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# AEC-NASA TECH BRIEF



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## Ductile Mandrel and Parting Compound Facilitate Tube Drawing

### The problem:

To draw refractory tubing to any desired OD without using conventional internal mandrels in a series of successive drawing operations.

### The solution:

Warm draw the refractory tubing over a solid ductile mandrel with a powder parting compound packed between the mandrel and the tube's inner surface.

### How it's done:

The mandrel, made from a ductile material such as 1020 steel, is equal in length to the original tube but is slightly smaller than the tubing ID. The space between the mandrel and the tube inner surface is packed with a refractory powder, such as MgO or Al<sub>2</sub>O<sub>3</sub>. The tube is then drawn to the desired OD size. During drawing the parting compound acts as a lubricant to prevent adhesion between the mandrel and the inner surface of the tube and to aid in forming a smooth inner tube surface. The drawing causes the ductile mandrel along with the entire tube to deform, which reduces the tube inner diameter. After drawing, the mandrel alone is strained in tension so that its diameter is reduced to less than that of the tubing ID. The mandrel is then withdrawn from the tube.

### Notes:

1. This method applies also to the coextrusion of a billet and a ductile mandrel. The mandrel is fitted into a cylindrical cavity in the billet with sufficient clearance to accommodate refractory powder between them. The heated billet is extruded and drawn to size, and the mandrel is withdrawn as the final step.

2. This method is of value both in extruding and drawing refractory metal tubing. The method is not likely to interest producers of soft metal tubing such as copper or aluminum, since these metals may be easily cold drawn by conventional means.
3. Inquiries concerning this innovation may be directed to:

Office of Industrial Cooperation  
Argonne National Laboratory  
9700 S. Cass Avenue  
Argonne, Illinois 60439  
Reference: B66-10571

### Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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Chicago Patent Group  
U.S. Atomic Energy Commission  
Chicago Operations Office  
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Category 05