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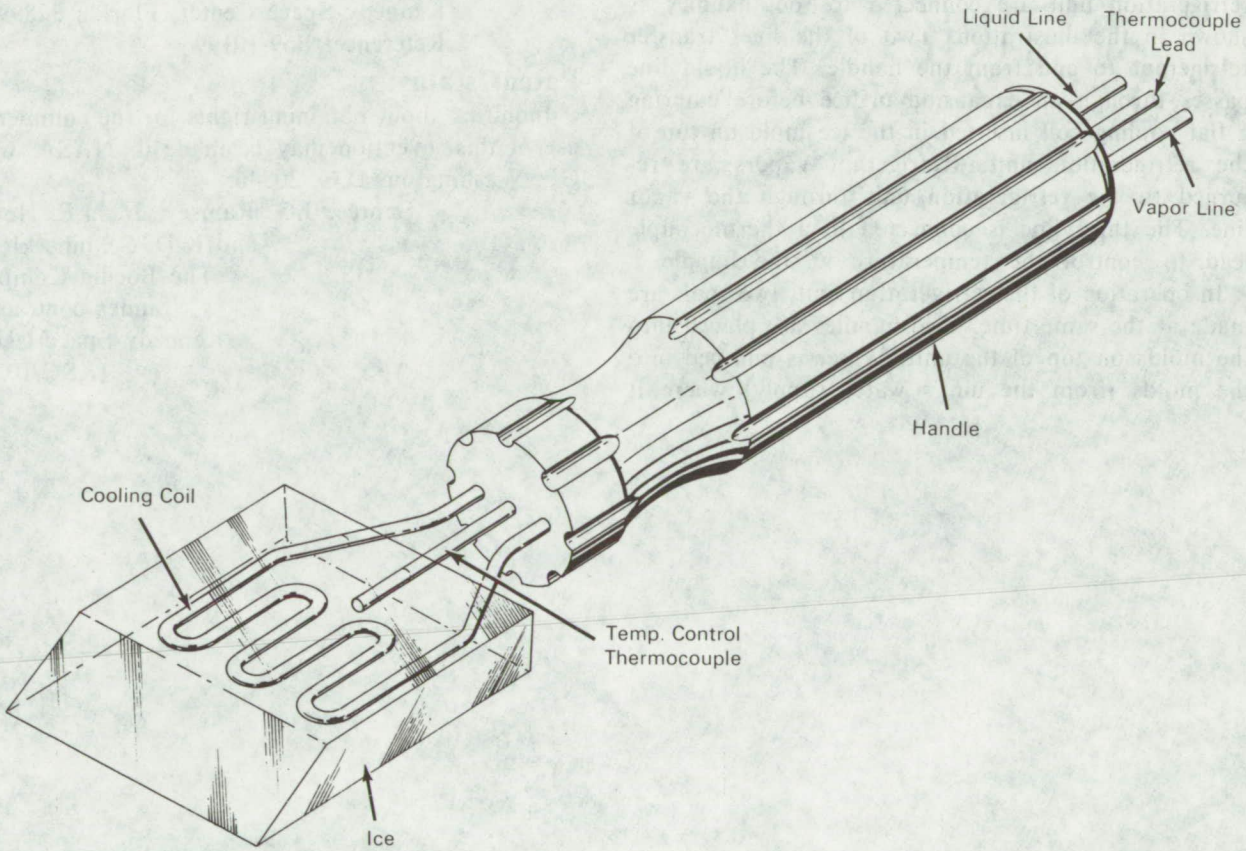
NASA TECH BRIEF

Tools Made of Ice Facilitate Forming of Soft, Sticky Materials



Tools made of ice have been developed to facilitate the forming or shaping of materials that are soft and sticky in the uncured state. An example of their usefulness is in the shaping of silicone rubber gaskets and seals that are formed in place in applications where premolded sealants cannot be used.

Ice has several advantages as a tool for working room-temperature-curing materials. The low temperature of the ice slows the curing of the material, extending the working time available before setup; handling problems are eliminated, because the material does not adhere to the tool; and the melting

(continued overleaf)

ice serves as a lubricant, which aids in producing a part of the desired shape.

A tool can be simply made by inserting a handle (such as a dowel) through a one-hole stopper into an ordinary plastic tube filled with water. The assembly is then refrigerated until the water freezes. Removal of the tool is accomplished by warming the tube by hand or dipping it in tap water. The tool can then be used as long as a useful ice form remains.

Flexible, reusable molds can be easily fabricated from room-temperature-curing-elastomers to the exact ice-tool shape desired for specific jobs.

A portable refrigeration unit has been devised for use in work areas where large numbers of applications are made. This unit has the capability of freezing water in molds and maintaining the frozen condition while the tools are in use. Flexible lines from the refrigeration unit are connected to tool handles as shown in the illustration. Two of the lines transfer refrigerant to and from the handle. The liquid line passes through an expansion orifice before entering a flat cooling coil inserted in the ice mold on top of the refrigeration unit. Refrigerant vapors are returned to the refrigeration unit through the vapor line. The third line is connected to a thermocouple lead to control the temperature at the handle.

In operation of the refrigeration unit, two tools are made at the same time. Two handles are placed into the molds on top of the unit. Water is pumped into the molds (from the unit's water supply) where it freezes around the coils. The operator then simply picks up one of the handles and uses the tool until the ice loses its shape by melting. The tool is reshaped by replacing it in the mold, adding water, and allowing it to freeze. During this period, the second tool can be used. Different tool shapes can be made on the job simply by changing molds.

Ice tooling should be especially helpful for working with sealants applied to metal, glass, and other nonporous surfaces. For best results, water should be prevented from contacting the surfaces before the sealant is applied.

Notes:

1. No further documentation is available.
2. Inquiries may be directed to:

   Technology Utilization Officer
   Kennedy Space Center
   Kennedy Space Center, Florida 32899
   Reference: B69-10199

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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