**Manufacturing**

**Paint-Overspray Catcher**

Turning airflow and entrained droplets would be drawn away.

*Langley Research Center, Hampton, Virginia*

An apparatus to catch paint overspray has been proposed. Overspray is an unavoidable parasitic component of spray that occurs because the flow of air or other gas in the spray must turn at the sprayed surface. Very small droplets are carried away in this turning flow, and some land on adjacent surfaces not meant to be painted.

The basic principle of the paint-spray catcher is to divert the overspray into a suction system at the boundary of the area to be painted. The paint-spray catcher (see figure) would include a toroidal plenum connected through narrow throat to a nozzle that would face toward the center of the torus, which would be positioned over the center of the area to be spray-painted. The plenum would be supported by four tubes that would also serve as suction exhaust ducts. The downstream ends of the tubes (not shown in the figure) would be connected to a filter on a suction pump. The pump would be rated to provide a suction mass flow somewhat greater than that of the directed spray gas stream, so that the nozzle would take in a small excess of surrounding gas and catch nearly all of the overspray. A small raised lip at the bottom edge of the nozzle would catch paint that landed inside the nozzle. Even if the paint is directly piston pumped, the droplets entrain an air flow by time they approach the wall, so there is always a gas stream to carry the excess droplets to the side. For long-duration spraying operations, it could be desirable to include a suction-drain apparatus to prevent overflowing and dripping of paint from inside the lip. A version without an external contraction and with the throat angled downward would be a more compact version of catcher, although it might be slightly less efficient.

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LAR-15613

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**Preparation of Regular Specimens for Atom Probes**

Single- or multiple-tip specimens can readily be prepared.

*NASA’s Jet Propulsion Laboratory, Pasadena, California*

A method of preparation of specimens of non-electropolishable materials for analysis by atom probes is being developed as a superior alternative to a prior method. In comparison with the prior method, the present method involves less processing time. Also, whereas the prior method yields irregularly shaped and sized specimens, the present developmental method offers the potential to prepare specimens of regular shape and size.

The prior method is called the method of sharp shards because it involves crushing the material of interest.
Inverse Tomo-Lithography for Making Microscopic 3D Parts
Inverse tomography would be used to generate complex three-dimensional patterns.

NASA’s Jet Propulsion Laboratory, Pasadena, California

According to a proposal, basic x-ray lithography would be extended to incorporate a technique, called “inverse tomography,” that would enable the fabrication of microscopic three-dimensional (3D) objects. The proposed inverse tomo-lithographic process would make it possible to produce complex shaped, submillimeter-sized parts that would be difficult or impossible to make in any other way. Examples of such shapes or parts include tapered helices, paraboloids with axes of different lengths, and even Archimedean screws that could serve as rotors in microturbines.

The proposed inverse tomo-lithographic process would be based partly on a prior microfabrication process known by the German acronym “LIGA” (“lithographie, galvanoformung, abformung,” which means “lithography, electroforming, molding”). In LIGA, one generates a precise, high-aspect ratio pattern by exposing a thick, x-ray-sensitive resist material to an x-ray beam through a mask that contains the pattern. One can electrodeposit metal into the developed resist pattern to form a precise metal part, then dissolve the resist to free the metal. Aspect ratios of 100:1 and patterns into resist thicknesses of several millimeters are possible.

Typically, high-molecular-weight poly (methyl methacrylate) (PMMA) is used as the resist material. PMMA is an excellent resist material in most respects, its major shortcoming being insensitivity. Conventional x-ray sources are not practical for LIGA work, and it is necessary to use a synchrotron as the source. Because syn-