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A REVIEW ON MECHANISM FOR REGENRATIVE BRAKING USING FLAT SPIRAL SPRING

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Abstract- The conventional manner of braking causes friction between brake pads and brake disc. It converts the vehicle's kinetic energy into heat, which goes waste. However, the regenerative system recovers some of the waste energy and puts it to work again. The system captures and converts this waste energy into electricity. The electricity thus regenerated; charges the battery of the vehicle. A flat spiral spring kinetic energy recovery system stores the kinetic energy in form of potential energy and this potential energy is then used to run an alternator which converts potential to electrical energy. Such a system has not been manufactured yet and this project will be instrumental in testing its efficiency and feasibility in conventional vehicles.

I INTRODUCTION

With increasing fuel prices and an emphasis on sustainability, automotive manufacturers have placed substantial effort on making their vehicles more fuel efficient. The rise of hybrid and electric vehicles are a result of the efforts to improve fuel efficiency. However, hybrid and electric vehicles make up only 3% of the market. The vast majority of vehicles on the road are still conventional vehicles with only an internal combustion (IC) engine. Using similar technology which the hybrid and electric vehicles implement, conventional automobiles may be able to increase efficiency with regenerative braking. Currently, when a conventional vehicle slows down the brakes are applied and the kinetic energy is wasted. Regenerative braking is the harnessing of kinetic energy lost due to braking. When regenerative braking is used in a closed system, the stored energy is used to later power the system. This concept has been used on vehicles dating back to an electric car in 1906. Over the years, various methods for both harnessing and storing the energy have been used, including chemical, electrical, and mechanical methods.

Problem Statement

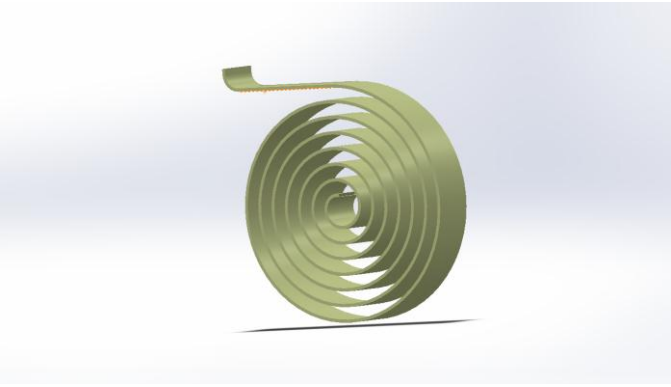
The existing regenerative braking system use hydraulic, electrical and spring kinetic energy recovery system to recover the lost kinetic energy. But, these have limited applications, mostly in electric and hybrid vehicles. Moreover, their braking effectiveness is not high. So, it becomes an important task to develop a system that works in a conventional vehicle and recovers the lost energy in a usable form apart from offering a considerable braking force.

Objectives

This project explores the possible mechanism of using a flat spiral spring to recover the lost kinetic energy and convert it into electrical energy for conventional vehicles, thus offering solution to the above said problems. The project will involve designing a working mechanism, a 3D CAD model, various components of the system. The project proposes a mechanism of regenerative braking using a flat spiral spring(Mechanical regenerative braking).

Major components

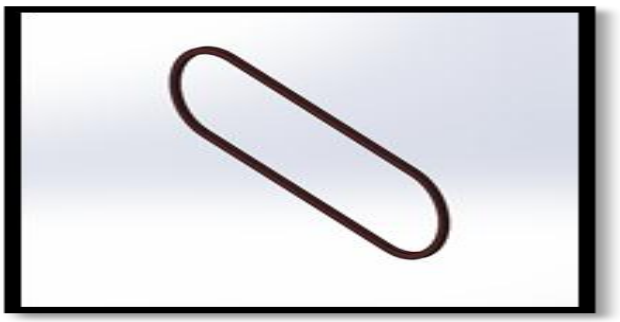
1. Spiral Spring



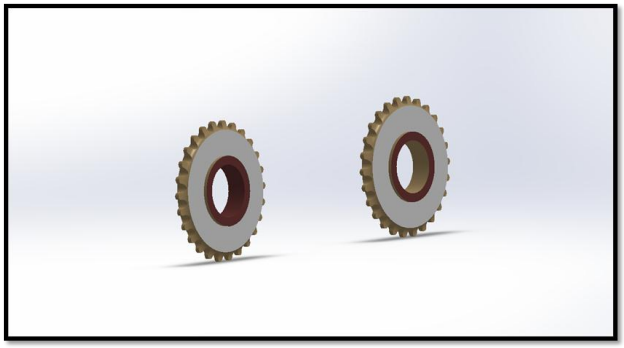
2. Friction Ring

3. Shaft

4. Chain



5. Sprocket



II WORKING

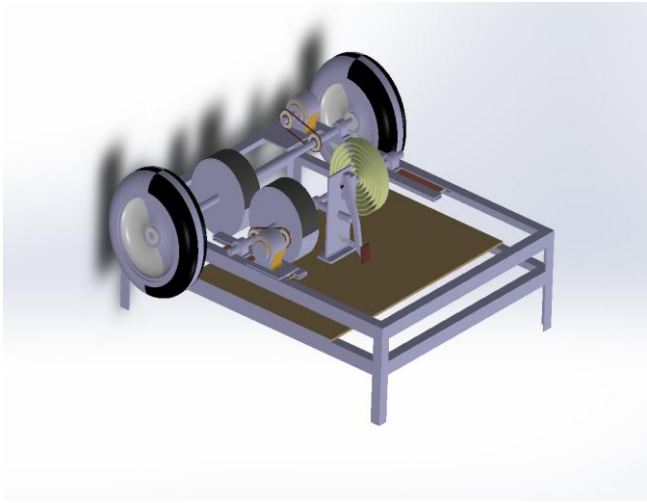


Figure 1 CAD Model of Assembly

The drive shaft is powered by a motor through a chain-sprocket arrangement. The drive shaft has a friction ring mounted on it by welding. The brake shaft has another friction ring welded on it along with a spiral spring whose one end is connected to shaft and the other end is bolted to the stationary platform. The brake pedal arrangement is fixed on the same platform. The brake pedal lever is connected to the brake shaft by a linearly moving rod. The second chain sprocket arrangement connects the brake shaft to the alternator.

When the brake pedal is pressed, the rod moves linearly and pushes the brake shaft towards the drive shaft until both friction rings come into contact. This leads to torque transfer from drive shaft to brake shaft, which eventually leads to winding of flat spiral spring. The winding and the friction result into braking of the wheel. Once the wheel stops, the brake pedal is released and brake shaft moves to its original position. Also, the flat spiral spring unwinds and rotates the alternator shaft via chain sprocket to generate electricity.

III FUTURE SCOPE AND CONCLUSION

Regenerative braking is a popular feature in electric vehicles, but has not been used extensively in conventional vehicles, which have limited themselves to KERS and launch assist mechanisms. Our, project can be used on conventional vehicles, if weight of the setup is reduced in future optimizations. Better spring material and use of better brake torque transmission can improve the

design significantly. Moreover, other than automotive use, this project can be used in all those applications that require repeated braking. For e.g. lathe machines. This will lead to huge savings in cost and will increase the profit considerably, when applied on large scale.

This project intends to recover the kinetic energy lost during braking and converting it into electrical energy, for conventional vehicles and similar applications using flat spiral spring. It will offer an innovative and environment friendly option to other alternatives. In the end, a working mechanism of such a system is designed and tested for feasibility in terms of efficiency.

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