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REVIEWER'S REPORT

Manuscript No.: IJAR-51108 Date: 19-04-2025

Title: Design of a stepped disk for continuous kinetic energy storage: an educational toy

Recommendation:
Accept as it is.................**YES............**
Accept after minor revision.................
Accept after major revision ....
Do not accept (*Reasons below*) ....

Rating	Excel.	Good	Fair	Poor
Originality	√			
Techn. Quality		√		
Clarity		√		
Significance			√	

Reviewer's Name: Mir Tanveer

Reviewer's Decision about Paper: **Recommended for Publication.**

Comments (*Use additional pages, if required*)
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Reviewer's Comment / Report

General Assessment:
The article presents a thoughtful and innovative design of a stepped disk mechanism that demonstrates the principle of continuous kinetic energy storage using gravitational potential energy. It situates this design within the broader context of renewable energy research, particularly flywheel technology and gravitational energy, while maintaining its central aim of serving as an educational toy for instructional and experimental purposes.

Summary and Contribution:
The proposed system comprises a stepped disk with two components—a large disk for energy storage and a small disk to manage string tension—combined with a small mass. As the mass falls and rises, the system demonstrates energy transformation between potential and kinetic forms in a continuous loop, assuming negligible friction.

The contribution of the study lies in its educational utility: it provides a tangible, demonstrative apparatus for kinetic energy storage principles. Moreover, it serves as an accessible platform for research and experimentation, making complex energy concepts more comprehensible to learners.

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By linking the toy's design with concepts from flywheel and gravitational energy technologies, the article highlights the potential pedagogical value of combining theoretical models with physical demonstration tools. The use of simplified physical assumptions (e.g., neglecting friction) supports clarity in the conceptual understanding of energy transfer.

Contextual Framing and Literature Integration:
The introduction effectively sets the stage for the study by establishing the relevance of gravitational and flywheel energy storage systems within renewable energy discourse. Citing seminal works, including those by Shyu (2010, 2011), Li et al. (2013), and Shao et al. (2014), the article demonstrates an understanding of the historical and technological trajectory of these systems.

The linkage of flywheel energy storage to transportation systems (e.g., tramway applications and regenerative braking) helps bridge the gap between industrial-scale systems and the scaled-down, pedagogical focus of the stepped disk design. The inclusion of Ratniyomchai et al. (2014) and Erd et al. (2024) enhances the practical dimension of the discussion.

Technical Content and Conceptual Clarity:
The physical mechanism is described clearly and succinctly. The description of energy transformation between potential and kinetic forms is straightforward and allows the reader to visualize the back-and-forth motion enabled by the string-mass system. By introducing the concept of the stepped disk in an educational context, the article underscores its relevance to hands-on physics education and engineering instruction.

Neglecting friction is a logical simplification for theoretical analysis and educational demonstration. This assumption aids in maintaining conceptual clarity while focusing on core principles of energy conservation and mechanical motion.

Pedagogical and Practical Relevance:
The educational value of the proposed system is a notable strength. The article successfully makes the case for its utility as a teaching aid that promotes experiential learning in the areas of mechanical physics, renewable energy, and energy systems engineering. The dual emphasis on instructional use and exploratory research makes the toy a potentially effective tool in both classroom and laboratory environments.

Writing and Presentation:
The writing style is formal, academic, and concise. The technical explanation is balanced with references to broader energy concepts, making the article accessible to readers from both engineering and educational backgrounds. The structure is logical, with a clear progression from theoretical context to device function and purpose.

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Overall Evaluation:

The article provides a novel, well-contextualized, and pedagogically valuable exploration of a stepped disk mechanism for continuous kinetic energy storage. It bridges theoretical energy concepts and practical instructional tools, offering insights that are both educational and potentially useful for experimental research. The clarity of presentation, relevance of the topic, and integration with current renewable energy discussions make it a meaningful contribution to literature in applied physics and science education.