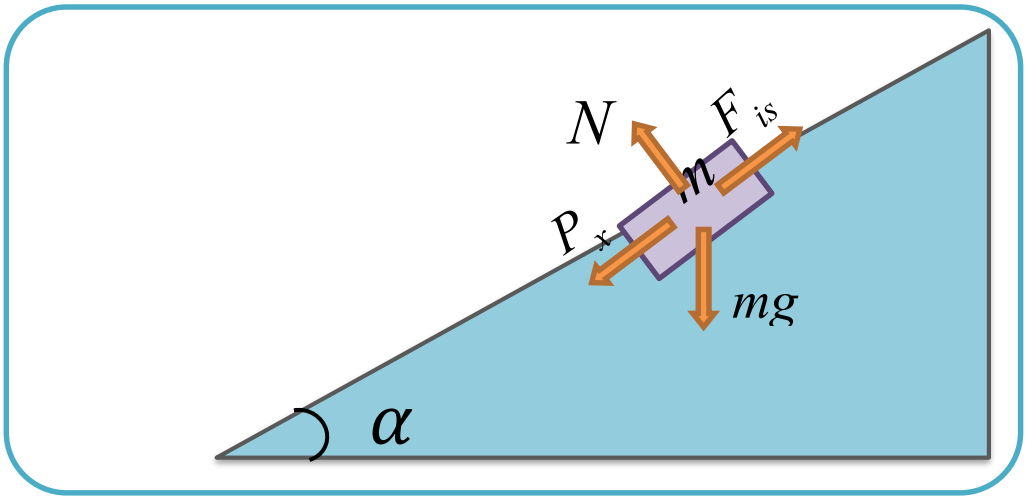
$$F^2(\sin^2\beta + \cos^2\beta) = P_x^2 + F_{ish}^2$$

$$F^2 = P_x^2 + F_{ish}^2$$

$$F=\sqrt{F_x^2 + F_i^2} = \sqrt{(mg\sin\alpha)^2 + (\mu mg\cos\alpha)^2} = mg\sqrt{\sin^2\alpha + \mu^2\cos^2\alpha}$$

$$F=mg\sqrt{\sin^2\alpha+\mu^2\cos^2\alpha}$$

An example. Find the expression of the frictional force acting on a body of mass m sliding down an inclined plane forming an angle α with the horizon.



Given: **Solution:**

α, m Expression for friction force: Fish= μN To find N

F_{ish}=? we find the projection of the forces on the y-axis:

$N_y + P_y = ma_y$ (1) **$N - mg\cos\alpha = 0$ (2)**

$N = mg\cos\alpha$ (3) **$F_{ish} = \mu mg\cos\alpha$ (3)**

Summary:

To move an object along a horizontal line on an inclined plane, the direction of the resultant force must be the same as the horizontal line. Then we will consider the projections of forces to move it. In finding the smallest value of the force, we assume that it is moving in a straight line. Because when the body moves with acceleration, the value of the force increases..

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