The Imris experiment

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Abstract:

We checked the Imris experiment experimentally and theoretically. We prove that the patent of Imris is based on a theoretical misinterpretations and show that classical mechanics makes the correct prediction.

Introduction

The essence of the Imris experiment is the claim that the conservation of angular momentum is not fulfilled experimentally during the exchange in a inelastic recoil experiment of angular momentum. In the light of Wuerth's patents this patent is very similar to his experimental claims valid in the horizontal plane, however, we show here that classical mechanics makes theoretically and experimentally the correct prediction here which means that energy is conserved .

The experimental setup and Imris's claims

The setup of Imris is shown in Fig.1. The setup consists of a rotating slab with a pivot in its periphery which itself is the axis of the subrotation of a mass point around the pivot on the rotating slab.

The experiment is performed as follows: In the acceleration phase the subrotation is blocked (by locking 12 in fig. 1) and the mass is fixed to the most outward position r_1. The setup is accelerated on the cyclic path with the biggest possible radius of the mass. If the maximum angular speed is reached the arm of the subrotation is unlocked. Then, the movement of the slab is stopped abruptly, and the mass continues to move at the little radius r_2 of the subrotation at higher angular velocity.

Probably basing on the correct equation (with *q*:= general velocity, *p*:=generalized momentum, $L = ½ m\dot{q}^2$:=Lagrange energy) valid for this setup,

$$p = \frac{d}{dt}\frac{\partial L}{\partial \dot{q}} = 0$$

Imris states that angular moment *p* is conserved. This leads him to the conclusion that energy is not conserved due to conservation of moment $P_{1/2}$.

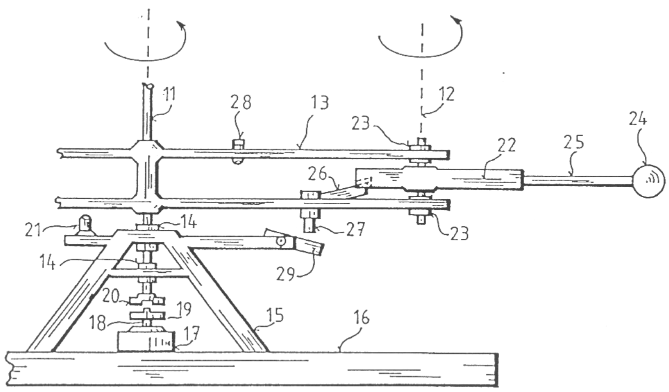

Fig.1: The Imris setup acc. to DE 41 14 870 A1

$$P_1 = \Theta_1\omega_1 = \Theta_2\omega_2 = P_2$$

Therefore, Imris follows (due to the last equation applied to the definitions of energy below)

$$\frac{E_2}{E_1} = \frac{1}{2}\Theta_2\omega_2^2 : \frac{1}{2}\Theta_1\omega_1^2 = \omega_2 : \omega_1$$

This would mean, that the recoil process yields energy, because the setup rotates faster after the inelastic recoil experiment. We will prove that this simple idea is wrong.

Theory

In the theory section we analyse the recoil experiment as a fast braking down process of the slab. The braking down process is described by a constraint.

For calculation purposes the setup consists a mass point hanging at a weightless arm, comp. fig.2. The coordinates in space **X** and velocity **V** of the mass point are

$$\mathbf{X} = \begin{pmatrix} r_1\cos(\alpha) + r_2\cos(\beta) \\ r_1\sin(\alpha) + r_2\sin(\beta) \end{pmatrix} \qquad \mathbf{V} = \frac{\partial \mathbf{X}}{\partial t} = \begin{pmatrix} \dot{\alpha}r_1\sin(\alpha) + \dot{\beta}r_2\sin(\beta) \\ -\dot{\alpha}r_1\cos(\alpha) - \dot{\beta}r_2\cos(\beta) \end{pmatrix}$$

The angle α and β are the rotation angles of the main rotation (α) and the subrotation (β) respectively, comp. fig. 2.

