AN ADDITIVE MANUFACTURING SYSTEM AND A METHOD OF MANUFACTURING A PRODUCT

IITM Technology Available for Licensing

Problem Statement

- Additive Manufacturing (AM) has evolved from rapid prototyping to rapid manufacturing, but it still faces significant challenges in areas such as design, materials, manufacturing, testing, and validation, particularly when dealing with multi-materials.
- Combining multiple materials concurrently in an AM machine is practically impossible due to the differing thermo-physical properties of each material, making the AM of multi-materials a significant challenge.
- **Current AM technologies, such as Fused Deposition Modelling (FDM), Selective Laser Sintering (SLS), Selective Laser Melting (SLM), and Direct Metal Deposition (DMD), have not effectively addressed the "staircase effect,"** and they predominantly use Cartesian systems with linear movements, limiting the quality and durability of functionally gradient products.

Intellectual Property

- IITM IDF Ref**. 1816**
- **IN 455804 - Patent Granted**

Technology Category/ Market

Category - Additive Manufacturing
Applications - 3D Printing Enhancement Tech
Industry- Additive Manufacturing
Market - Global additive manufacturing market is expected to grow from $13.16 billion in 2022 to $16.06 billion in 2023 at a **CAGR of 22.%.**

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Research Lab

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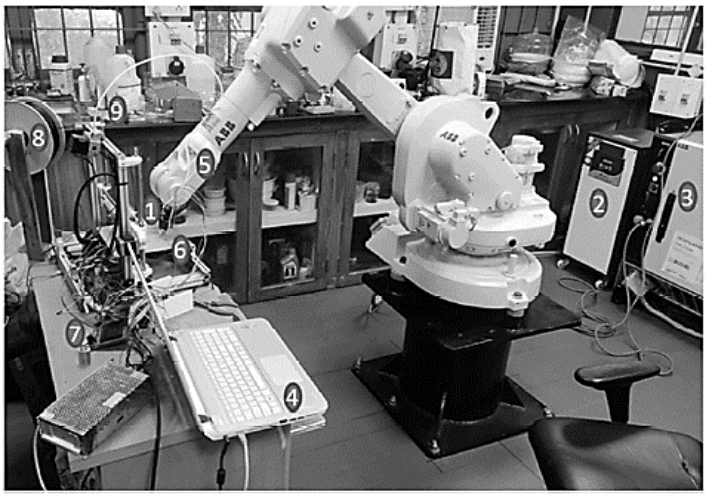

FIG.1. Shows an exemplary setup of the additive manufacturing system.

Technology

The technology is designed to improve additive manufacturing by addressing challenges **related to accommodating multiple materials and the "staircase effect" on curved surfaces.** (Fig. 1, 2 & 3)

1. **The system incorporates a robotic arm with multiple axes, along with several extruders and corresponding nozzles. This setup allows for precise control and smooth printing on curved surfaces with minimal staircasing.**
2. **It enables printing on a variety of surface topologies without significant limitations and reduces the need for support structures.**
3. **The technology significantly increases the speed of manufacturing, enhancing productivity.**
4. **By feeding a constant flow of materials to the printing head and using digital models for guidance, the system achieves high repeatability and well-fused inter-material contact surfaces in the manufactured products.**

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Key Features / Value Proposition

The approach of present disclosure comprising robotic arm with plurality of axes and plurality of extruders and corresponding plurality of nozzles enables:

- ❑ **Smooth printing** when manufacturing products with curved surfaces with minimal staircase effects.
- ❑ **Print over existing surfaces without any limitation of surface topology.**
- ❑ **Usage of minimal support structure** or almost no support.
- ❑ Significant increase in manufacturing speed.
- ❑ **Higher degrees of freedom and control** for movement of the plurality of nozzles.

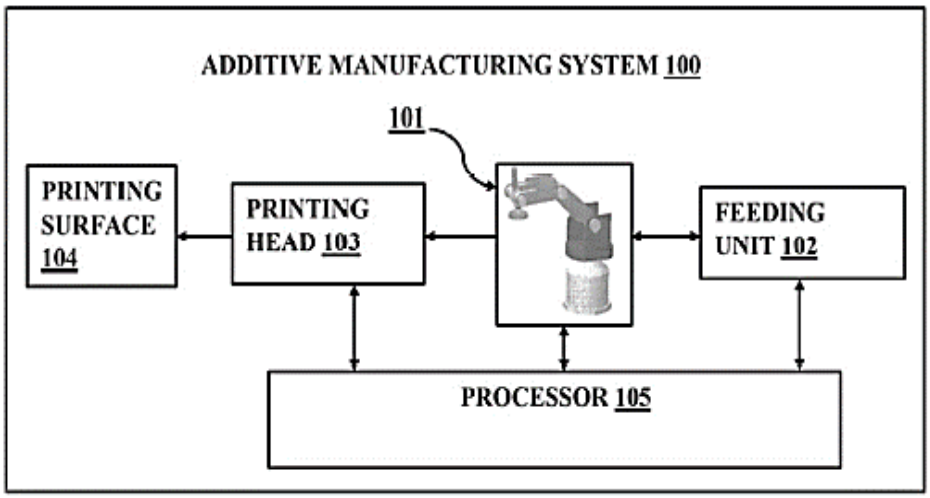

FIG. 2. Depicts an exemplary block diagram of the additive manufacturing system.

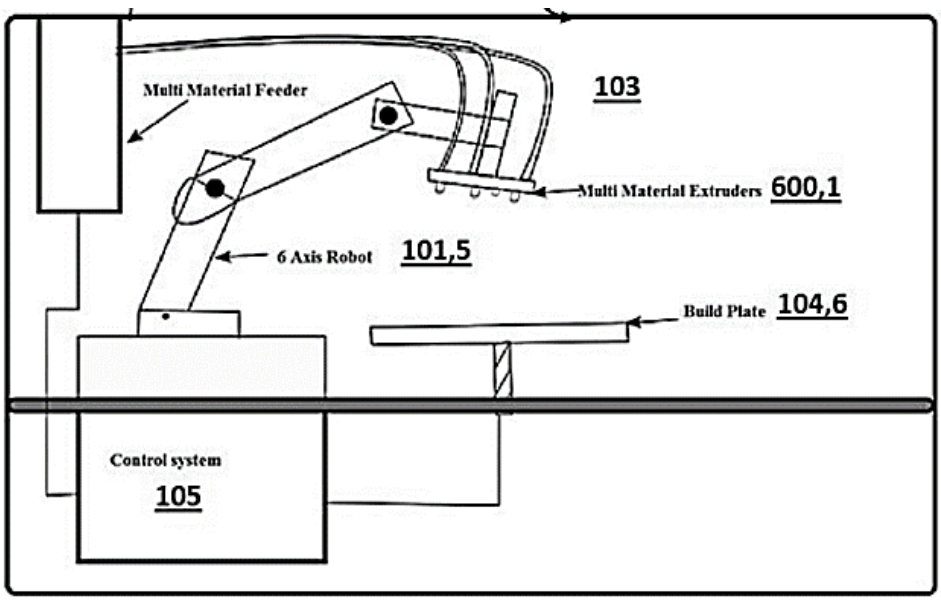

FIG. 3. Shows an exemplary schematic diagram of the additive manufacturing system.

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