LARGE AREA, HIGH RESOLUTION PROJECTION LITHOGRAPHY SYSTEM WITH MOVING OPTICS

Tech ID: 33679 / UC Case 2025-011-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Current methods for 3D printing high-resolution, large-scale designs often face a trade-off between feature size and build area, limiting the scalability of intricate structures. This invention developed by UC Berkeley researchers addresses this by providing a scanning projection system and related method that enables high-resolution, large-scale 3D printing. The system achieves this by employing an advanced optical train with moving optics to project a final image onto a curable resin located on a projection plane. The optical system includes an illumination device, a collimating lens, a first movable reflection mirror, a movable focusing lens, a second movable reflection mirror, and a movable projection lens. By mounting one or more parts of this system on motion stages, the system can scan and project a final image across a large area while maintaining a fine feature size (e.g., 20 micrometers). This approach offers superior resolution and scalability compared to fixed-optics systems, potentially enabling the fabrication of complex structures for applications previously constrained by size or detail limitations.

SUGGESTED USES

- Fabrication of Microfluidic Devices for lab-on-a-chip applications.
- Creation of Large-Scale Optical Components such as lenses or diffractive elements.
- Production of High-Resolution Molds and Tooling for micro-replication.
- Additive Manufacturing of detailed medical implants or prosthetics.
- Development of Advanced Materials with precisely structured internal geometries (e.g., metamaterials).

ADVANTAGES

- High Resolution Over Large Area: The scanning capability combined with the sophisticated optical train allows for consistent, high-resolution feature sizes (e.g., 20μm) across a much larger build area than conventional systems.
- Improved Scalability: The moving optics and scanning method overcome the fundamental size limitations of fixed-optics projection systems, enabling the fabrication of truly large-scale high-resolution parts.

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OTHER INFORMATION

CATEGORIZED AS

» **Optics and Photonics**
» All Optics and Photonics
» **Nanotechnology**
» Tools and Devices
» **Semiconductors**
» Design and Fabrication
» **Engineering**
» Other

RELATED CASES

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Enhanced Fabrication Speed: The projection lithography approach allows for curing an entire cross-sectional layer simultaneously, potentially increasing build speed for large objects compared to point or line-scanning methods.

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System Flexibility: The movable components provide opportunities for dynamic adjustments and error correction during the printing process.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Inverse Designing Metamaterials With Programmable Nonlinear Functional Responses
- Method To Inverse Design Mechanical Behaviors Using Artificial Intelligence

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