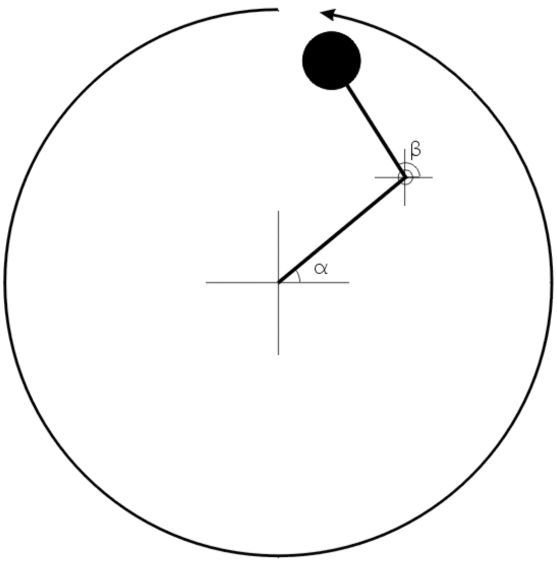

Fig.2: schematic illustration of the system described in the theory section

The Lagrange energy of the setup can be expressed by

$$L = \frac{1}{2} m \mathbf{V}^2 = \frac{1}{2} m r_1^2 \dot{\alpha}^2 + r_1 r_2 \cos(\alpha - \beta)\, \dot{\alpha} \dot{\beta} + \frac{1}{2} m r_1^2 \dot{\beta}^2$$

Because the slab is braked down in the inelastic recoil process we have a constraint (Lagrange equation of 2nd kind). It describes that the slab is braked down in the inelastic recoil process with an constant deceleration acc. to

$$\alpha = \dot{\alpha}_0 t (1 - t/(2\tau))$$

From the Euler-Lagrange equation energy the equation of motion follows

$$\frac{\partial}{\partial t}\frac{\partial L}{\partial \dot{\alpha}} = m r_1^2 \ddot{\alpha} + r_1 r_2 \cos(\alpha-\beta)\,\ddot{\beta} - r_1 r_2 (\dot{\alpha}-\dot{\beta})\sin(\alpha-\beta)\,\dot{\beta} = 0$$

$$\frac{\partial}{\partial t}\frac{\partial L}{\partial \dot{\beta}} = m r_1^2 \ddot{\beta} + r_1 r_2 \cos(\alpha-\beta)\,\ddot{\alpha} - r_1 r_2 (\dot{\alpha}-\dot{\beta})\sin(\alpha-\beta)\,\dot{\alpha} = 0$$

Using the values $\alpha_0=1$, $r_2=1$, $r_1=1$ and $\tau=0.01$ this yields the solution which is shown in fig.3. The solution shows that energy is conserved in this problem because it holds

This solution is self-evident if we discuss the problem in natural coordinates. There, it is clear that the velocity v is continuous and remains constant before and after the recoil experiment.

Where was the mistake in Imris´s consideration ?

The important point is that Imris did not notice that the Lagrangian momentum (which can contain constraints inserted) does not coincide always with the common definition of angular momentum as learned in school.

The difference is illustrated as well in the appendix of the rotator - article by the author, comp. the different definitions of angular momentum eq. (XX) and (XX).

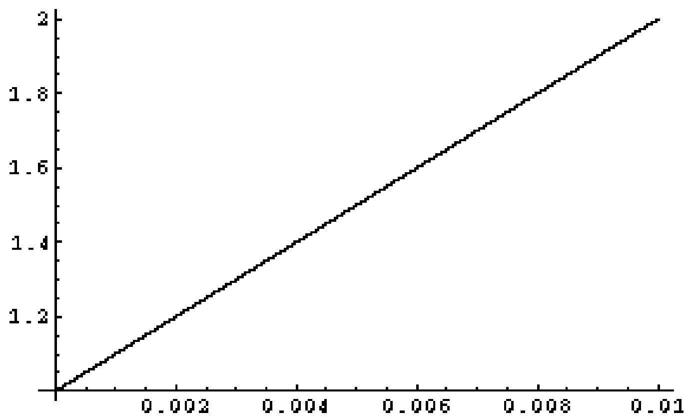

Fig.3: velocity β vs. time t of the system in fig. 2 if the movement of the slab is braked down abruptly ; numerical values: $\dot{\alpha}_0=1$, $r_2=1$, $r_1=1$ and $\tau=0.01$ comp. MATHEMATICA-file Imris.nb in the documentation package Imris.zip in this directory.

