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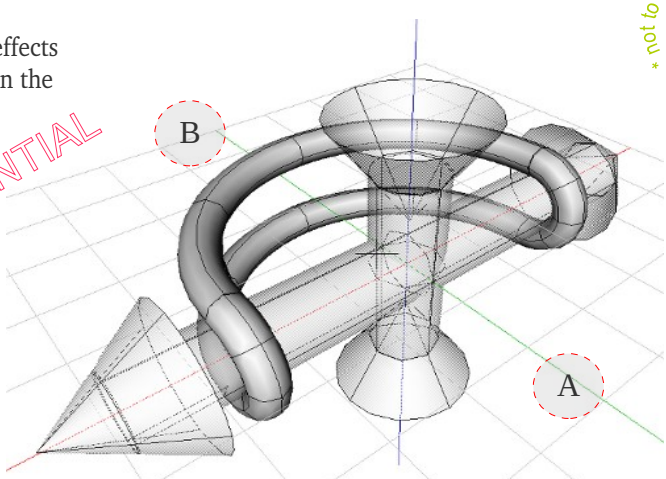
# Centrifugal Experiment I

Proposed with the objective of testing the possible effects of centrifugation produced by two masses running in the interior of a rounded tubular structure.





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## 1. Summary

We describe herein a system which aim is to allow us to make some tests on the effects of centrifugation generated by the angular motion of two masses. It is based on the idea of trying to somehow break the symmetry of a circular motion, in this case transformed into tow pares of half circles of different radius. Two masses are to move inside this tubular system, with a certain frequency ($\omega_0$). From the common analysis of classical mechanics, we may generate different accelerations in opposite directions (A and B), but we do not expect the apparatus to move by itself in any of these directions since the net mechanical impulse seems to be null. We would like, even so, to confirm such a behaviour by means of a real experiment in the laboratory, and also to observe what happens when all the system is made to rotate in the horizontal, then in the vertical, with a frequency $2\omega_0$.

## 2. The system

The basic structure of this system can be considered a circular tube previously forced to assume the geometry shown in the figure. In the interior of this tube, two equal masses run at a constant speed, separated from each other in a way that they will always be at opposite locations, and circulating with a frequency $\omega_0$. These masses can be connected by means of two flexible wires of nylon to help them maintaining such a separation. This is a way of ensuring the system will not rotate in the horizontal plane because of the centrifugal accelerations produced, or at least a way of minimizing such effects.

In the figure are shown the two sides into which an equilibrated system may move (A and B), while the conic transparencies simply represent the different angular momenta expected to be produced during operation. In the two small half-circles will be produced an acceleration into A direction, while in the middle of the two longer half-circles a less strong acceleration will be produced into B direction. The ratio of these accelerations is the same as the ratio between the radius of the two half-circles, the larger and the smaller.

Although the net acceleration into the A side is expected to be stronger than the net acceleration into B side, the amount of time the masses travel in those sections is different too, therefore they are expected to produce the same net linear momentum into each side. This tells us to expect a null net displacement of the system, even if it will try to oscillate in both directions. This behaviour, however, is predicted without considering aspects related to the overall inertia of the system, and the curious commutations of angular momentum.

The system should be installed and tested over a mobile platform with low friction, in order to better detect and record its response. Some 3 or 4 little bicycle wheels may perhaps be used to support the apparatus and obtain a fair low friction. The experiment is to be made in three different phases: in the first phase the apparatus must stay fixed in respect to its support; in the second phase it must be forced to rotate in the horizontal plane synchronously with $\omega_0$ with several frequencies, in particular with the frequency of $2\omega_0$; in the third phase this procedure must be repeated but now rotating around an axis perpendicular to AB. This must be tested for different conditions of masses' speed, and we propose it should at least be made to reach 10m/s, with masses of the order of 50g.

## 3. The mass accelerator

In order to move the internal masses in a controlled way we propose to build a magnetic accelerator of mass along all the perimeter of the tubular structure. This can easily be done by installing a sequence of several coils along the exterior of the tube, in which the magnetic field is electronically switched on, inverted, and switched off, depending on the proximity and relative position of a mass. High speeds are easily achieved using this sort of magnetic accelerators. Caution must be taken, however, to guarantee that the masses will always be completely deflected by the magnetic field at the sections of higher curvature, for not to fracture the walls of the tube in those sections. People must be well aware that this may in effect turn into a dangerous experiment if masses will be able to break the closed path and jump to the exterior, where in principle someone will be assisting the experiment.

## 4. Output data, and publication

The category and the amount of data to be recorded from the experiment must be enough to let us conclude on the dynamic effects that can be induced in a structure like this, by the described method, but special attention should be given to any variation of behaviour, or effects, with the speed of the masses, in the first phase, and with the relation between the base frequency ($\omega_0$) and the frequency and phase of the forced rotation of the apparatus in phases 2 and 3. The level of synchronism with the base frequency is important. The experiment should be recorded on video during its most relevant moments, and documented with some photos.

The results and the experiment should be classified as "confidential" till the moment that an article will be ready to be published in my website. Such a confidentiality, however, must not conflict with the fact that the idea is "not to be patented", since such a publication can always be delayed for enough time in order to concede the proper advantage to those who may eventually be interested in the system.

*By J. Manuel Feliz-Teixeira*

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