A MICRO DEEP DRAWING APPARATUS

IITM Technology Available for Licensing

Problem Statement

- **Conventional micro deep drawing** apparatuses lack efficient heating mechanisms, **resulting in defects, reduced surface finish, and restricted mass production capabilities for complex 3D micro components**.
- There is **a need for a micro deep drawing apparatus** that provides **rapid and localized heating**, precise tooling, and scalability for the **mass production of micro components with complex geometries.**

Technology Category/ Market

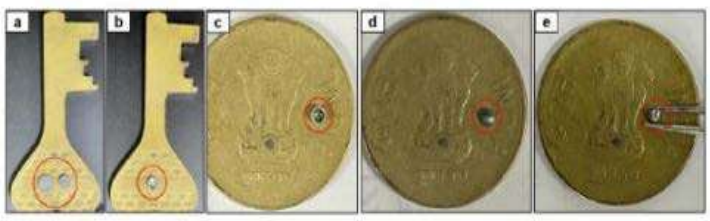
Category – Advanced Manufacturing Technology
Applications – Bio-Medical Engineering, Electronic system & design Manufacturing,
Industry – Electronics, Healthcare Devices**,** Aerospace and Defense, Automotive
Market - The Advance Manufacturing Market size is estimated at USD 141.39 billion in 2024, and is expected to reach USD 279.23 billion by 2029, growing at a **CAGR of 14.58%** during the forecast period (2024-2029).

Intellectual Property

- **IITM IDF Ref. 2210**
- **IN 404689 (Patent Granted)**

TRL (Technology Readiness Level)

TRL- 5, Technology validated in relevant environment



Figures 7a-7e demonstrate work piece sizes, partial formation, and fully formed micro components using the apparatus.

Technology

Microforming Apparatus:
A specialized apparatus designed for micro deep drawing processes, enabling the production of intricate micro components.

Localized Induction Heating:
Utilization of induction heating technology selectively heats the work piece, allowing for rapid and efficient heating without affecting peripheral components.

Precise Tooling:
The apparatus includes high-precision tooling components such as punch holders, guide pillars, and stripper plates, ensuring accurate and repeatable micro forming processes.

Scalability for Mass Production:
Capable of scaling up micro forming processes to mass production levels, meeting the increasing demand for micro components in various industries.

Complex Geometry Capabilities:
Enables the production of micro components with complex 3D geometries, such as hollow and high-aspect-ratio features, which are challenging to achieve with conventional manufacturing methods.

Research Lab

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Key Features / Value Proposition

User Perspective:

Enhanced Manufacturing Efficiency:

- Users benefit from increased efficiency in **micro component manufacturing,** achieved through **rapid heating, precise tooling, and scalability for mass production**.

Technical Perspective:

Advanced Heating Mechanism:

- The localized induction heating unit provides **precise and efficient heating**, overcoming limitations of **conventional heating** methods and ensuring uniform heating of the workpiece for **high-quality microforming processes.**

Image

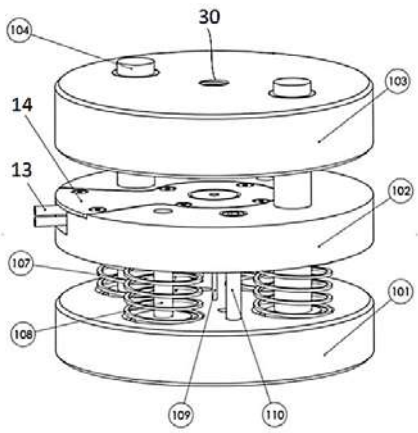

FIG.1 shows a perspective view of the micro-deep drawing apparatus.

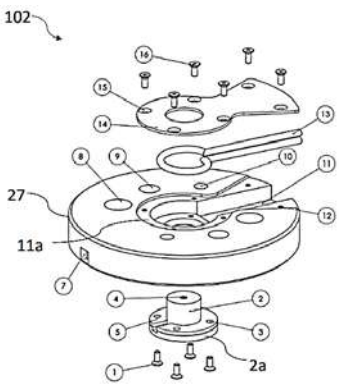

FIG. 2 depicts an exploded view of the stripper plate.

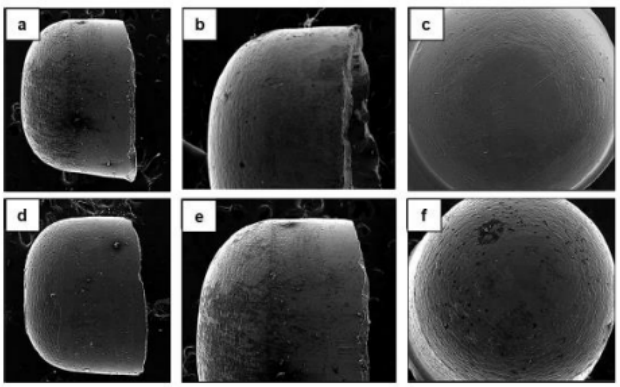

Fig. 8 showcases SEM images of fully formed micro components from the micro deep drawing apparatus.

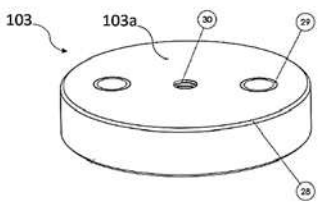

Fig. 4

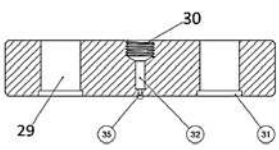

Fig. 5

Fig. 4 displays the perspective view of the die plate.
Fig, 5 shows a sectional view of the die plate.

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