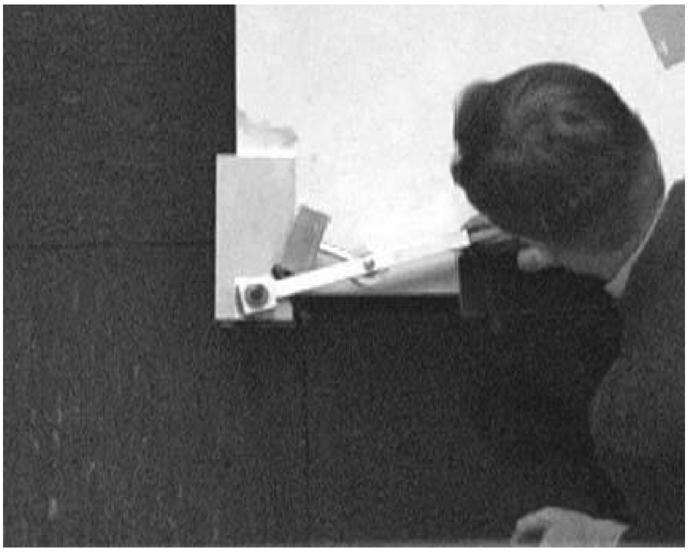

Fig.4: the technical realisation of the Imris experiment . The slab has bounced at the black rubber piece on the right in the neighbourhood of the finger, the subrotation continues its movement at an elevated angular rotation number.

A own experiment

We build up the same experiment like Imris, comp. Fig.4. The blueprints and, therefrom derived, the estimative calculation of the moments of inertia can be found in the files of the documentation package Imris.zip which can can be found in the directory of this article.

The measurement was done with a video camera. The measurements has been recorded by a good standard digital video camera using standard video frequency of 25 Hz and 1/1000 sec recording time.

After or before the measurement is recorded it should be done a test measurement which allows to check whether the horizontal and vertical direction have the same scale after the recording and grabbing process. We did this by recording pictures of a stick in horizontal and vertical position. After the videos are grabbed (in TIF) on a video system the pictures, consisting of two half pictures, can be reconstructed fully, if a graphic program is used which has a video interlace filter (for instance PHOTOSHOP). The colour information is discarded, because it makes more easy the data acquisition in the next step.

The acquisition of the data is done using a freeware program ‘NIH image’ to be downloaded at http://rsb.info.nih.gov/nih-image/Default.html

This program allows to combine B/W pictures in a clip (with the “Windows to stack” ! call).

Furthermore, it allows to determine the time dependent position of the moving setup in each clip photo by reading off the coordinates of position. After applying the scale correction the radius position and the angle are determined from the coordinate differences using elementary geometric functions like Pythagoras and Arcustangens.

The slab was accelerated by hand using a nail which fixed the weight during the manual acceleration through a hole in the outer frame. After the acceleration the frame and the weight moved free. During this phase the nail flew radially out of the hole by centrifugal force. Then the slab was braked down instantly by bouncing against rubber. At this position the slab was catched by the finger which prevented a elastic backward movement. Then, the weight continues to move with the shorter radius of the subrotation.

Results

If we assume conventionally energy conservation we obtain the equation

$$\frac{1}{2}\Theta_1\omega_1^2 = \frac{1}{2}\Theta_2\omega_2^2$$

From this we get

$$\frac{\Theta_1}{\Theta_2} = \frac{\omega_2^2}{\omega_1^2}$$

Based on the calculation of the inertia moments of the setup we obtained

$$\frac{\Theta_1}{\Theta_2} = 7.06$$

The evaluation of the video clips we obtained for the velocities

$$\frac{\omega_2^2}{\omega_1^2} = 6.4$$

Therefore, this short check showed a slight energy loss of ~ 10%, which confirms the exspectations due to classical mechanics which are far away from the promises of Imris.

Conclusion

The experiment confirms the conventional point of view of mechanics and proves that Imris patent bases on misinterpretations.

Bibliography:

1) W.D. Bauer The Wuerth overunity claim
http://www.overunity-theory.de/rotator/rotator2.htm

2) Kuypers F. Klassische Mechanik Wiley VCH Weinheim 1997