Complete Transfer of Liquid Drops by Modification of Nozzle Design

Tech ID: 20151 / UC Case 2005-409-0

SUMMARY

UCLA Researchers in the Mechanical and Aerospace Engineering Department have developed a novel device to promote complete transfer of liquid drops through a nozzle without any residual remaining at the nozzle.

BACKGROUND

Droplet printing precision is important for DNA/protein microarrays. Droplet variations cause detection errors. Inkjet-based and pin-based printing can produce inconsistent droplet volume. When transferred through a nozzle, liquid droplets tend to leave residuals on the printhead after printing. Residuals cause inconsistent printed droplets, and increase the need for cleaning to avoid cross contamination between different sample liquids.

INNOVATION

The novel method enables complete transfers of liquid droplets from a printhead to the printing surface. The effective energy at the nozzle circumference holding back the droplets is reduced, and adhesion between the liquid and print nozzle is lowered. Printhead pull-back is thereby minimized, ensuring no printhead residuals. Accordingly, the printed droplet volume consistently and accurately matches the intended droplet volume. Further, cleaning steps are minimized, which speeds printing processes. The treatment is permanent and does not require any extra step, unlike coating of the nozzle.

APPLICATIONS

- Biological assays/microarrays
- Microfluidic printing systems
- DNA solid pin Replicators
- Droplet-based discrete microfluidics
- Inkjet printing systems

ADVANTAGES

- Promotes complete transfer of discrete drops without residuals on nozzles
- Enables a flexible and compact system capable of printing different samples through the same nozzle
- Minimizes or eliminates cleaning steps typically needed between transfers while avoiding cross-contamination, speeding printing processes
- Improves nozzle consistency and accuracy without increasing manufacturing cost
- Integrates easily with existing nozzle technologies
- Eliminates satellite droplets, improving quality of, e.g., inkjet printing

STATE OF DEVELOPMENT

The device has been fabricated, tested, and verified.

PATENT STATUS

Country	Type	Number	Dated	Case

CONTACT

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INVENTORS

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OTHER INFORMATION

KEYWORDS

biological assays, microarrays, discrete, microfluidic, inkjet, printing, DNA, pin, replicator, droplet, printhead, nozzle, pull back, contamination

CATEGORIZED AS

- **Research Tools**
  - Other
- **Sensors & Instrumentation**
  - Other
- **Engineering**
  - Other

RELATED CASES

2005-409-0

United States Of America	Issued Patent	7,458,661	12/02/2008	2005-409

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Methods of Restoring and Maintaining Gas Film on Superhydrophobic Surfaces while Underwater
- Stereo Image Acquisition By Lens Translation
- Method of Fluid Manipulation By Electrodewetting
- A Built-In Mechanism Of Gas Maintenance In Microfeatures On A Submerged Surface
- No-Assembly Devices for Microfluidics Inside a Cavity
- Liquid-Repellent Surfaces Made of Any Materials
- On-chip, Real-time Feedback Control for Electrical Manipulation of Droplets
- Micropumping of Liquids by Directional Growth and Selective Venting of Bubbles

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