LINEAR INDUCTION MOTOR WITH REDUCED END-EFFECTS

IITM Technology Available for Licensing

Problem Statement

- **Linear induction motors (LIMs)** encounter end-effects, resulting in flux drop and diminished thrust, **hampering overall efficiency and performance.**
- **Current solutions such as adding auxiliary components** or modifying teeth lack simplicity and **fail to provide substantial improvement in thrust characteristics.**
- There is a **need for an LIM design** that **efficiently addresses end-effects without introducing complexity or additional components.**
- Existing approaches often overlook the importance of enhancing linear thrust, crucial for applications like **propulsion systems and transportation technologies**.
- An unmet need exists for a LIM innovation capable of significantly mitigating end effects while **simultaneously improving thrust characteristics**, thus **advancing various industrial and transportation sectors.**

Technology Category/ Market

Category –Aerospace & Defense Technologies, Electronics & Circuits

Applications - Magnetic Levitation, Linear Propulsion, Linear Actuators, Transportation Systems (e.g., Electric Trains, Conveyor Belts, Cranes), Hyperloop Technology

Industry - Aerospace & Defense Technologies, Transportation

Market - The global aerospace and defense market size was worth around USD 750 billion in 2022 and is predicted to grow to around USD 1388 billion by 2030 with a compound annual growth rate **(CAGR) of roughly 8.2%** between 2023 and 2030.

Intellectual Property

- **IITM IDF Ref. 2329**
- **IN 531158 (Patent Granted)**
- **PCT /IN2023/050383**

TRL (Technology Readiness Level)

TRL- 4, Technology validated in Lab.

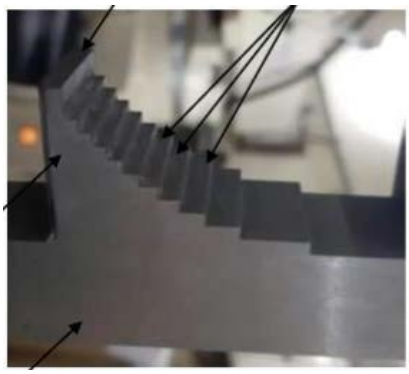

Fig. 1: Primary core of a linear induction motor (LIM)

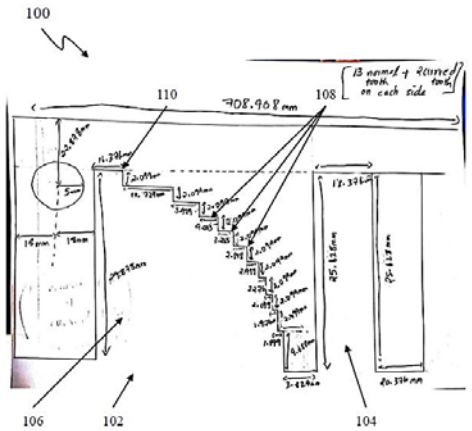

Fig. 2: Representation of teeth of the primary core arranged in a curved profile

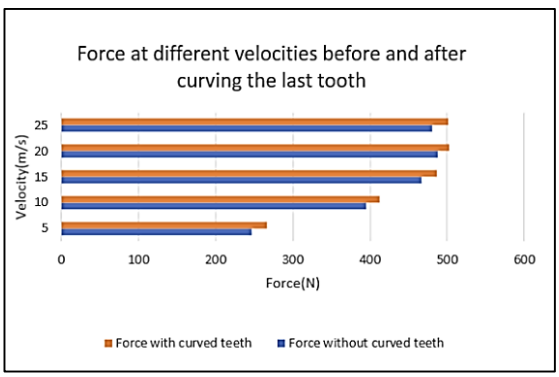

Fig. 3: Graphical representation of linear thrust force comparison between the invention and conventional LIM

Research Lab

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Technology

1. ***Optimized Tooth Design:***
   - The invention introduces a **unique tooth design** for the primary core, featuring protrusions arranged in a **curved profile with a convex shape.**
2. ***Gradual Flux Distribution:***
   - The **protrusions on the tooth** allow for a **gradual distribution of the magnetic flux,** reducing abrupt drops in flux density at the end portion of the primary core.
3. ***Cubic Spline Formulation:***
   - The **outer protrusion of the tooth is formed using a cubic spline,** enhancing the **smoothness of the flux distribution** and optimizing magnetic field strength.
4. ***Improved Thrust Characteristics:***
   - By mitigating end-effects and facilitating a more uniform flux distribution, the **invention leads to a notable increase in linear thrust generated by the linear induction motor.**
5. ***Simplicity and Reliability:***
   - Unlike complex solutions involving additional components, this technology **provides a straightforward approach to enhancing LIM performance** without introducing unnecessary complexity.
6. ***Application Versatility:***
   - The **improved LIM design** can find applications in various fields **such as magnetic levitation, linear propulsion, and transportation systems,** offering efficiency and reliability benefits.

Key Features / Value Proposition

Improved Efficiency:
- Mitigating end-effects enhances LIM efficiency and performance.

Enhanced Thrust:
- Optimized tooth design increases linear thrust for better propulsion.

Smooth Operation:
- Gradual flux distribution ensures smoother and more reliable performance.

Simplified Design:
- Cubic spline outer protrusion offers a simple, effective enhancement.

Versatility:
- Suitable for various industries, from magnetic levitation to linear propulsion.

Image

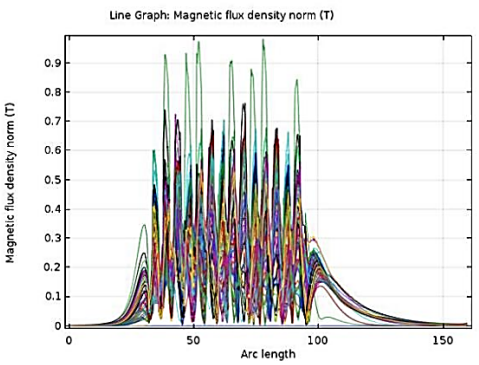

Fig. 4: Graphical representation of magnetic flux density in the LIM of the invention

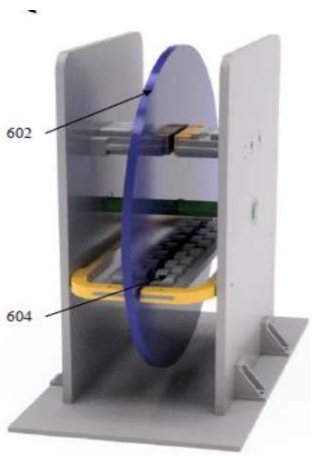

Fig. 5: Testing device for assessing linear thrust characteristics

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