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DEMONSTRATION OF THE LAW OF CONSERVATION OF ANGULAR MOMENTUM ("TUMBLING CAT")

G. I. KATAEV

Moscow State University

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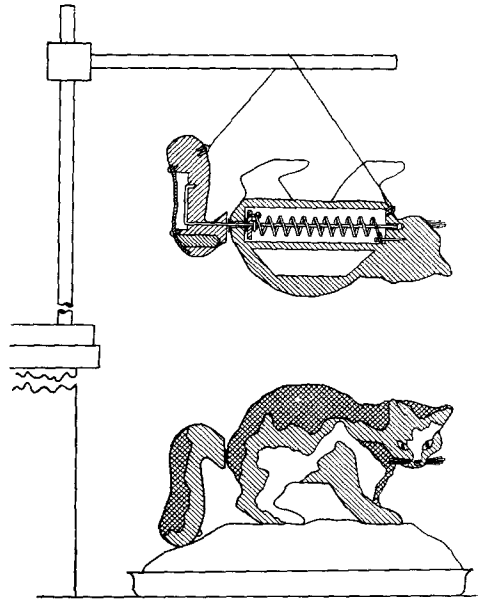
THE law of conservation of angular momentum is one of the most important laws studied in the mechanics section of a course of general physics. However, students frequently do not have a complete understanding of this law, and as a rule they can only cite the "Zhukovskii bench" as an example of its application. It is therefore necessary to perform at the appropriate lecture a convincing demonstration and to present numerous examples of applications of this law.



At the Physics Department of the Moscow State University, we devised a demonstration which has been firmly established as part of the lectures on general physics, namely the "tumbling cat." The cat's instinct of always falling on all four feet, righting itself by rotating its tail, is mentioned in many textbooks on mechanics. But it is impossible to use a live cat in a lecture.

The construction of our "cat" is illustrated in the figure. Its body is made of wood or foamed plastic and consists of two halves. Inside the body there is a cavity for a soft spring, which is wound by rotating the "cat's" tail. After such a winding, the "cat" is suspended from a stand with a string that keeps the tail from unwinding. The string is then burned, and the "cat" falls down to a pan with a sufficiently thick layer of sand. The number of revolutions of the tail during its winding, and the height from which the "cat" falls are so chosen that the "cat" turns through 180° and lands on its feet. The rotation of the tail is stopped by the sand. The body of the "cat" is best balanced with respect to the axis of the spring. The tail is also balanced with respect to this axis by means of an insert made of lead, as can be seen from the figure.

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SIMPLE PLASMATRON FOR LECTURE DEMONSTRATIONS

V. E. KORESHCHUK, S. P. POLYAKOV, and V. I. TVERDOKHLEBOV

Dnepropetrovsk Mining Institute

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CONSIDERABLE attention is paid in physics lecture courses to the production and properties of low-temperature plasma. Recently, in particular, arc-discharge plasmas have been successfully used in plasmatrons. In these devices, the plasma jet has a temperature ranging from several thousands to several tens of thousands degrees. Plasmatrons are now used in various branches of engineering. For example, they are used to cut and weld metals, to melt and sputter high-temperature and anti-corrosion coatings, and to produce acetylene.

We constructed a simple plasmatron suitable for demonstration purposes. Its scheme is shown in Fig. 1. The outlet opening of the copper nozzle has a diameter d = 0.8 mm, the diameter of the central electrode (8) is 4 mm. The plasmatron is fed from a DG-2 arc generator operating in the spark mode. Air cooling is used in the plasmatron. The vortex stabilization is with the aid of a stream of inert gas or a stream of nitrogen, if the central electrode is made of thoriated tungsten. The use of a copper rod with a pressed end piece of zirconium