System and Method for Developing Uni-layer Brazed Grinding Wheels by Placing Grit in a Pre-defined Array

IITM Technology Available for Licensing

Problem Statement

- In **Manufacturing high-quality uni-layer brazed grinding wheels** with a predefined array of cBN/Diamond abrasive grits, **several challenges are been faced.**
- Traditional methods have limitations, including **grit clustering, uneven protrusion** from the **bond level**, and the **use of templates**.
- To address these issues and to improve the **precision, control, and efficiency** of grit placement, a new system and the method are needed.
- The solution offered by the instant Patent is a **pick-drop-place (PDP) technique and system**, designed to provide improved control, uniform protrusion, & customizable grit patterns **without relying on predefined templates.**

Technology Category/ Market

Categories: Applied Mechanics & Mechanical Engineering | Advance Material & Manufacturing

Industry: Tool Manufacturing Industry, Advanced Materials Processing, Industrial Automation and Robotics, Machining and Manufacturing Industries, Super-abrasive Materials Manufacturing

Applications: Precision Machining, Metalworking, Ceramic and Composite Material Processing, Tool Manufacturing, Surface Finishing, Industrial Automation, Super-abrasive Material Production, Customized Grinding Patterns

Market: The global **grinding wheel** market size is estimated to grow by **USD 5,877.71** million and the size of the market is forecast to increase at **5.24% CAGR** between **2022-27.**

Research Lab

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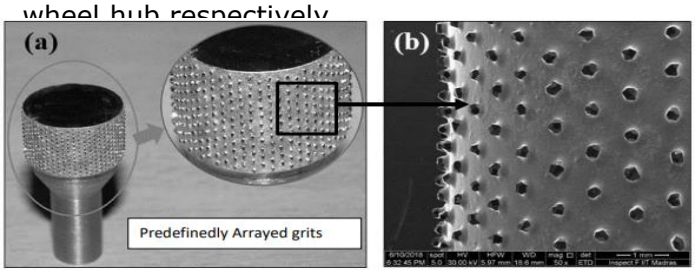
Technology

The present patent invention is a **system and method for developing uni-layer brazed Grinding wheels by precisely placing cBN/Diamond** abrasive grit in a pre-defined array on grinding wheels using a pick-drop-place **(PDP) technique**, ensuring **uniform distribution & controlled protrusion**, thus **enhancing** grinding wheel performance as shown in figures. **FIG 1(a) & 1(b)** illustrates an image of single layer **diamond grinding wheel** in its as **brazed condition** and **SEM image**.

FIG 1(b) showcasing the **uniform** distribution of diamond grits over the curved surface of the wheel hub respectively.



Method

Selection of Grinding Wheel Substrate

- **Preparation of Surface with Filler Alloy**

Grit Preparation

- **Utilization of Gripper System**

Vacuum and Pneumatic System Operation

- **Digital Monitoring**

Piezoelectric Sensor Integration

- **Load Control**

Optional Special Attachment

- **Brazing Process**

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Image

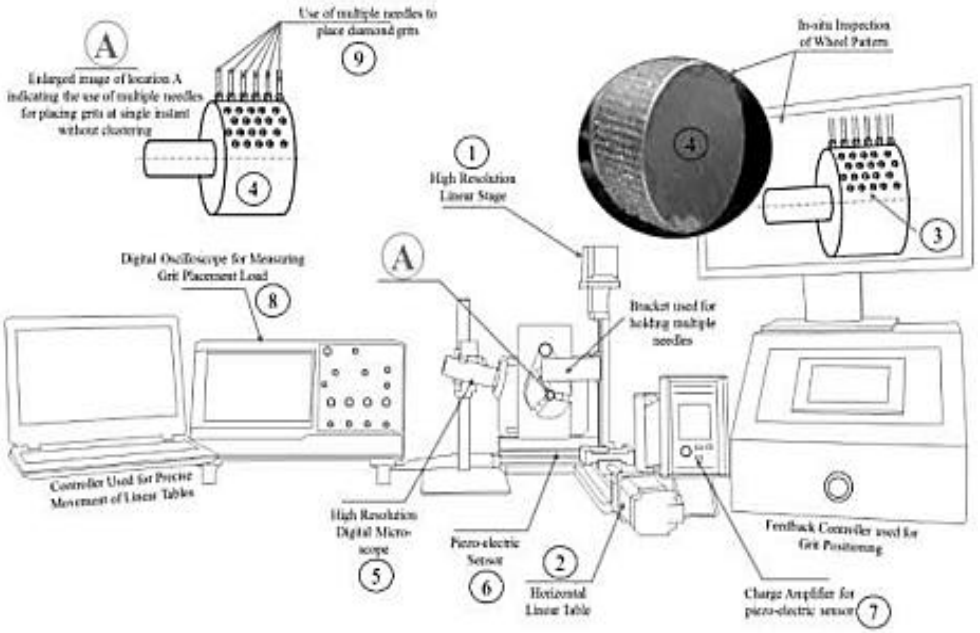

FIG.2 illustrates a graphical representation of a system 100 for developing uni-layered brazed grinding wheels by placing cBN/ Diamond abrasive grits in a pre-defined array using pick-drop-place (PDP) technique.

Key Features / Value Proposition

❖ ***User Perspective:***

- Enhanced Efficiency, Longer Tool Life, Quality Assurance, Expanded Capabilities

❖ ***Technical Perspective:***

- Invention utilizes PDP Tech for **advanced, controlled & precise grit placement**.
- Offers **flexibility** in adopting **grit patterns without templates**.
- Enhanced **Real-time Monitoring** using digital cameras and sensors.
- Represents an **innovative approach** to grinding wheel manufacturing.

❖ ***Industrial Perspective:***

- **High-Quality Tools**: Industries benefit from high-quality brazed grinding wheels.
- **Uniform Grit Distribution**: Ensures even grit distribution, reducing uneven grinding.
- Enhances **competitiveness** in industries working with hard materials.
- Efficient grit placement results in **cost-effective manufacturing.**
- Industries achieve **superior machining outcomes, enhancing product quality**.

Intellectual Property

IITM IDF Ref. 1956; Patent No. 451184 (Grant); PCT Application No. PCT/IN2021/050115

TRL (Technology Readiness Level)

TRL- 3/4, Proof of Concept and validated in Lab

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