APPARATUS FOR MEASUREMENT OF TRIBOLOGICAL QUANTITIES FOR ELECTROMECHANICALLY LOADED CONTACTS

IITM Technology Available for Licensing

Problem Statement

- Generally, a tribometer is an instrument that measures tribological quantities, like coefficient of friction, friction force & wear volume, between two surfaces in contact.
- Further, **Bearings** are one of the critical element in electric motors.
- Failure analysis of **conventional bearings used in traction motors** revealed the appearance of **morphological damages to raceway surfaces and quicker lubricant degradation.** The damages to surface is consistent with surfaces subjected to electro-discharge machining.
- The prior arts do not discuss a **method for measuring the tribological quantities** in electromechanically loaded contacts**.** Hence, there is a need to introduce an improved **device** to mitigate above challenges & provide **efficient solution**.

Technology Category/ Market

Technology: Apparatus for measurement of tribological quantities;
Industry: Manufacturing; **Applications:** Advanced Materials & Test Equipment;
Market: The global **Traction motors bearing** market size is projected to **$30B** by **2032**, at a **CAGR** of **13%** during period of 2022-**2032.**

Intellectual Property

IITM IDF Ref.:2415; IN Patent No. 436865

TRL (Technology Readiness Level)

TRL- 9 Actual System Proven in Operational Environment

Research Lab

Prof. R Gnanamoorthy, Dept. of Mechanical Engg.

Technology

- Present invention describes an **apparatus for measurement of a plurality of tribological quantities** of an electromechanically loaded contact between a disc sample and a test sample.
- Said apparatus comprises of

1. A **disc** sample **holder** for accommodating the disc sample and, sample holder coupled with a motor drive configured to rotate at a predetermined speed;
2. A **test** sample **holder** for accommodating the test sample, the test sample holder coupled with a linear actuator, through a lever-arm assembly to enable movement of the test sample over a surface of the disc sample, the test sample holder comprising an insulating support attached to the lever-arm assembly configured to prevent grounding of electric current from the test sample holder;

-> the lever-arm assembly comprises a **plurality of sensors** mounted thereon for detecting the **plurality of tribological quantities.**

Image

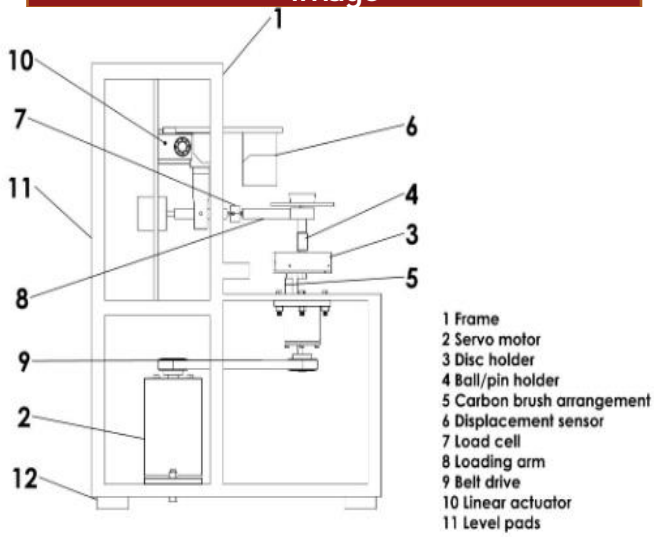

Fig.1: Illustrates a side view of an Apparatus for measurement of a plurality of tribological quantities of an electromechanically loaded contact.

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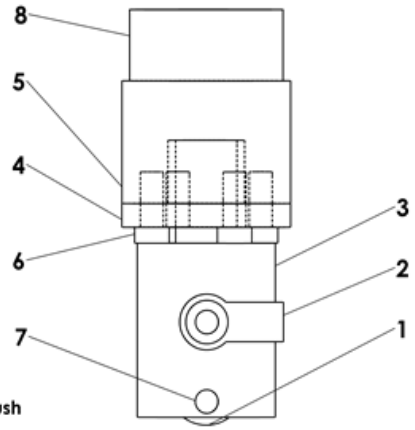
Industrial Consultancy & Sponsored Research (IC&SR)

Experimental Images of Test Sample

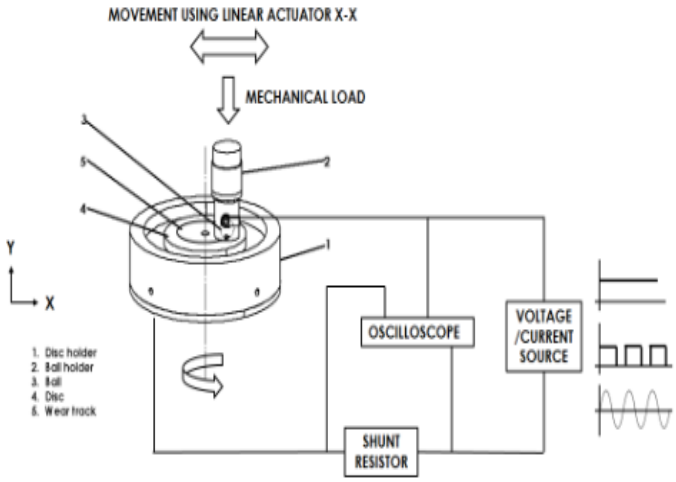
Fig.2 illustrates a perspective view of ball holder with polymer insulation to protect the load cell and accelerometer from currents when the contact is electromechanically loaded as well as ensure long life of the.



1. Ball sample
2. Voltage terminal
3. Ball holder
4. Flange
5. Polymer insulated bush
6. Bolt x4
7. Threaded hole
8. Threaded region

Experimental Setup

Fig.3 Illustrates a Tribological quantity measurement unit of the apparatus



Key Features / Value Proposition

❖ *Technical Perspective*:

1. Claimed apparatus is used to **measure tribological quantities in the presence of an electrical environment which is encountered in traction motor bearings.**
2. **Subject matter of the Patent incorporates a plurality of sensors to assess the electromechanical contacts, wherein the plurality of sensors includes load cell, displacement sensor, temperature sensor, accelerometer, electrical measurements.**
3. Includes an **infrared imaging unit** configured to capture **a temperature profile** of the **electromechanically loaded contact** between the disc sample and the test sample.
4. Support for various **speed regimes & electrical loads using hardware and software**.
5. Provides an apparatus **for simulating electromechanical loading** condition in tribological contacts **under lubricated as well as non-lubricated conditions**; and
6. Using different holder designs and attachments in the apparatus, **comprehensive assessment of friction and wear properties under electromechanical loading** of different geometries of test samples such **as ball, pin, roller, etc. under dry and lubricated** (oil and grease) **conditions** can be carried out.

❖ *Industrial Perspective:*

1. **Cost-effective apparatus and eco-friendly.**

❖ *User Perspective*:

1. Ensures **more reliable & user-friendly apparatus.**

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