Force and reaction (Item No.: P0998900)

Curricular Relevance

Area of Expertise: Physik
Education Level: Klasse 7-10
Topic: Mechanik
Subtopic: Kräfte, einfache Maschinen
Experiment: Kraft und Gegenkraft

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	2 Students

Additional Requirements:

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Additional Information

1. The students should learn with the help of the spring balance that a force on a body can only be exerted when a counterforce acts on it simultaneously.
2. Using two spring balances, the students should experimentally determine that the forces on both spring balances are equally great, i.e. that force = counterforce (action = reaction).

Force and reaction (Item No.: P0998900)

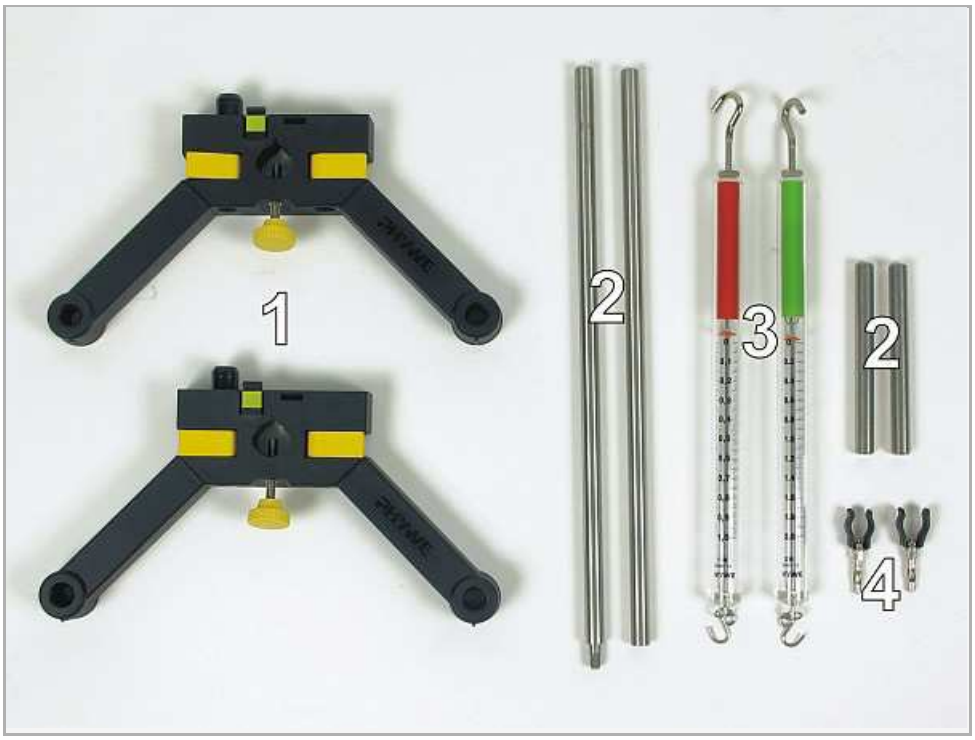
Task and equipment

Task

Does a spring balance need a retention force?

Two spring balances are connected via their measuring hooks to one another. The force that they exert on each other is measured at different distances.

Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod with hole, stainless steel, 10 cm	02036-01	2
2	Support rod, stainless steel, l = 600 mm, d = 10 mm	02037-00	1
3	Spring balance,transparent, 1 N	03065-02	1
3	Spring balance,transparent, 2 N	03065-03	1
4	Spring balance holder	03065-20	2

Set-up and procedure

Set-up

First of all screw the two splited rods together (Fig.1). Connect the two halves of the support base with the long support rod and tighten the locking lever on the left half (Fig. 2). Insert the spring balance holders into the short rods (Fig. 3)


