NASA TECH BRIEF

Diffusion Bond Method of Joining Steel and a TFE-Bronze Composite

The problem:

To join a TFE-bronze composite and 4340 steel of Rc 39-41 in a time/temperature relationship that would neither affect the mechanical properties of the steel, nor the strength of the teflon. The TFE-bronze composite is to be the dry lubricant for gears of the steel which must operate in the hostile environment of space. Previous methods have involved adhesive bonding which has been less than satisfactory due to adhesive outgassing, radiation damage, and frequent delamination during final machining of the gears.

The solution:

A diffusion bonding method that results in a product that is freed of outgassing and radiation problems by means of a diffuser at the TFE-steel interface.

How it's done:

Relatively standard procedures are used, with the exception of the interspaced diffuser. The parts to be joined are cleaned with methyl alcohol and the metal interfaces are copper flashed after which a coat of flux is treated with fine-mesh oxygen-free copper granules. The parts are then placed in a straightforward bonding press, brought up to heat (580°F) and pressure (2500 psi) for 15-to-20 minutes and allowed to cool to room temperature.

Notes:

1. This method, while offering a superior product, involves only 1-1/2 hours time in process whereas the use of adhesives takes approximately 26 hours (setup time and adhesive curing).
2. The method shows promise in the field of dry lubrication for other than aerospace applications.
3. No further documentation is available.
4. Technical questions may be directed to:
   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B69-10237

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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