A System and Method for Bionic Impact Absorption Device

IITM Technology Available for Licensing

Problem Statement

- According to the WHO 2022 report on world traffic injuries, **1.3 million fatalities and 39 million injuries** occur globally.
- In automobile crash zones, impact absorbers are placed between the bumper and side rails of the vehicles, which are widely used to absorb kinetic energy through plastic deformation.
- However, the **design of the impact absorber determines the crashworthiness** of the vehicle structure.
- In general, automotive industries mainly aim to reduce vehicle weight to meet the safety standards set by Federal Motor Vehicle Safety standards.
- For low-cost and high strength-to-weight ratios, aluminum, steel and fiber-reinforced composites have been mostly used in the fabrication of crash-boxes.
- Currently, existing systems have tried to address this problem. However, their scope was limited to the use of micro-lattices, and glass sponge to derived tubular structures for lightweight applications.

Technology Category/ Market

Category - Mechnical Engineering, Automotives
Applications – Automotive energy absorption pads, Aerospace, Additive manufacturing, 3D printing.

Market - Automotive energy absorption (EA) pads market will reach USD 2,085.72 million by 2028 and grow at a CAGR of 4.30% during 2021 to 2028.

Intellectual Property

- IITM IDF Ref. **2400**
- **IN 431156 - Patent Granted**

TRL (Technology Readiness Level)

TRL - 2 , Technology concept formulated.

Technology

The present invention discloses a system and method for a **bionic impact absorption device** (as shown in Fig. 1).

System

1. **The system comprises comprising at least one bionic tube (102) for absorbing high impact energy.**
2. **The bionic tube (102) comprises at least two relatively closed cell and at least two relatively open cell, forming at least one-unit cell (104).**
3. **The one-unit cell (as shown in Fig.2 & 3) comprises at least one horizontal strut (110) for providing strength, one diagonal strut (112) for providing buckling resistance, and at least two vertical strut (114) for providing strength.**

Key Features / Value Proposition

1. The advantages are **one bionic tube is retrofitted** to the bionic impact absorption devices.
2. **Improved energy absorption** as compared to conventional bionic impact absorption devices.
3. The device is possible to control the energy absorption by changing the at least one-unit cell parameters **without changing the weight and overall dimensions**.
4. Device is **light weight** and **uses less material consumption.**
5. An additional advantage is **to lower the cost of impact absorbing devices,** as well as **to ensure their design complicity.**

Research Lab

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Fig. 1. Depicts/illustrates a perspective view of a bionic impact-absorbing device.

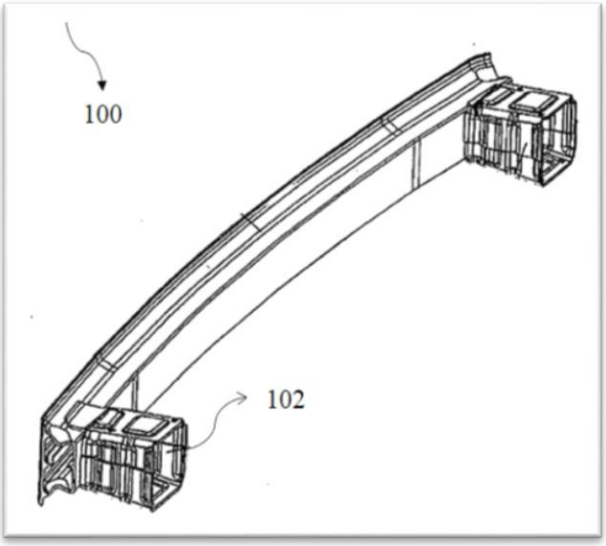


Fig. 2. illustrates a unit cell of the bionic tube.

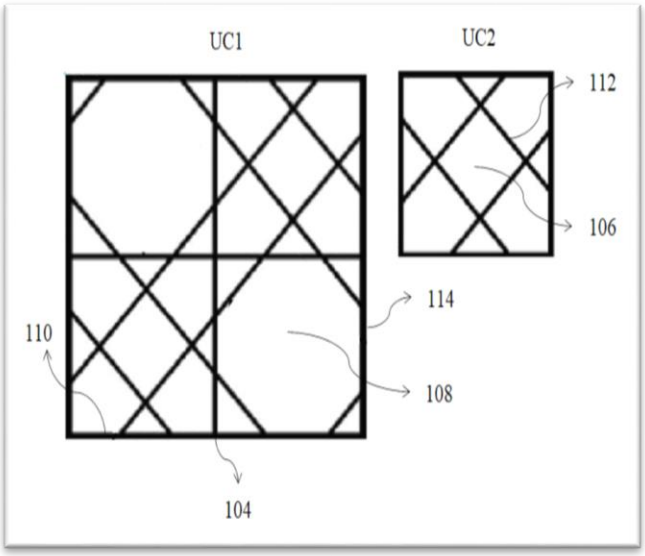
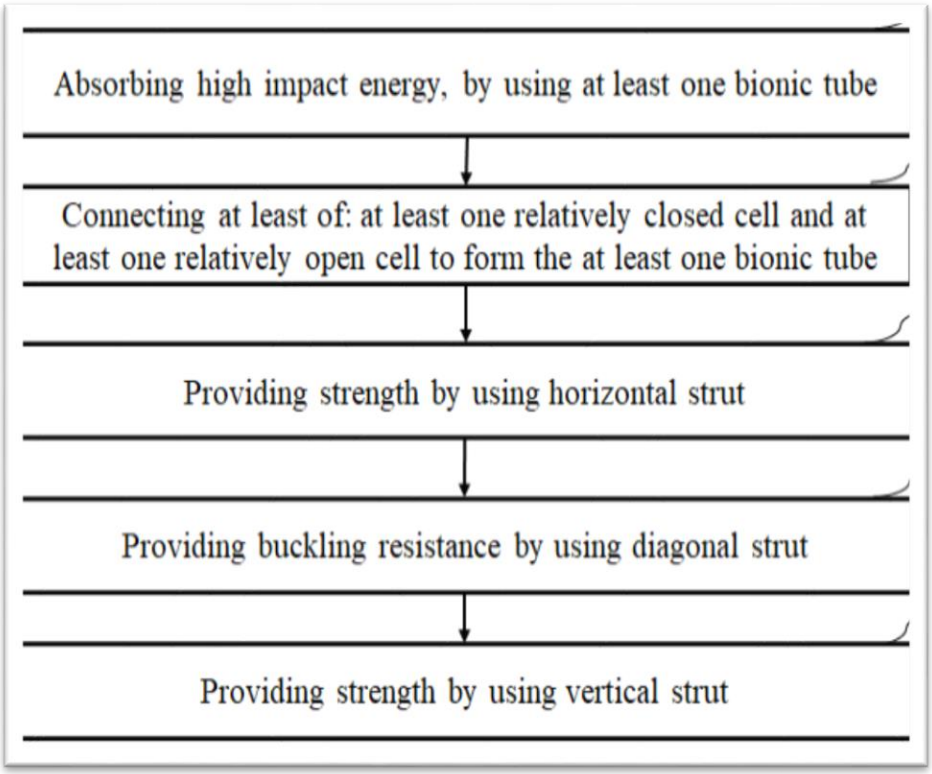


Fig. 3. illustrates a method for designing a bionic crash-boxes.



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