Fig. 1

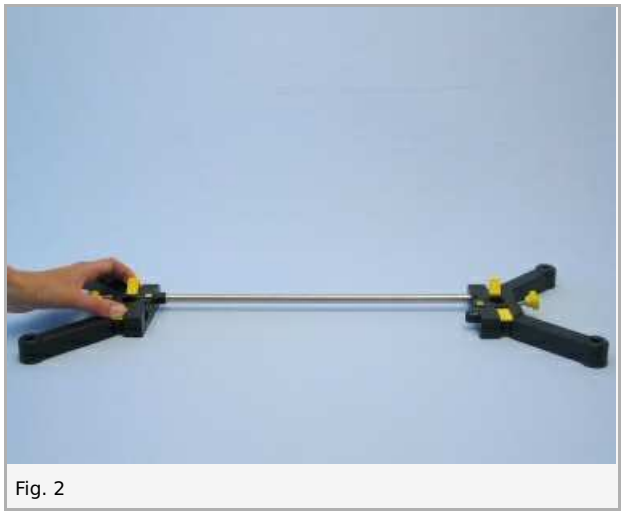


Fig. 2

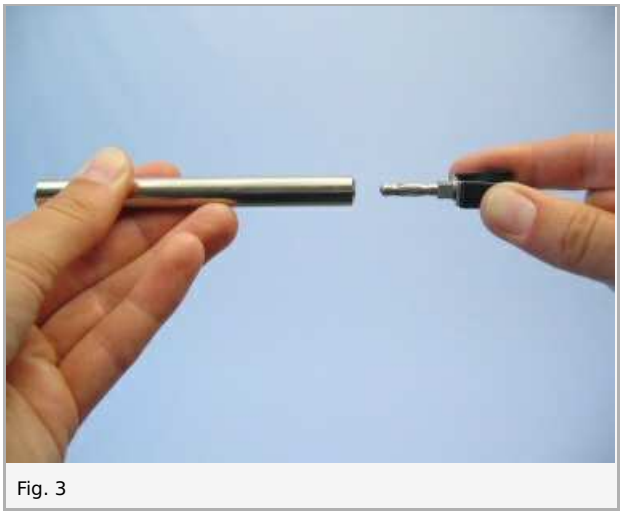


Fig. 3

Then set the two support rods into the support base halves (Fig. 4). Clamp the two spring balances into place, adjust them to zero (see Remark) and connect their weighing hooks (Fig. 5).


Fig. 4


Fig. 5

Remark:

To adjust the spring balances pull on the weighing hook of each spring balance several times and then release it suddenly. If they do not return to zero, you must adjust them (Fig. 6).

Fig. 6

Procedure

Action
Pull each of the two spring balances out to about 2/3 of their length, pay attention to their effect on your hands (Fig. 7).

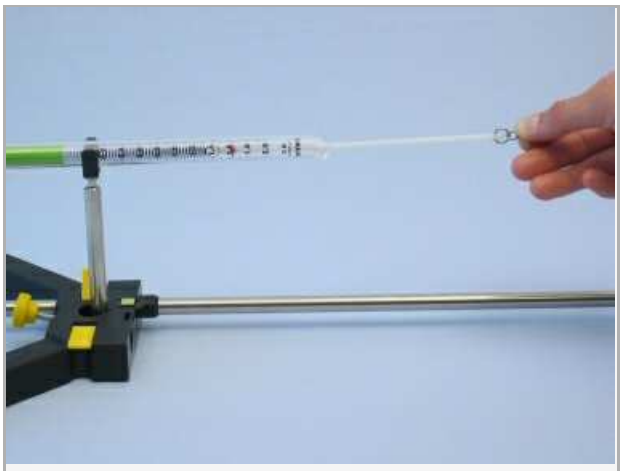


Fig. 7

Hold the left support base half and pull the two spring balances apart with the right one (Fig. 8). Read the scales of both spring balances about every two centimetres and record the values in Table 1 in the report. Determine 5 pairs of values. In Fig. 9 you can see, how to name the forces for the Table 1.

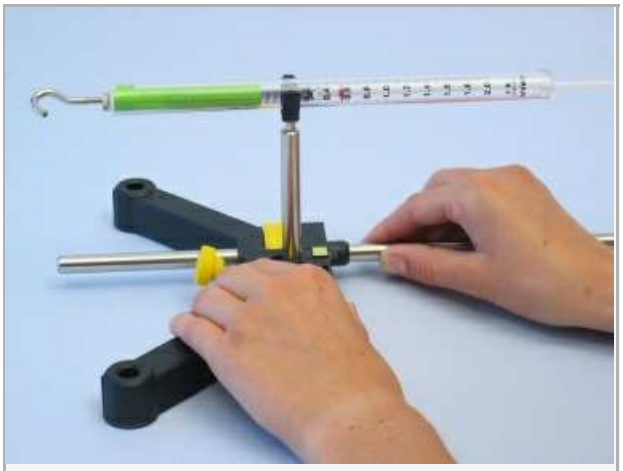


Fig. 8

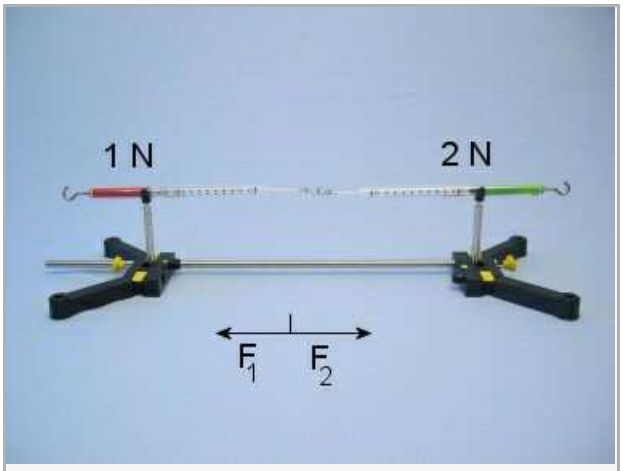


Fig. 9

Report: Force and reaction

Evaluation – Observation

Note your observations.

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Results – Table 1

Enter the measured values in the Table.

Spring balance	1 N	2 N
Measurement		
1	1 ±0	1 ±0
2	1 ±0	1 ±0
3	1 ±0	1 ±0
4	1 ±0	1 ±0
5	1 ±0	1 ±0

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Evaluation – Question 1

What do you notice, when you attach a spring balance to a solid object (e.g. table, window) and pull on it?

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Evaluation – Question 2

Can you also pull it out when one end is unattached?

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Evaluation – Question 3

Compare the two forces F_1 and F_2 with each other. What do you establish?

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Evaluation – Question 4

Does a spring balance need a retention force?

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