611-1340 (25-100) Acceleration Trolley

Description:

This apparatus consists of an aluminum form with two low friction pulleys. There are holes in the bottom of the frame for attaching additional weights. The trolley runs on a tightly stretched wire.

Warranty and Parts:

We replace all defective or missing parts free of charge. Additional parts may be ordered toll-free. We accept Master Card and Visa, School P.O's. All products warranted to be free from defect for 90 days. This warranty does not apply to accident, misuse, or normal wear and tear.

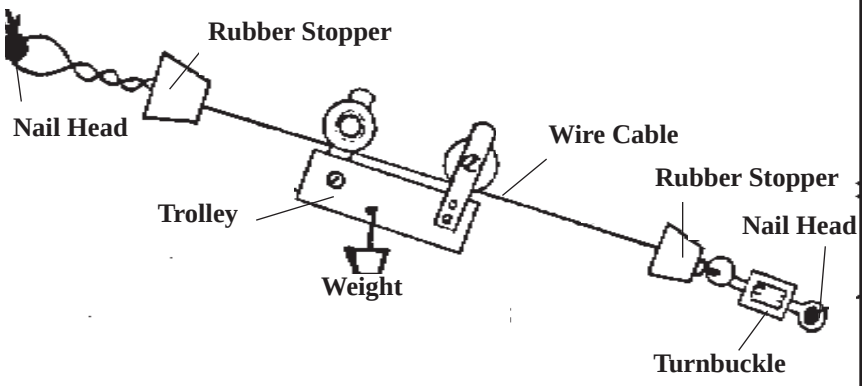
How to Install:

Screw two hooks into wall, one 2 or 3 feet higher than the other and up to 28 feet away. You may also use a blackboard frame, keeping in mind that the setup is temporary.

Since classroom wall space is limited, the installation of this device should be performed in a manner which will allow simple installation and removal.

We recommend two large nails protruding 1" from the wall.

Diagram 1 - Labeled Parts



Includes 30 feet of flexible wire cable, trolley, turnbuckle, two rubber stoppers, two screwhooks. Weights NOT included.

Materials Needed:

Stopwatch
Accurate to 0.1 sec or better

Tapeweights

P/N 24-2510

How to Use:

Use this trolley to determine a value for gravitational acceleration. Show how rate of acceleration of an object depends upon angle of incline.

Use of this product requires a timing device. Since each determination will require time measurements of not more than 5 seconds, we recommend a stop watch accurate to 1/10 second or better. Human error in short time intervals may be high and you should make allowances for it.

Attach a piece of tape to the wall behind the trolley approximately halfway from either end. Raise the trolley to the upper end of the wire and time it as it passes the marker. By trial and error, move the marker to the position where the trolley passes it in one second. Measure the distance from the one second marker to the starting point. Repeat the experiment for 2 seconds, 3 seconds or more. Taking these values, you can show that the distance traveled is proportional to the square of the time.

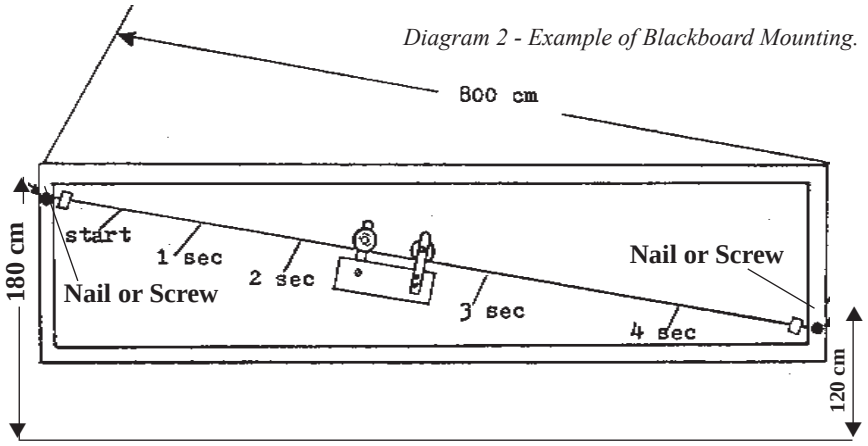
By substituting these values in the equation:

$$S = 1/2\ a\ t^2$$

you can obtain a value for **a**, where *S* is *distance, a* is *acceleration,* and *t* is *time.*

Values differ for 1, 2 and 3 seconds due to frictional error, human error and sag of the wire. By repeating with weights attached to the trolley, you can show that the value for **a** is substantially the same as before.

Diagram 2 - Example of Blackboard Mounting.



Vertical distance = 180 cm - 120 cm = 60 cm.

Expected value for **a** = $\left(\frac{980\ \text{cm}}{\text{sec}^2}\right)\left(\frac{60\ \text{cm}}{800\ \text{cm}}\right)$ = 73.5 cm/sec^2

for 1 sec **s** = $1/2\ \left(\frac{73.5\ \text{cm}}{\text{sec}^2}\right)(4\ \text{sec})^2$ = 37 cm

Expected distances from start to the 1 second mark = **37 cm**, to the 2 second mark = **148 cm,** to the 3 second mark = **333 cm.**

The 4 second distance is then $(1/2)\left(\frac{73.5\ \text{cm}}{\text{sec}}\right)$ 4 sec^2 or **588 cm.**

In order to check the value of **a**, measure the vertical distance between the two ends of the wire and the length of the wire. The value of **a** then becomes:

$$g\ \left(\frac{\text{vertical distance}}{\text{length of wire}}\right)$$

Related Products:

35-050 Free-Fall Tube - Show how heavy and light items fall at the same rate in a vacuum despite different weights and sizes.

40-250 Inclined Plane - Aluminum with removable protractor, low-friction pulley. Investigate acceleration, friction and gravity.

40-145 Mini-Dynamics - Colorful system lets you experiment affordablely with elastic and inelastic collisions. Plastic cars have bumpers, deep wells, low friction wheels.

25-070 Tape Timer - Determine velocity, acceleration, friction with the precision of an electric clock. Timer places carbon dot on moving paper every 1/60 second.