



### Industrial Consultancy & Sponsored Research (IC&SR)

#### ACTIVE WHEEL ALIGNMENT MECHANISM FOR CHANGING TOE ANGLE IN A VEHICLE

#### IITM Technology Available for Licensing

##### Problem Statement

- Good handling and ride control of a vehicle depends upon a steering system and a suspension system of a vehicle, **but external factors such as road conditions affect the ride of a vehicle.**
- Hence an improved **suspension performance** by varying the suspension parameters i.e, **the wheel angles (camber, toe, caster) is required for changing dynamic characteristics of the vehicle**

##### Technology Category/Market

**Category – Automobile & Transportation**

**Applications** –Automobiles, assistive devices, steering systems

**Industry** – Automotive

**Market** -The Automotive Industry is projected to grow USD 6,070.4 billion till 2030 from the value of **USD 3,566.5 Billion in 2022**, exhibiting a compound annual growth rate (CAGR) of **6.9%** during the forecast period (2023 - 2030).

##### Key Features / Value Proposition

###### ❖ *Technical Perspective:*

- A **toe adjustment mechanism** of the front wheels of a vehicle, in an active manner while the vehicle is in motion.
- The linear movement of the slider brings the pair of tie rods closer or farther and **changes effective length of tie rods resulting in change of toe angle.**
- Increases grip of the tires** while entering and leaving corners with increased speed.

###### ❖ *User Perspective:*

- Reduces steering effort and provide greater stability** of the vehicle.
- Mitigates over and under steering** in a vehicle.

##### Research Lab

**Prof. Jayaganthan**

Dept. of Engineering Design

##### Intellectual Property

- IITM IDF Ref. 2222**
- IN410761-Granted**

##### Technology

The present invention discloses a vehicle toe adjustment mechanism:

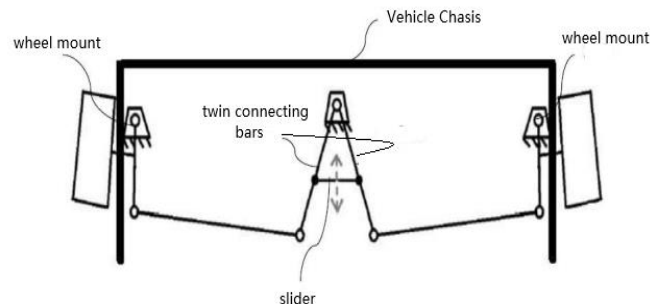
**Two end effectors** connected to wheel mounts and pair of tie rods

**Two twin connecting bars** fixed to the vehicle chassis

**A slider** that moves linearly along the twin connecting bars

**A slider holder** connected to the slider and the vehicle's steering system

- The linear movement of the slider **away from the steering rod axis** along the twin connecting bars creates a toe-in for the wheels by **pulling the pair of tie rods**
- The linear movement of the slider **towards the steering rod axis** along the twin connecting bars creates a toe-out for the wheels by pushing the pair of tie rods



**Fig. 1** illustrates a kinematic diagram of toe adjustment mechanism

##### CONTACT US

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- ❑ Fixing the slider at the neutral position along the twin connecting bars creates a neutral toe for the first wheel and the second wheel by fixing the pair of tie rods
- ❑ The linear movement of the slider changes an effective length of the pair of tie rods, thereby resulting in **toe-in** or **toe-out** of wheels of the vehicle.

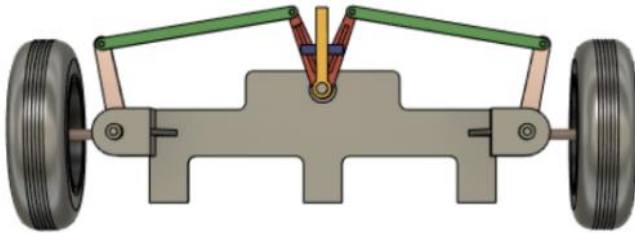


Fig. 2 illustrates a top view of the toe adjustment mechanism depicting the wheel in the neutral position

#### Images

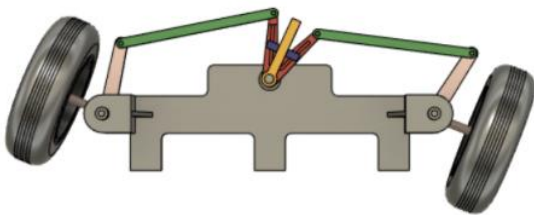


Fig. 3 illustrates a top view of the toe adjustment mechanism depicting a given steering position with the wheel having a toe-out position

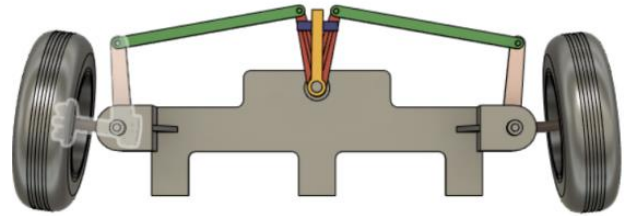


Fig. 4 illustrates a top view of the toe adjustment mechanism depicting steering in neutral position with the wheel in the toe-in position

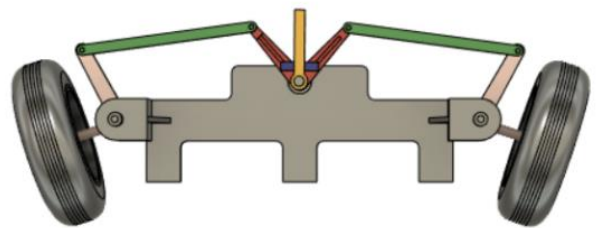


Fig. 5 illustrates a top view of the toe adjustment mechanism depicting steering in neutral position with the wheel in the toe-out position

#### TRL (Technology Readiness Level)

**TRL-4/5** Technology Validated in Relevant Environment

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